Khyber Pakhtunkhwa Water Resources Development Project
Composition and Terms of Reference of
Detailed Engineering Design and Project Readiness Support Consulting Services

I. Background

1. ADB approved a technical assistance grant[1] on 6 December 2017, amounting to $1.2 million, for preparing or upgrading the feasibility studies of three investment sub-projects in Khyber Pakhtunkhwa; (i) Mulkoh irrigation distribution system (IDS) and its command area development (CAD) in Chitral district (Mulkoh); (ii) Modernization of the Tanda IDS (Tanda) and its CAD in Kohat district; and (iii) Pehur Main Canal IDS and its CAD in Swabi district (PMC). ADB increased the financing amount by $300,000 and extended the TA facility from December 2019 to March 2022 for additional studies and offsetting implementation delays including due to COVID-19. Due to high priority, the federal government and Government of KP (GOKP) decided to finance Tanda IDS and CAD through the federal Public Sector Development Program instead of ADB financing and approved the Tanda subproject on 3 March 2020. The feasibility studies of Mulkoh and PMC were finalized in 2022.

2. The ADB's Country Partnership Strategy 2021-2025[2] aims at enhancing food security which requires adopting modern agriculture technology, modernizing the delivery of irrigation water services, improving agricultural productivity, and increasing access to affordable credit and marketing services. The strategy prioritizes investing in value chain rural infrastructure development by improving climate-resilient water storage and regulatory capacity for surface, groundwater, and water harvesting and for irrigation system upgrades.

3. GOKP and ADB agreed on financing a new project in 2024 with indicative allocation of $150 million and a Project Readiness Financing (PRF) of up to $5 million in 2022 for the detailed engineering design and also to ensure project readiness. In addition, ADB is supplementing the PRF with grant resources with a facility-transaction technical assistance (F-TRTA) of $3 million (for KP and Punjab) approved in December 2021[3]. The terms of reference for the "Detailed Engineering Design (DED) and Project Readiness Support Consulting Services" referred to as "consultants" or "consulting services" in this document will prepare Mulkoh and PMC projects. The Irrigation Department of Government of Khyber Pakhtunkhwa (KPID) and Agriculture Department of Government of Khyber Pakhtunkhwa (KPAD) are the implementing agencies. The KPID will be responsible for all the preparatory works related to irrigation system and the KPAD will be responsible for preparatory work related to CAD and agriculture. The recruitment of consulting services and subsequent contract management, however, shall be the responsibility of the KPID who will coordinate with all relevant stakeholders.

II. Key Features of Completed Feasibility Studies

4. The Mulkoh project was formerly known as Trichan Irrigation System and was conceived by the locals about three decades ago. Partial excavation of the channel was also carried out on self-help basis with some assistance from the district council. Due to difficulties in construction and lack of funds for the project, the remaining work was stopped. KPID engaged consultants to

[1] ADB. 2017. *Khyber Pakhtunkhwa Water Resources Development Project.* https://www.adb.org/projects/51249-003/main

[2] ADB. 2020. *Country Partnership Strategy: Pakistan, 2021-2025*. https://www.adb.org/documents/pakistan-country-partnership-strategy-2021-2025

[3] ADB. 2021. *Preparing Climate-Resilient Agriculture and Natural Resources Development Projects*. https://www.adb.org/projects/55225-001/main

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conduct feasibility studies in 1993-94. The feasibility studies were updated in 2015 and 2022. The project envisages increased agriculture benefits through irrigating 6,111 hectares (ha) of agricultural lands of Union council Kosht, Mulkoh and Kagh Lasht plain. The project components include construction of a 55 meters (m) wide weir on Tirich River near Lashtdeh-Shagrom village, a headrace channel of about 1.2 kilometers (km), 5.2 km long tunnel and irrigation system comprising canals, syphons, cross-drainages, ancillary works, and CAD. The estimated project cost is $110 million.

5. The PMC canal was built in 1957 to divert water from Indus River to the command area in Swabi district. The offtake had to be abandoned due to the construction of Tarbela dam and the canal was converted to lift irrigation scheme pumping from downstream of Tarbela dam. After construction of Ghazi Barotha Barrage, the canal was re-converted to gravity supply and a new head regulator in Ghazi Pond was constructed to feed the PMC. The canal is designed for irrigating an area of about 19,500 ha - the agriculture area however is reduced due to urbanization. The feasibility study recommends five options ranging from minor outlets replacement works with CAD works to remodeling. Each option has varying benefits and cost, later ranging from $15 to $45 million with FS consultant's recommendations of one of the options, costing $35 million.

III. PRF Consulting Services

6. The consulting services will enhance and prepare PMC and Mulkoh subprojects design for modernized, improved, climate-adaptive and gender inclusive water resources management and agricultural productivity, improved farmers skills, agri-businesses, value chain development, farms, and non-farm incomes, and improved capacity of the executing and implementing institutions. Key consulting services will include (i) review of available studies, consultation with GOKP, ADB, F-TRTA consultants,[4] other stakeholders', and preparing a concept design which improves, upgrades and fills the gaps in the existing feasibility studies; (ii) the detailed engineering design (DED) of the irrigation and drainage infrastructure, CAD, development of strategic procurement planning, preparation of bid documents, preparation of Planning Commission-1, environment and social safeguards, and other project readiness and capacity building activities. The2ervice2n of 2ervicees is estimated at 30 months: 18 months for DED and additional time for related activities such as preparation of technical specifications, draft bid documents, review of bid evaluation reports, land acquisition and resettlement start-up implementation, and capacity building.

7. The DED will cover (a) all the technical aspects using acceptable best practices being used for the design of new, upgraded, and remodeled irrigation system with improved technologies and practices in command area development; and (b) design of all other project allied facilities. The survey and investigation data shall meet the DED requirements to calculate all the quantities with maximum accuracy as per site conditions to prepare the bill of quantities for the bidding documents for works contracts. The DED shall cover sufficient details required for the preparation of drawings and technical specifications for the bidding documents and for the implementation of the project. In addition, the assignment will facilitate (i) project approval (Planning Commission-1); (ii) procurement; (iii) compliances with environmental and social

[4] F-TRTA consultants includes Climate Change Assessment firm, Irrigation and Agriculture firm, Safeguards and Gender firm, and individual advisory and support consultants. Details are at https://www.adb.org/projects/documents/pak-55225-001-tar

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safeguards; and (iv) ensure that the project remains technically, economically, financially, institutionally relevant, viable and

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sustainable after the DED. Experience and lessons learned will be drawn and incorporated in the DED.

IV. ADB Additional Support with PRF

8. ADB has approved a F-TRTA (footnote 4) which will support the PRF's quality outputs through (i) early-stage upstream stakeholder engagement, scoping, and initial assessments for safeguards and gender due diligence; (ii) review and enhancement by international consultants to integrate best international practices and quality solutions in the project design; and (iii) prepare supplementary documentation and due diligence not included in the PRF's scope. The F-TRTA support will ensure the development of climate resilient solutions, and that projects are grounded in strategic sector and climate change assessments, respond to the specific needs of women working in agriculture, have a high level of procurement and safeguards readiness, and provide innovative and integrated solutions. The PFR consultants' team will work in close coordination with the F-TRTA consultants.

V. Consultant's Scope of Services and Terms of Reference

9. **Overall assignment.** The duration of services is estimated at 30 months tentatively starting Q1 2023 and completing Q3 2025 with 18 months for the preparation of detailed design and land acquisition and resettlement (LAR) documents. Additional time for procurement transaction, LAR implementation, and capacity building will continue until the end of Q3 2025. The following are key scope of services while details are provided in subsequent sections.

i. review the feasibility level project design, criteria, approach of water resources management, irrigation and drainage system, and CAD model; hold extensive consultation and field surveys in finalizing the project concept design.
ii. finalize irrigation and drainage infrastructure system, command area and agribusiness development design.
iii. review topographic and geographic information system (GIS) information and maps produced during the feasibility stage and identify the gaps for the DED.
iv. review geotechnical investigation including exploratory drilling and laboratory tests and analysis report and identify the requirements for further investigation and testing to be carried out for DED.
v. review surveys and investigation work for the irrigation canals and hydraulic structures of canals and command area development.
vi. carry out project DED using updated topographic, geotechnical, hydrological, hydraulic, seismic analyses based on the updated design criteria and parameters.
vii. support preparation of draft strategic procurement plan, technical specifications, bidding documents, support in the bidding process, review of bid evaluation reports.
viii. support preparation of draft Planning Commission-1 and project administration manual per the government's and ADB's requirements.
ix. support in reviewing and updating social safeguards, environment, social development, and gender action documents and plans.
x. carry out economic and financial analysis.
xi. update or conduct a climate change risk assessment of the project assets and beneficiaries and incorporate good practice and feasible climate change adaptation interventions in the project design especially on structural and nonstructural interventions.

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xii. prepare the implementation and construction planning.
xiii. conduct stakeholders' engagement.
xiv. design operation and maintenance systems and instrumentations.
xv. provide support for LARP implementation and procurement transaction.
xvi. digitize farms information from revenue record for farm areas delineation and command area mapping
xvii. baseline surveys for social and gender, agri-value chain assessment, and primary command area information,
xviii. community outreach, consultation, and mobilization.

10. **Water Resources Management, Irrigation and Agriculture Development Concept Design.** Review of water resources management, irrigation and agriculture productivity improvement design proposed in the feasibility design, and conditions of the project's command area and the farming communities. The consultants shall cover the following aspects and submit a concept design:

i. review of feasibility studies and other information, plan early consultations and primary data collection.
ii. modify or propose additional measures of credible water and agricultural productivity improvements scenarios that the project may adopt through increased and/or reliable supply of irrigation and supporting agriculture development.
iii. review existing and/or recommended water allowances, water requirements, conveyance systems, conjunctive use, groundwater conditions, cropping patterns, intensities, yields, land use development, soil, farming practices, agroecological conditions.
iv. suggest cropping patterns, agriculture inputs, practices, value chains improvements, agri-business, and improvements of provision of physical, digital, financial and agriculture services access.
v. identify main challenges and constraints to the realization of agricultural development scenarios, and propose most cost-effective measures to address such constraints
vi. agriculture value chain assessment in the command area and propose model of development.
vii. study social hydrology including existing water rights and existing water allocation and distribution system at the farm level and provide recommendations for new or upgraded system.
viii. in case of PMC, review hydraulic surveys results available under the feasibility study, and analyze the results of main canal flows, over and underdrawn distributaries, minors, and outlets, with crop water requirements using GIS/RS techniques and recommend the irrigation, drainage, and CAD development model. In case additional area is available within the water availability, propose its exclusion.
ix. estimate non-agriculture water and provision in the system.
x. incorporate advisory recommendations from F-TRTA on water resources, irrigation, drainage, agri-business farms value chain development, irrigation agronomy, HEIS, groundwater and conjunctive use, resilience and nature-based solutions, climate change, and gender development.
xi. review climate change assessment and propose adaptation measures.
xii. propose technological options in design and construction introducing modern, alternative, suitable system, methods, and technologies for local conditions with

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strengthened institutional capacity and arrangements.

xiii. in case of Mulkoh, review watershed management interventions

xiv. in case of PMC, review the feasibility study in particular the condition surveys, hydraulic survey, *chakbandi* maps and command area assessment, groundwater survey and agro-economic survey, the robustness of development options 1-5, selection of one option or any combinations or different options in combination with conjunctive water management.

- Option 1 – replacement / rehabilitation of canal outlets and command area development works
- Option 2 – major repair works along PMC, replacement of outlets and command area development
- Option 3 – complete rehabilitation / repair of PMC system, Command Area Development
- Option 4 – remodel PMC for increasing water allowance of PMC by 20% and command area development
- Option 5 – remodel PMC for Increasing Increase water allowance of PMC by 40% and command area development

xv. submit the concept design for consultation, approval, and next steps preparatory work.

11. **Irrigation and Drainage Infrastructure Design.** Based on the concept design and review of irrigation and drainage infrastructure design, the consultants will design new and existing canal and drainage system. The consultants shall cover the following aspects:

(a) Mulkoh IDS and its CAD in Chitral district

i. review and finalize the adequacy of the hydrological studies completed including but not limited to the drainage basin, climatology, precipitation, humidity, temperature, and others with sources of data, catchment area extent, stream gauging network, instantaneous peak discharges, method, and approach to calculate flood discharges at the weir and dependable diversions.

ii. identify and mapping glacial lakes as a potential glacial lake outburst flood (GLOF) in the project area basins based on field observations, past events, geomorphologic and geotechnical characteristics, and others, and propose structural measures for managing the hazard and risk associated with potential GLOFs on the weir, head race and tunnel inlet portal.

iii. design the weir, head conduit and tunnel system based on the existing and new field investigation and survey data

iv. tunnel designing by using numerical model to assess potential stress induced stability problem due to overburden to confirm the maximum deformation and design support required.

v. review the surface geology along the irrigation system for the construction method, slope stabilization, operation, and maintenance. If needed the conveyance system is changed to piped or open channel or a combination with different technological options.

vi. study social hydrology including existing water rights and existing water allocation and distribution system at the farm level and provide recommendations for new or upgraded system.

vii. review the proposed layout plan proposed and optimization of project components especially the irrigation system and recommending modern

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options for irrigating undulating areas and recommend one suitable for local conditions.

viii. design a demand-based system integrated system with water availability, crop, and other requirements, and controlling the supply through gated escape operation at the tunnel inlet releasing water in stream excess to the requirements.

ix. review, evaluate and update past studies on the seismic hazard analyses, and determine, according to best international practice, the most credible safety evaluation earthquake for the tunnel, and operating basis earthquake for other non-critical structures, both in terms of peak ground acceleration.

x. review all hydraulic design options for ensuring satisfactory sediment transport and minimizing cost requirement without compromising system performance.

xi. prepare detailed engineering design for all facets of construction works of the in accordance with the accepted state of the art methods and irrigation science, hydraulics, soil mechanics and structural engineering.

xii. design cost effective and easy to operate hydromechanical, electromechanical, electrical, auxiliary, instrumentation, telecommunication, safety installations, back-up, and control systems the at weir site and control points in conveyance systems connected with the information and control rooms. The possibility of installation of Telemetry System at appropriate location for real time monitoring may also be assessed.

xiii. design other allied facilities.

xiv. design the project with consultation incorporating knowledge of community.

xv. recommend any associated hydropower facility (if any) and additional studies and resources required for its development.

(b) Pehur Main Canal IDS and its CAD in Swabi district

i. review hydraulic surveys result available under the feasibility study, and analyze the results of main canal flows, over and underdrawn distributaries, minors, and outlets, with crop water requirements using GIS/RS techniques.

ii. review key problems identified in feasibility study including but not limited to deficiencies in canal design, larger bed width than required for the designed depths, roughness and seepage estimation in original design, regulation, unequitable distribution, lowering of groundwater in tail reaches, conversion from silt laden to silt free canal, pond regulation from offtake, flood and sheet flow entering canal, sewage disposal, weed growth and localized sloughing

iii. review the causes for the weed growth and propose solutions for the problem.

iv. review feasibility studies, update or improve detailed physical condition assessment of all structures including head regulators, cross regulators, aqueducts, siphons, outlets structures, channel sections and bridges, patrol banks conditions of the irrigation system and the right of way.

v. carry out detailed assessment of the relevant cross, horizontal, and vertical drainage system and propose solution for resolution including clearing, rehabilitating, or modifying drainage passages.

vi. detail survey of flood protection works in the area, their type of physical condition.

vii. review recommendations of Option 1 to 5 or combination thereof and prioritize infrastructure (irrigation, watercourses, drainage, tube wells, flood protection works) for rehabilitation and upgradation based on physical

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conditions to be done under the project or the O&M program. The field assessment, digitization and georeferencing will develop a model to replicate for other KPID system.

viii. design cost effective and easy to operate hydromechanical, electromechanical, electrical, auxiliary, instrumentation, telecommunication, safety installations, back-up, and control systems in conveyance systems connected with the information and control rooms. The possibility of installation of Telemetry System at appropriate location for real time monitoring may also be assessed.

12. **Command Area Development.** Review of design of CAD carried out at feasibility study stage. This shall cover the following aspects of the command area development.

(a) Mulkoh IDS and its CAD in Chitral district

i. review of FS prepared for development of tertiary distribution system.
ii. command area development, using modernized approaches and technologies for improved water and agriculture productivity preferably a demand-based system with small, localized water storage tanks
iii. based on the topography of command area, identify undulations and recommend options for its development using nontraditional approaches for high value crops and irrigation methods and various other combination of options not limited to terracing, land development, and levelling.
iv. consultation with communities to develop the *chakbandi* of the proposed new outlets, water distribution and irrigation scheduling.
v. suggesting cost sharing or complete public investment model arrangements in consultation with beneficiaries and coordination with agriculture department to promote adoption of modern technologies like efficient water conveyance and application, watercourse development, laser land levelling, drip, or simpler cost-effective piped irrigation system, type of outlets, design options for rough land levelling, terrace farming or piped system on slopes.
vi. collect, analyze, georeferenced, digitize farmers data in the command area from field surveys and revenue record.
vii. present tertiary system alignments, *chakbandi* boundaries, farmers data and other GIS based features for designing farmers outreach and support initiatives.
viii. explore relevant non-crop intervention that may facilitate income to the project beneficiaries.
ix. suggest procedure for the capacity building of the farmers and other stakeholders for successful implementation of project deliverables.
x. propose afforestation measures in slopes and social forestry inside and out-of-command areas with potential for livelihood, nature-based solutions, and ecosystem services increased plantation, conservation, non-timber, and medicinal benefits.

(b) Pehur Main Canal IDS and its CAD in Swabi district

i. collect, analyze, georeferenced, digitize farmers data in the command area from field surveys and revenue record.
ii. carry out survey of watercourses to assess physical condition of outlets, channels, length and condition of lining, type, and age of lining, and recommend solutions.
iii. collect groundwater related information like tube well's location, details of

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discharge and water quality.

iv. conduct detailed assessment of groundwater use in the command area including number of public and private tube-wells, discharge, and contribution to irrigation in the area, number of acres served in kharif and rabi, and depth and quality of water.

v. updated the *chakbandi* maps of each outlet with watercourse alignment and branches, updated records of warabandi along with details of owners and location of fields.

vi. present tertiary system alignments, *chakbandi* boundaries, farmers data and other GIS based features for designing farmers outreach and support initiatives.

13. **Agribusiness and Value Chain Assessment.** The project intends to support farmers and agribusinesses in improved technology and practices and maximizing the benefits of increased water availability of the two command areas. The agribusiness consultant will study the potential for the commercial agriculture in the two project areas; the support needed to realize this potential and advise models in how to bring this support to farmers and agribusinesses. To study above and alternative options, the consultants will perform following tasks:

i. conduct survey and mapping of the two command areas to priorities value chains in crops, livestock and dairy, and fisheries for further development. The consultants will use a well thought out criteria for the prioritization.

ii. conduct detailed assessment for the high priority (at least 5) value chains to; (a) determine the training and technology (equipment, machinery, infrastructure and materials) needs of the various stakeholders involved from input supply; production on-farm to marketing (local and export) and processing; (b) estimate the potential demand for the commercial production; including estimate of consumption and potential for commercial availability for local and other markets with the project area; (c) assess accessibility to market and current mode of surplus supplies to markets; (d) assess current profitability and potential for improvement with improved inputs, packaging, and value addition; I analyze data, conduct consultations with stakeholders and present options for agribusiness model for both areas; (f) identify potential production clusters and size of potential contract growing.

iii. advise and design model (s) for agribusiness development for both areas such as farmers collectives or cooperatives; cluster-based development; contract growing; common interest groups; farm enterprise groups; value chin financing models of various development partners and best practices, including but not limited to the design adopted by the International Fund for Agriculture Development, Pakistan (IFAD-Pakistan) in KP under its KP Rural Economic Transformation project i.e. (i) Professional Farmer Organizations, (ii) Public-Private-Producers Partnershi–s - 4Ps, (iii) Farm Services Companies/Centers, and (iv) Institutional support services (performance-based engagement with departments and services providers).

14. **Topographic Surveys and GIS Mapping**. The scope of work given in the following is in addition to what has been completed in the feasibility studies stage to meet DED requirements. Where required, consultants will access free earth observation data or acquire high resolution GIS maps. The following surveys will be carried out:

(a) Mulkoh IDS and its CAD in Chitral district

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i. catchment area map by using recent satellite images
ii. topographic survey of weir site, headrace conduit, tunnel portals, irrigation network and other structures sites on scale 1:500 with contour interval of 30 cm along with digitization. This will be supplemented by updated satellite imagery and digital elevation data and a drone survey.
iii. 200 m wide strip survey for new irrigation system considering different options for its recommended alignment. For distributaries 100 m wide survey and for minors and watercourses 50 m wide survey is recommended, however the Consultants may make the adjustments in the scale of strip survey as required after the physical reconnaissance survey of the area. The scale of the topographic survey and contour interval shall be selected based on the topography of the area and design requirement.
iv. command area mapping through control points and generating topography maps at 1:5,000 scale with 0.3-0.5 m interval contour (the contour interval shall be selected based on the topography and physical features of the area. This will be supplemented by updated satellite imagery and digital elevation data and a drone survey.
v. establishment of reference point/permanent benchmarks at appropriate location along the proposed alignment and these shall be inscribed with coordinates and levels.
vi. longitudinal profile & cross-sections / if required bathymetric survey of main river & nullahs/cross drainage works.
vii. traversing and precise leveling from BMs (Benchmarks) of Survey of Pakistan for establishing permanent concrete survey monuments datum.
viii. verify and update land ownership records under each outlet.
ix. verify and digitize *chakbandi* maps prepared under feasibility studies.

(b) Pehur Main Canal IDS and its CAD in Swabi district

i. cross sectional survey along PMC and its distributaries/minors with 100 meters interval. Additional cross-sections for bends, structures and their upstream and downstream. Cross sections of the entire channel prism, channel banks, patrol and non-patrol banks, toe points of banks with natural surface and at least two additional points outside of the banks to establish natural ground level and marking all features
ii. topographic survey near cross-drainage structures and cross-section survey of nullahs.
iii. command area mapping through control points and generating topography maps at 1:5,000 scale with 0.3-0.5 m interval contour (the contour interval shall be selected based on the topography and physical features of the area.
iv. traversing and precise leveling from BMs (Benchmarks) of Survey of Pakistan for establishing permanent concrete survey monuments datum

15. **Geological and Geotechnical Studies.** The scope of work given in the following is in addition to what has been completed in the feasibility studies to meet DED requirements. The following will be carried out:

(a) Mulkoh IDS and its CAD in Chitral district
i. review FS level investigations and other reports, recommend additional (if required) and carry out the geotechnical investigations at the specified locations given in the TORs and produce “Geological and Geotechnical

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Investigations Report".

ii. prepare a programme of extensive supplementary geological mapping would be required to be implemented in critical areas.
iii. identification of potential geological and geotechnical risk and hazards with recommendation about remedial measures.
iv. recommend the geotechnical investigations and testing for the detail engineering design after the complete review of the existing available information from previous studies.
v. perform field investigations including analysis and testing on disturbed and undisturbed soil samples.
vi. the geotechnical investigations given in the Table 1 have been proposed based on available information identified from the previous reports. The geotechnical investigation numbers, type and location shall be reviewed. However, precautions have been taken that proposed investigations for the detail engineering design shall cover all the gaps in geotechnical studies of the specific locations.
vii. review available information from geological maps for faults, joints, stratigraphy, and other significant geological features for assessing the need for more tests in the weir and tunnel portal areas.
viii. Identify and analyze potential risk of land slide, seepage and other hazards in the weir, tunnel portals and irrigation distribution system & management plan.

Table 1: Geotechnical Investigation at Mulkoh

Sr. No.	Location and Type	Requirements
1	Weir and Head Race conduit	2 Boreholes 50 meters
2	Tunnel portals and near axis	4 boreholes each of 300 m depth
3	Canals, Cross Drainage, Key Structures, Critical Cut Slopes, High Cut Areas	20 boreholes each of 30 m depth
4	Test Pits	Test pits in structures and borrow areas

*The number of boreholes shall be finalized after consultants' reviews of the available data

(b) Pehur Main Canal IDS and its CAD in Swabi district

i. carry out the geotechnical investigations at the specified locations given in the TORs and produce "Geological and Geotechnical Investigations Report"
ii. the geotechnical investigations given in the Table 2 have been proposed based on available information identified from the previous reports. The geotechnical investigation numbers, type and location shall be reviewed.
iii. for remodeling of the canal during the detailed design stage, some of the following structures of the canal shall be dismantled and reconstructed like bridges, aqueducts and fall structures. Geotechnical investigations envisaged for the detailed design of these structures comprise drilling of boreholes, excavation of test pits, in-situ field testing and laboratory testing of the collected samples. Details of the proposed geotechnical investigations at the locations of structures to be reconstructed are listed

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hereunder:

Table 2: Geotechnical Investigation at PMC

Sr. No.	Location and Type	Estimate Requirements*
1	Bridges, Falls, Aqueducts, and Critical Canal Sections	10 boreholes each of 15 m depth and 5 boreholes each of 10 m depth

*In the feasibility study, 47 boreholes were recommended at 27 RDs with various depths ranging from 11 meters to 20 meters. This will be finalized after "Water Resources Management, Irrigation and Agriculture Development Concept Design". The current requirement is for the purpose of estimation

iv. for borrow areas and command areas of PMC, thirty (30) test pits shall be excavated down to a maximum depth of 3m. The location of these test pits shall be finalized at the time of execution of this project.

v. investigations for critical sections of the canal includes two boreholes each down to 10 meters and four test pits each down to 3 meters depth shall be excavated

16. **Stakeholders Communication Management.** The services will cover the following:

continuity of the work undertaken during feasibility study on consultation and communications

i. recommend additional measures if the consultation and communication need to be made more effective or the intended results need more improvement

ii. suggest adding other stakeholders like local NGOs or other civil society organizations like rural support network for delivering the results during PRF or the ensuing project

17. **Climate Change.** The services will cover the following:

i. review project feasibility assessment based on the data collected under anticipated regional climatic change

ii. review results of the sub-basin level climate assessment and adaptation planning exercise conducted by F-TRTA consultants, and plan additional detailed project-specific analysis to be conducted

iii. identify key vulnerabilities to the project assets and beneficiaries from climate change and associated key climate variables including water availability and agricultural productivity under changes in key indicators ground and surface water availability and demand, drought risk, water quality, extreme precipitation, crop yield, and average and extreme temperatures

iv. conduct scenario analysis of climate impacts to project (and project components) technical and economic viability considering particularly key model uncertainties through analysis of an envelope of feasible climate change storylines (e.g., hot/wet, hot/dry, cool/wet, cool/dry – or similar)

v. identify and prioritize appropriate adaptation measures to be incorporated into the project detailed design, including structural and non-structural measures

vi. in consultation with F-TRTA consultants, determine which components would be classified as 'Type 2' adaptation investment projects under ADB nomenclature i.e., representing projects predicated in large part on climate change adaptation

vii. estimate and report climate change finance in line with joint MDB climate finance

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accounting methodology,[5] associated ADB guidelines and templates

18. **Economic and Financial Analysis.** The services will cover the following:

i. review and update the economic analysis prepared under the feasibility study.
ii. updating the economic analysis in accordance with ADB's Guidelines for the Economic Analysis of Projects (2017),[6] including the risks associated with the project and undertaking a sensitivity and risk analysis.
iii. updating sensitivity and switching value analysis, distribution analysis between different groups, calculating poverty impact ratio and analyzing project impact on farmers' incomes (farm budget analysis).
iv. review and update of the cost estimate according to ADB's Technical Guidance Note on Cost Estimation in Sovereign Operations (February 2022)[7] including component/output-wise, investment cost, segregated by foreign exchange and local costs, with tax and duties, physical contingencies and price escalation estimating for each component/output, and the total interest and financial charges during construction, using Excel
v. preparation of a disbursement schedule including S-curve for projections of contract awards and disbursements, and standard cost estimates tables (by
vi. expenditure category, by financier, by Output, and by year.
vii. undertaking of financial sustainability analysis of the project by preparation of projections of future incremental costs for operation and maintenance of the project facilities, assess if the project agencies will have funding to cover such long-term operational expenditures as needed to ensure adequate and sustainable asset management, and identify actions to ensure project's financial sustainability.

19. **Project Financial Management System.** The services will cover the following:

i. review and update of the financial management assessment prepared under the feasibility study including review and update the financial management capacity of irrigation and agriculture departments PMOs and PIOs in terms of planning and budgeting, management and financial accounting, reporting, auditing, internal controls, and information systems in accordance with ADB's relevant requirements.
ii. review and update of proposed disbursement and fund flow arrangements considering executing agency and implementing agencies capacity and needs of the ensuing project, along with disclosure arrangements for financial reporting and auditing requirements
iii. review and update of financial management, internal control, and risk assessment, identify any new potential project and inherent risks, and proposing mitigation measures along with timelines agreed by the executing agency and implementing agencies or where the risk is deemed high in nature, propose financial covenants to be incorporated in the ensuing loan / project agreement.

20. **Land Acquisition and Resettlement Plan.** The services will cover the following:

[5] https://publications.iadb.org/publications/english/document/2018_Joint_Report_on_Multilateral_Development_Banks_Climate_Finance_en_en.pdf or updated from time to time.
[6] https://www.adb.org/documents/guidelines-economic-analysis-projects
[7] https://www.adb.org/documents/preparing-cost-estimates-adb-financed-projects-programs

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i. continue the land acquisition and resettlement plan process taken over from feasibility study and ensure applicable national/provincial laws/rules/regulations and the ADB's Safeguard Policy Statement are adhered in plan formulation and implementation.
ii. undertake additional or new surveys for census of displaced persons, inventory of losses socio-economic information.
iii. continue carrying out consultation and awareness raising campaign with the affected communities to identify their concerns.
iv. interact with non-governmental and community-based organizations, including the need for capacity development as identified in the feasibility study.
v. assist in preparation and implementation and their approval from government and ADB.

21. **Environmental Assessment and Management Plan.** The services will cover the following:

i. continue the environmental safeguards preparation process taken over from the feasibility study and ensure applicable national/provincial laws/rules/regulations and the ADB's Safeguard Policy Statement are adhered in plan formulation and implementation.
ii. Update the environmental assessment reports (EIA and IEE), describing the environment of the project area and downstream, the anticipated environmental impacts including (but not limited to) e-flows, downstream water usage, transboundary impacts, socio-economic impacts, occupational and community health and safety impacts during construction works, mitigation measures to address likely adverse impacts, results of public consultation, and environmental management plan including institutional requirements and monitoring.
iii. Conducting baseline surveys including ambient air quality, noise, water (surface and ground water) as well as terrestrial and aquatic ecological surveys.
iv. Preparation of a critical habitat assessment (CHA, as per IFC GN 6). Based on the assessment a biodiversity action plan (BAP) and biodiversity monitory plan (BMP) may also need to be prepared.
v. Preparation / updating of stakeholder engagement plan (SEP) with robust consultations with various stakeholders (community, government departments, NGOs, and water user associations etc.) carried out;
vi. interact with non-governmental and community-based organizations, including the need for capacity development as identified in FS.
vii. assist in preparation and implementation of the studies and their approval from government and ADB, in case of former, No Objection Certificate from Environmental Protection Agency Khyber Pakhtunkhwa.
viii. finalize the EMPs for bidding documents and prepare checklist for SSEMPs.

22. **Social and Gender Development Plan.** The services will cover the following:

i. review poverty and social analysis prepared under feasibility study and update the data where required on social and gender characteristics of the communities affected by the project as well as communities benefiting from the project.
ii. review and where required update the summary poverty reduction and social strategy.
iii. continue consultation with vulnerable groups and women to obtain views on the

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need and opportunities for social and gender development.
iv. assist in preparation and implementation of the social and gender plans.
v. recommend additional social facilities and capacity development, and other measures under the plans.
vi. interact with non-governmental and community-based organizations, including the need for capacity development as identified in the feasibility study.
vii. support the consultants' team in conducting separate consultations with women groups.
viii. review of the existing gender mainstreaming models developed under ADB financed projects and other development partners.
ix. identify entry points for mainstreaming gender in agri-based value chains and opportunities for women agri-based businesses.
x. collate baseline data (gender-disaggregated) relevant to the scope and design of the sub-projects of the ensuing project.
xi. assess the institutional capacity of the executing agency and implementing agency in gender-inclusive planning and implementation.
xii. based on the assessment, identify the areas for capacity building as one of the gender actions under the GAP;
xiii. conduct consultations with research centers and academia to identify areas for technical support and research.
xiv. suggest special design features and strategies to be built into the sub-projects to facilitate and encourage women's involvement and ensure tangible benefits to women; and
xv. develop gender specific guidelines, affirmative actions and instructions for the contractors' ToRs, bidding documents and bid evaluation process.
xvi. prepare the Gender Action Plan for the project in close coordination with the consultants' team, KPID and KPAD.

23. **Preparation of Planning Commission-1 and PAM.** The services will cover Planning Commission-1 preparation based on the templates of the Planning Commission of Pakistan. Prepare PAM according to ADB template.

24. **Implementation and Construction Planning.** The services will cover the following:

i. review and update the overall implementation schedule synchronized with activities including procurement, award of works, social safeguards plan, commencement of works, mobilization, sequencing of construction methods, water diversions, annual canal closures.
ii. analyze and recommend planning for labour, construction machinery, and materials and recommend implementation period.
iii. re-analyze the options between drill and blast method, and mechanical excavation method for cost effectiveness and constructability.
iv. propose project implementation arrangements including institutional structure clearly defining the role of KPID, KPAD and others that may get involved consultants, contractors, and supervisory engineers.
v. layout an appropriate workflow for technical approvals, approvals for technical design, approval for changes in technical designs during construction, for effective implementation, measurements and verification of works undertaken, payment procedure, flow of funds.
vi. set up framework for monitoring and evaluation of the project.
vii. review and propose the institutional mechanism for project implementation

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including KPID, KPAD, PMO, PIO, WUAs, FOs and others.

25. **Operation and Maintenance, and Instrumentations.** The services will cover the following:

i. assess operation and maintenance (O&M) capacity of KPID, KPAD and beneficiary community and propose feasible measures for improvement and project O&M.
ii. prepare the O&M plan will be based on the future incremental costs for operation and maintenance of the project facilities, assess if the project agencies will have funding to cover such long-term operational expenditures as needed to ensure adequate and sustainable asset management, and identify actions to ensure project's financial sustainability.
iii. review and propose the institutional mechanism for sustainable O&M of the project including KPID, KPAD, WUAs, FOs and others.
iv. propose systems for instrumentation, measurement, control, information which is easier to implement with plan for upgraded to next phase with system-based units created and trained.
v. design cost effective and easy to operate hydromechanical, electromechanical, electrical, auxiliary, instrumentation, telecommunication, safety installations, back-up, and control systems in conveyance systems connected with the information and control rooms. The possibility of installation of Telemetry System at appropriate location for real time monitoring may also be assessed

26. **LARP Implementation Start-up Support.** The services will support the EA and land acquisition collector in implementing LARP including land acquisitions sections, exhaustive efforts, and consultations, addressing or documenting administrative impediments, monitoring and reporting progress.

27. **Procurement:** The services will cover the following:

i. support to the executing agency/implementing agencies in conducting a thorough strategic procurement planning (SPP) process and in the preparation of a solid procurement plan with full engagement of all key Government stakeholders as well as ADB and other IFIs active in this sector, in line with the latest SPP Guidance Note and by making use of the tools referred therein.
ii. developing well-planned and fit-for-purpose procurement arrangements and options for various packages based on robust assessment of the operating environment, market analysis and risk assessment that will support achieving value for money and the project's development objectives.
iii. inclusion of value for money statement in the procurement strategy
iv. discussing the strategy with the executing agency/implementing agencies in a workshop and seeking government and ADB concurrence of the SPP that includes procurement plan
v. preparation of bidding documents and advertisement
vi. preparation of reports for various milestones required in transactions till the award of contract(s)
vii. participating in EA's procurement committees meeting(s)

VI. Deliverables

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28. The duration of services is estimated at 30 months: 18 months for detailed design and additional time for supporting procurement transaction, land acquisition and resettlement planning and start-up implementation, and capacity building. The schedule for various reports and documents is given in Table 3.

Table 3. Schedule of Deliverables

Sr.	Report	Submission Deadline (after the Commencement of Services)
1	Inception Report	2 months
2	Scoping of Detail Field Surveys, Investigations and Consultations	2 months
3	Seismic Assessment Report Mulkoh	3 months
4	Hydrological Assessment Report Mulkoh	3 months
5	Preliminary Geological Assessment Report	3 months
6	Topographic Survey Report	5 months
7	Water Resources Management, Irrigation and Agriculture Development Concept Design	5 months
8	Report on PMC Hydraulic, Condition and Performance Assessment, Crop Requirements and Final Option Selection	5 months
9	Submission of Geological and Geotechnical Investigation Report	6 months
10	Climate Change Assessment Report	6 months
11	Agribusiness and Value Chain Assessment Report	6 Months
12	Report on Surveys for Social, Gender, Community Mobilization, Outreach and related Consultation and Baseline for Command Area Development	9 Months
13	Interim Report on Design of Irrigation, Drainage Infrastructure and Command Area Development	9 months
14	Environmental Assessment and Management Plan	9 months
15	Strategic Procurement Planning report	9 months
16	Social and Gender Development Plan	12 months
17	Implementation and Construction Planning Report with Strategic Procurement Planning	12 months
18	Operation and Maintenance, and Instrumentations System Report	12 months
19	Preparation of Engineer's Estimate	12 months
20	Draft Economic, Financial Analysis and Financial Management Assessment	12 months
21	Land Acquisition and Resettlement Plan, including livelihood restoration strategy	14 months
22	Draft Detailed Engineering Design Report	14 months
23	Preparation and approval of PC-1 and PAM	15 months
24	Bidding Documents	15 months
25	Final Detailed Engineering Design Report Approved and Ready to Procurement	18 months
26	Command Area Mapping (digitization of *chakbandi* and records for new *chakbandi*	18 months
27	Monthly Progress Brief on Implementation of LARP, Procurement, and Command Area Surveys	15th day of each month after LARP by ADB to continue till the end of consultancy assignment
28	Quarterly Progress Reports	15th day of the quarter
29	Walkthrough presentation to Client, and ADB consultants and team	Every month for first 12 months

VII. Key International and National, Personnel, Qualification Requirements and Job Description

29. Table 4 provides the indicative required expertise including key and non-key experts. The consulting firms will need to identify the need for other support staff and other non-key experts (such as junior and assistant engineers, surveyors) and administrative support staff (such as team

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assistant) to enable the firm to deliver the output as per agreed deliverables. The cost of all such experts should be included in the firm's financial proposal. Firms are required to provide CVs of all non-key experts who shall be scored on fail/pass criteria and shall be considered in the overall proposal evaluation.

Table 4: Summary of Indicative Consulting Services Requirement

No.	Designation	International or National	Total person months
	Key Staff*		
1	Water Resource Planning Specialist and Team Leader	National	30
2	Tunneling Design Specialist	International	3
3	Geotechnical Engineer	International	3
4	Irrigation System Instrumentation Specialist	International	3
5	Hydraulics Specialist, Deputy Team Leader and Chief Design Engineer	National	18
6	Engineering Geologist	National	4
7	Hydrologist	National	4
8	Social Safeguards Specialist	National	30
9	Principal Agronomist	National	12
10	Principal Irrigation Engineer	National	12
11	Principal Structure Engineer	National	12
12	Agribusiness and Value Chain Specialist	National	9
13	Climate Change Adaptation Specialist	National	4
14	Environment Specialist	National	9
		Sub-Total	**153**
	Non-Key Staff**		
1	Electro-Mechanical Engineer	National	4
2	System Engineer	National	4
3	Asset Management Specialist	National	12
4	Seismologist	National	4
5	Tunneling Design Engineer	National	8
6	Geotechnical Engineer	National	6
7	Irrigation and Drainage Engineer	National	18
8	Structure Engineer	National	12
9	Groundwater Specialist	National	8
10	On-Farm Water and HEIS Development Specialist	National	15
11	GIS and Remote Sensing Specialist	National	18
12	Watershed Management and Forestry Specialist	National	6
13	Principal Economist	National	8
14	Gender and Social Development Specialist	National	6
15	Procurement and Contract Specialist	National	8
16	Financial Management Specialist	National	4
17	Architect	National	6
		Sub-Total	**147**
		Total	**300**

* Key experts proposed to be named by firm and evaluated under the technical proposal.
** Non-Key experts proposed to be named by firm will not be evaluated under the technical proposal.

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VIII. Qualification of Key Experts.

30. The following is a brief description of required qualification, experience and expected role for the assignment.

1) Water Resource Planning Specialist / Team Leader -National

General Qualification	Bachelor's degree, preferably post graduate degree, in Civil Engineering, water resources engineering or other relevant degrees.
Project Related Experience	At least 20 years of relevant work experience in design of irrigation and drainage infrastructure. Experience in integrated water resources development including irrigation, drainage and command area development will be advantageous. The applicant shall have worked as a Team Leader on at least three similar type and size of projects. Experience in externally funded projects will be given advantages. At least 3 years of work experience with ADB, the World Bank and/or other international financial institutions and other reputed international consulting company is preferred.
Experience with International Organization	1. Coordinate and manage team activities to ensure full compliance with the TOR and delivery of quality outputs in a timely manner. 2. Liaise with Government of Khyber Pakhtunkhwa, executing and implementing agencies KPID, KPAD, ADB, and other authorities as required. 3. Manage field surveys and investigations required for detail design.
Job Description	4. Coordinate the studies related to water management, design, and costing in close coordination with Hydrologist, Hydraulic Expert, Design Engineers, and other team members. 5. Provide guidance in Hydrological studies, Design criteria, and Climate change impact on the design. 6. Supervise the team to achieve the milestones proposed for the various studies and submission of documents in timely manner and establish a quality control mechanism for the technical coordination, design, and documents control. 7. Review of PC-1 and Bidding Documents.

2) Tunneling Design Specialist-International

General Qualification	Minimum Bachelor's degree, preferably postgraduate degree, in civil engineering or similar field. Degrees and/or strong expedience in in geotechnical/rock mechanics or civil engineering or related field is required.
Project Related Experience	At least 15 years of Twork experience in tunnels design for irrigation projects. Demonstrated competencies in detailed engineering design of tunnels in at least three similar projects. Experience in projects funded by international development partners will be advantageous.
Overseas/Country Experience	At least 5 years of work experience on major projects in Asia. Experience in Pakistan is preferred.
Job Description	1. Review the available feasibility, geotechnical investigation reports and relevant documents of tunnels and assist in the design. 2. Guide and lead the design keeping in view the rock type, test results for suitability, and rock stability. 3. Lead and set the design criteria for tunnel loads and stresses, size, locations, and type. 4. Lead tunnels design drawings and works and assist other engineering design works as required. 5. Prepare quantity and cost estimate for relevant part and assist in the preparation of the project cost estimates, including the preparation of bill of

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	quantities and relevant specifications of the materials and construction methods; and 6. Preparation of tunnels design report as part of the final report.

3) Geotechnical Engineer – International

General Qualification	Minimum Bachelor's degree in Civil Engineering and post-graduate degree in geotechnical engineering.
Project Related Experience	At least 15 years of work experience in geotechnical investigations and testing for design of tunnels and irrigation and drainage infrastructure development. The applicant shall have worked as a geotechnical specialist on at least three similar type projects for a period of minimum 5 years.
Overseas/Country Experience	At least 5 years of work experience on major projects in Asia. Experience in Pakistan is preferred.
Job Description	1. Lead the geotechnical investigation and analyses, in close collaboration with Water Resources Planning Specialist, Hydraulic Specialist, Design Engineer, Structures Expert and other team members as required. 2. Lead and assist in the site selection of boreholes, guide for in-situ testing and lab tests following the international standards. 3. Elaborate test reports and guide design team of concerned structures for the selection of geotechnical design parameters. 4. Prepare geotechnical report of the project. 5. Assist in establishing design criteria, standards, and specifications for structural works. 6. Assist in the engineering design works, particularly in selecting quarries and selection of construction materials.

4) Irrigation System Instrumentation Specialist – International

General Qualification	Minimum Bachelor's degree, preferably post-graduate degree, in electronics/Information technology engineering with degree and/or strong work experince in systems automation/controls or a related field.
Project Related Experience	At least 10 years of work experience in design and operations of irritation controls, measurements, automation, instrumentation and testing at primary, secondary and tertiary systems including pressure pipe systems, catchment rain-run off measurement systems. The applicant shall have worked with at least three similar type projects for a period of minimum 5 years.
Overseas/Country Experience	At least 5 years of work experience on major projects in Asia. Experience in Pakistan is preferred.
Job Description	1. Lead the irrigation system automation design in close collaboration with Water Resources Planning Specialist, Hydraulic Specialist, Design Engineer, Structures Expert and other team members as required. 2. Coordinate with electro-mechanical engineer, system engineer, asset management specialist for designing the system required for modernization of existing system and design of new system best suited to the local conditions with similar best practices, for better O&M and financial, technical, and institutional sustainability. 3. Design cost effective and easy to operate hydromechanical, electromechanical, electrical, auxiliary, instrumentation, telecommunication, safety installations, back-up, and control systems in conveyance systems connected with the information and control rooms. The possibility of installation of Telemetry System at appropriate location for real time monitoring may also be assessed. 4. Establish design criteria, design the system, and prepare equipment requirements as per international standards and specifications. 5. Prepare drawings, cost estimates, and draft specifications.

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	6. Advise on procurement arrangements. 7. Undertake other tasks as deemed necessary by the team leader.

5) Hydraulics Specialist Deputy Team Leader and Chief Design Engineer – National

General Qualification	Minimum Bachelor's degree in Civil Engineering and post-graduate degree in hydraulic engineering. A degree from a recognized foreign university will be an advantage.
Project Related Experience	At least 15 - 20 years of work experience in hydraulic structures design of irrigation and drainage infrastructure development. The applicant shall have worked as a Deputy Team Leader on at least three similar projects for a period of minimum 8 years.
Experience with International Organization	At least 3 years of work experience with ADB, the World Bank and/or other international financial institutions directly or on projects and other reputed international consulting company is preferred.
Job Description	1. Coordinate and manage team activities to ensure full compliance with the TOR and delivery of quality outputs in a timely manner. 2. Assist Team Leader in keeping Liaison with KP executing and implementing agencies, and other authorities as required. 3. Lead the survey and investigation works in close collaboration with Geotechnical Specialist to ensure that the survey and investigation outputs fully meet the requirement of the design criteria. 4. Carryout the hydraulic design of all major structures of the project. 5. Coordinate and guide being the Chief Engineer Design for the formulation of the Design Criteria. 6. Carryout and supervise all the hydraulic design of Irrigation and drainage infrastructures. 7. Close coordination with other team members on the timely issuance of all the reports. 8. Review of Bidding Documents with special reference of estimation of quantities and bidding Drawings.

6) Engineering Geologist-National

General Qualification	Post-graduate degree in engineering geology or related field. A degree from a recognized foreign university will be an advantage.
Project Related Experience	At least 15 years of national work experience in geological investigations and testing for design of irrigation and drainage infrastructure development. The applicant shall have worked as an engineering geologist on at least one similar project for a period of minimum 5 years.
Experience with International Organization	At least 3 years of work experience with reputed international consulting company or in the region pr on similar nature of services is preferred.
Job Description	1. Assist in carrying out the geological investigation and analyses in the project areas. 2. Assist in finalizing site selection of tunnel for Mulkokh and other critical structures. 3. Carry out and assist in the preparation of geological sections and surface geological mapping of the project area. 4. Assist in the engineering design works, particularly in selecting quarries and selection of construction materials. 5. Assist the geological mapping of rock formations of the Tunnels in the project 6. Prepare geological report.

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7) Hydrologist -National

General Qualification	Minimum Bachelor's degree in Civil Engineering and post-graduate degree in hydrology or related field.
Project Related Experience	At least 15 years of work experience as hydrologist in analyses, design, and implementation of similar projects; Demonstrated competencies in leading comprehensive hydrological studies for detailed design of at least three water resources development projects
Experience with International Organization	At least 3 years of work experience with reputed international consulting company or in the region pr on similar nature of services is preferred.
Job Description	1. Carry out the hydrological analyses, in close collaboration with Water Resources Planning Specialist, Water Resources/Hydraulic Specialist, Climate Change Specialist, and other team members as required. 2. Assist in the preparation of water balance study and water resources management plan. 3. Assist in the engineering design works, particularly in setting the relevant climatic and hydrological design parameters; and 4. Prepare irrigation system operational plan. 5. Prepare hydrology reports of both systems

8) Social Safeguards Specialist - National

General Qualification	Minimum Post-graduate degree in human science, social science or related field.
Project Related Experience	At least 15 years of work experience in land acquisition and resettlement planning, implementation and monitoring. Demonstrated competencies in developing and/or managing land acquisition and resettlement plans including resettlement monitoring and troubleshooting. Experience of LAR preparation and management in ADB/WB funded large water resources development projects would be considered preferential.
Experience with International Organization	At least 3 years of work experience with ADB, the World Bank and/or other international financial institutions directly or on projects is preferred.
Job Description	1. Based on the detailed engineering design and advanced level of land acquisition process, determine the scope and type of land acquisition and resettlement (LAR) and the IPs related impacts; 2. Screen LAR and IP impacts for IR and IPs categorization in accordance with the safeguard's categorization criterion of SPS 2009. 3. Document in the land acquisition and resettlement plan (LARP) the options considered in avoiding or minimizing the LAR impacts, and the best option adopted with a comparative analysis of LAR impacts. 4. Prepare 100% census of displaced persons, inventory of losses (IOL) based on DED and advanced level of LA. and identify any vulnerable displaced persons and those severely affected based on the full census of displaced persons. 5. Define resettlement policy, specific to the types and extent of project impacts on displaced persons and entitlements and eligibility. 6. Carry out meaningful public consultations with the affected communities, identify their concerns and expectations of cash compensation and livelihood restoration support agreeing on a set of cash compensation and other support measures including any remedial/mitigation measures for adoption in the LARP. Provide evidence of public consultations in the LARP. . 7. In consultations with displaced persons and key project stakeholders, propose a resettlement strategy including the resettlement options that address the needs of those requiring to be resettled with their proper livelihood restoration.

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	8. Prepare LARP following the standard outline of a LARP (ref. SPS, Appendix SR 2) but in consultation with all relevant stakeholders including the GOKP, PMO/PIU, displaced persons, local community members, the land revenue department and concerned government line department having role in pricing of affected assets. 9. Re-establish (when needed) a cut-off date for impacts and entitlements and provide evidence about how the cut-off date has been formalized throughout the project area and with displaced persons. 10. Establish a grievance redress mechanism (GRM) and the grievance redress committees, as needed explaining how any grievances of displaced persons and local people will be addressed and how the aggrieved parties will access the GRM/GRCs and to have their grievances addressed. 11. Provide a detailed and clear methodology for determination of land and non-land prices to meet the SPS's requirement of "full replacement costs". 12. In case, if the government prices are less than full replacement costs, mention how any gaps in replacement costs will be addressed. 13. If an independent land valuation is undertaken, document the results of the study and the steps how any differential in compensation will be topped up and paid to the displaced persons. 14. Define institutional arrangements required for implementation of LARP and its monitoring and provide, specify monitoring frequency, and provide monitoring indicators for both internal monitoring by PMO/PMU and external monitoring by external monitoring expert. Assess the current institutional capacity of GOKP for updating and implementing the LARP, and identify the needs for capacity strengthening including training in safeguards management, implementation, and monitoring, and 15. Identify the possible need and role of non-governmental and community-based organizations, including the need for capacity development.

9) Principal Agronomist -National

General Qualification	Minimum post-graduate degree in agronomy/crop sciences, or a related field from a recognized local/foreign university.
Project Related Experience	At least 15 years of work experience in agriculture development, irrigation scheduling and design and implementation of agriculture development projects; Demonstrated competencies in leading agricultural development planning for at least three large-scale irrigation and drainage development projects design.
Experience with International Organization	At least 3 years of work experience with ADB, the World Bank, FAO, IFAD and/or other international financial institutions directly or on projects is preferred.
Job Description	1. Assist in agriculture development plan, irrigation scheduling and canals operations, 2. Lead, in close collaboration with Irrigation Specialist, Water Resources Planning Expert, Water Resources Planning Specialist, Social Development Specialist, and others as required), the development of agricultural development, and plan, and assist in the development of irrigation management plan to ensure that it fully reflects the prevailing and potential agricultural development constraints and opportunities. 3. Review existing cropping pattern and constraints, irrigation methods, crop water requirements and opportunities to improve the cropping pattern that is socially and economically acceptable. 4. Lead and assist in the preparation of modern and innovative best practices and methods for crops in accordance with the required agricultural development support; and

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	5. Assist in the preparation of the draft final report.

10) Principal Irrigation Engineer -National

General Qualification	Minimum Bachelor's degree in Civil engineering, or Agricultural Engineering and post-graduate in Water Resources/Irrigation Engineering, or in related field.
Project Related Experience	At least 15 years of work experience in irrigation and drainage management. Working experience in water resources development projects is required.
Experience with International Organization	At least 3 years of work experience with reputed international consulting company or in the region pr on similar nature of services is preferred.
Job Description	1. Assist in the finalizing water allocation and water allowance for equitable water distribution to the irrigation system. 2. Assist in engineering design works for irrigation and drainage component. 3. Assist in close collaboration with Agricultural Specialist, Water Resources Expert, and others as required), the development of irrigation management plan, and assist in the development of agricultural development plan to ensure that agricultural development scenario is fully consistent with the irrigation system and management designs. 4. Assist the preparation of the irrigation component cost estimates, including the preparation of bill of quantities and relevant specifications of the materials and construction methods, as well as costs of plausible institutional development for sustainable and equitable irrigation management; and 5. Preparation of the draft final report.

11) Principal Structure Engineer– National

General Qualification	Minimum Bachelor's degree in Civil Engineering and post-graduate degree in structural engineering or related field.
Project Related Experience	At least 15 years of work experience in structures design of similar projects and/or construction; Demonstrated competencies in leading detailed engineering design of irrigation and drainage infrastructure in at least three similar projects.
Experience with International Organization	At least 3 years of work experience with reputed international consulting company or in the region pr on similar nature of services is preferred.
Job Description	1. Review the FS and relevant documents related to the irrigation and dam infrastructure design parameters. 2. Guide and lead the design keeping in view the material and test results, for suitability, foundation, and rock suitability, 3. Prepare the structure design of all the hydraulic structures of the irrigation and drainage system for various loading conditions using designed geotechnical and seismic parameters. 4. Prepare quantity and cost estimate for relevant part and assist in the preparation of the project cost estimates, including the preparation of bill of quantities and relevant specifications of the materials and construction methods; and 5. Prepare draft final report and bidding documents.

12) Agribusiness and Value Chain Specialist -National

General Qualification	Minimum post-graduate degree Agriculture Economics/MBA in Agribusiness or a related field from a recognized local/foreign university.
Project Related Experience	At least 15 years of work experience in agribusiness and value chain development, marketing and off-farm enterprise development, linking of business to smallholder farmers and markets, mapping and prioritizing value chains and

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	their development potential. Demonstrated competencies and experience in at least three similar projects.
Experience with International Organization	At least 3 years of work experience with ADB, the World Bank, FAO, IFAD and/or other international financial institutions directly or on projects is preferred.
Job Description	1. Lead the agribusiness and value chain development plan. 2. Carry out review of agriculture with mapping and prioritizing value chains and their development potential and needs in the context of markets; 3. Examine the potential of and constraints to sustainable crops, livestock/poultry and off-farm enterprise development of farmers to markets and constraints to value chain development of the key products; 4. Evaluate the potential of key agriculture clusters and priorities commodities (3 – 5 per cluster) that have the greatest potential for value addition, crop intensification, technology adoption and marketing; 5. Suggest institutional arrangements around project implementation; 6. Define the operations of this component for PC-1 preparation and project implementation; 7. Work out budgets and phasing for the proposed activities.

13) Climate Change Adaptation Specialist -National

General Qualification	Minimum graduate (preferable post-graduate) degree in Climate Change, Environmental Sciences, Water Resources, or in related field.
Project Related Experience	At least 15 years of work experience in climate change science and adaptation assessments and planning in related agriculture and natural resources projects.
Experience with International Organization	At least 5 years of work experience with ADB, the World Bank and/or other IFI-financed project is preferred.
Job Description	1. Lead updating or preparation of project-specific climate change assessment and adaptation planning, considering earlier feasibility study and F-TRTA results. 2. Lead preparation of project vulnerability assessments, identifying key scenarios and/or trigger points and impacts to project technical or economic viability. 3. Lead preparation of climate change scenario preparation and work in close collaboration with other technical expects to identify, prioritize, and incorporate adaptation options into project design. 4. Coordinate with F-TRTA team to incorporate recommendations and comments. 5. Preparation of the draft final report including climate change assessment and climate finance accounting.

14) Environment Specialist -National

General Qualification	Minimum graduate (preferable post-graduate) degree in, Environmental Sciences / Environmental Engineering, or in related field.
Project Related Experience	At least 15 years of work experience in environmental assessment studies (IEE's / EIA's) in related agriculture and natural resources projects.
Experience with International Organization	At least 3 years of work experience with ADB, the World Bank and/or other international financial institutions directly or on projects is preferred.
Job Description	1. Lead updating or preparation of project-specific environmental assessment studies (IEE's / EIA's) based on earlier feasibility study and F-TRTA results. This includes (but not limited to) assessment related with e-flows, downstream water usage, transboundary, socio-economic and occupational health and safety impacts ; 2. Carry out baseline surveys (also including terrestrial and ecological surveys).

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	3. Prepare critical habitat assessment study as per IFC GN 06 and associated plans (BAP, BMP); 4. Preparation / updation of stakeholder engagement plan (SEP) with robust consultations with various stakeholders (community, government departments, NGO's, and water user associations etc.) carried out 5. Coordinate with F-TRTA team to incorporate recommendations and comments. 6. Coordination with resettlement specialist to include detailed socio-economic impacts in the in the EIA / IEE studies 7. Preparation of the draft final reports including climate change assessment and climate finance accounting. 8. Providing environmental safeguards input in the construction bidding documents

31. **Qualification of Non-Key Experts.** All non-key experts will have a university degree in a related field and have at least 10 years of working experience in related field of the work assignments (3 years of working experience for junior positions). Experience with international organizations will be preferred. It is the responsibility of the consulting firms to identify junior and/or assistant engineers and supporting staff required under the assignment and included in the proposal.

IX. Client's Input and Counterpart Personnel

32. The following services, facilities, and property will be made available to the Consultants by the Client: (i) access to all reports, studies, data, photographs, maps, and institutions relating to the assignment and access to all sites for surveys and investigations; and (ii) all professional and support counterpart personnel of the Client will be available to the Consultant's team during the assignment

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Composition and Terms of Reference of Project Working Committee

1. **Role.** The Project Working Committee will (i) review the technical, economic, financial, sustainability, institutions, operation and maintenance, and other technical matters of detail engineering design (PRF) and planning for the ensuing project, and (ii) meet and receive PRF consultant's deliverables and recommend improvements. Each member of the committee will act as focal person on behalf of the respective department or sub-departments and will provide respective advice.

1. The following are key term of references of the committee:

   a. review the technical, economic, financial, sustainability, social and environmental safeguards, operation and maintenance, institutions, resettlement, and other related matters of detail engineering design and overall planning for the ensuing project.
   b. attend meetings of detail design consultants about their deliverables and recommend improvements.
   c. review reports prepared under detail design and provide comments or raise in the next meeting to be recorded.
   d. each member of the committee will act as focal person ensuring departmental representation to all matters considered under the purview of committee.
   e. provide advice and share proceedings of the meetings.
   f. monitor the progress and ensure project remains on track with the overall timelines agreed between government and ADB.
   g. suggest solutions to issues brought for the decision of the committee.
   h. Project Management Office (PMO) in coordination with Project Implementation Office (PIO) will serve as secretariat to the committee and prepare and circulate the agenda, working paper, and minutes of the proceedings.
   i. meet at least on monthly basis initially which can be reduced to quarterly basis as needed.
   j. Receive walk-through presentations from the consultants on each key milestones or in committee meetings.
   k. Following composition is proposed:

      - Chief Engineer (North) KP Irrigation Department (Chair) or as deemed appropriate by the GOKP Planning and Development Department.
      - Director General, Directorate On-Farm Water Management, Agriculture Department (Member) or their nominated representative
      - Director General, Directorate of Agriculture Extension, Agriculture Department (Member) or their nominated representative
      - Director General, Directorate of Agriculture Engineering, Agriculture Department, or their representative (member or co-opted member).
      - Director General, Soil Conservation, Agriculture Department or their representative (member or co-opted member).
      - Director General, Livestock & Dairy Development, or their nominated representative
      - Chief Conservator Forest Department or their nominated representative
      - Director General, GOKP Local Government and Rural Development, Department, or their representative (member or co-opted member).

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- Superintending Engineer, Swabi Circle, GOKP Irrigation Department (Member) or related Executive Engineer
- Superintending Engineer, Swat Circle, GOKP Irrigation Department (Member) related Executive Engineer
- Relevant District Director/Officer, Agriculture Department from (i) Agriculture Extension, (ii) On-Farm Water Management, Agriculture, (iii) Livestock & Dairy Development, (iv) Agriculture Engineering, and (iv) Soil Conservation (Members)
- Deputy Director (PIO), (Member)
- Project Director, PMO (Member and Secretary)
- Local or community representative as deemed appropriate by the GOKP Planning and Development Department.

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