Government of Nepal

Ministry of Energy, Water Resources & Irrigation

Department of Water Resources and Irrigation

Rani Jamara Kulariya Irrigation Project Phase3
Tikapur, Kailali

Terms of Reference (TOR)

For

Consulting Services

Of

Detailed Engineering Design and Construction Supervision for Patharaiya-Kandra Area Irrigation Development and Modernization (Patharaiya Extension Canal)

Under

Rani Jamara Kulariya Irrigation Project Phase3

February 2025

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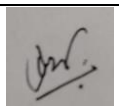
Abbreviations

AMIS	Agency- Managed Irrigation System
AO	Association Organizer (Social Worker)
CBO	Community Based Organization
DADO	District Agriculture Development Office
DDC	District Development Committee
DDG	Deputy Director General
DG	Director General
DHM	Department of Hydrology and Meteorology
DIO	District Irrigation Office
DoA	Department of Agriculture
DoI	Department of Irrigation
DTL	Deputy Team Leader
DTT	District Technical Team
DTW	Deep Tube Well
DWRC	District Water Resources Committee
DWRI	Department of Water Resources and Irrigation
EIA	Environmental Impact Assessment
FMIS	Farmers Managed Irrigation System
FY	Fiscal Year
GIS	Geographical Information System
GMIS	Geographical Management Information System
GoN	Government of Nepal
GW	Groundwater
GWID	Groundwater Irrigation Directorate
GWIDD	Groundwater Irrigation Development Division
ha	hectare
ICWMP	Integrated Crop and Water Management Program
IDA	International Development Association
IDD	Irrigation Development Division
IDSD	Irrigation Development Sub Division
IEE	Initial Environmental Examination
ISE	Initial Social Examination
ISEA	Integrated Social and Environment Assessment
ISF	Irrigation Service Fee
IWRMP	Irrigation and Water Resources Management Project
LEC	Lamki Extension Canal
M&E	Monitoring and Evaluation
MIS	Management Information System
MoA	Ministry of Agriculture



MoF	Ministry of Finance
MoI	Ministry of Irrigation
MTR	Mid Term Review
MWDR	Mid-Western Development Region
NGO	Nongovernmental Organization
NISP	Nepal Irrigation Sector Project
NPC	National Planning Commission
O&M	Operation and Maintenance
OPD	Office of the Project Director
PAD	Project Appraisal Document
PBME	Project Beneficiary Monitoring & Evaluation
PC	Project Coordinator
PD	Project Director
PECS	Patharaiya Extension Canal System
PICC	Project Implementation and Coordination Committee
PIM	Project Implementation Manual
PIU	Project Implementation Unit
PMU	Project Management Unit
PSC	Project Steering Committee
RAC	Regional Appraisal Committee
RAD	Regional Agriculture Directorate
RD	Regional Director
RfP	Request for Proposal
RJKIP	Rani Jamara Kulariya Irrigation Project
RID	Regional Irrigation Directorate
RPSU	Regional Project Support Unit
SAC	Sub-project Appraisal Committee
SBD	Standard Bidding Document
SDE	Senior Divisional Engineer
SEA	Social and Environment Assessment
SEMP	Social and Environmental Management Plan
SMU	Sub-project Management Unit
TA	Technical Assistance
ToR	Terms of Reference
WB	World Bank
WUA	Water Users Association
WUG	Water Users Group

1. INTRODUCTION

Rani Jamara Kulariya Irrigation Project (RJKIP), one of the National pride projects of Government of Nepal, is located in the eastern part of Kailali district in the Sudurpaschim province of Nepal. The Government of Nepal (GoN) has given prime importance for the implementation of this project. From the perspective of irrigation development, the project has three distinct areas. The first and the foremost area is the existing Rani Jamara Kulariya Irrigation System (RJKIS). The second one is the Lamki Extension area which is completely new to irrigation and the project has constructed Lamki Extension Canal and structures. The third area is the Patharaiya extension which is a combination of a new command area to be developed and the existing farmer managed irrigation systems. This area lies to the west of Lamki Extension Canal and is enclosed between Patharaiya and Kandra River.

1.1 The RJKIS

Rani, Jamara and Kulariya are three separate irrigation systems originally constructed by the local farmers. These three irrigation systems were independent, traditionally operated and managed by the indigenous Tharu community. These three systems were integrated as Rani, Jamara, Kulariya Irrigation System at the end of 1986. All these three systems used to withdraw water into their canal by constructing a temporary diversion structures every season. Total command area of three irrigation system is 14300 Ha. In the past, the farmers had to dig long and deep channel in the riverbed to join diverted water into their system. Diversion task was getting more difficult every year due to the swinging of Karnali River towards left bank.

Now, Government of Nepal has constructed and operated permanent Intake structure at right bank of Karnali River at Chisapani which can withdraw 100 cumecs of water; 80 cumecs for irrigation purpose and 20 cumecs for desilting purpose. With combination of the new modern intake at Chisapani, 8.56 Km long main and 11.9 km long feeder canals, these three separate irrigation systems are now integrated as a single system.

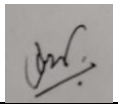
The Karnali Intake at Chisapani, the main canal with associated structures, the hydropower plant and the 2.9 Km long feeder canal were constructed under the Government budget. In the meantime, the project with financial support of World Bank for the modernization of RJKIS, has completed the construction and modernization of higher order canals like feeder and secondary canals along with associated structures in Phase 1 and modernization of the lower order canals like sub secondary, tertiary and water course canals along with associated structures are at completion stage in Phase 2.

1.1.1 Work under GON Funded Part

The major works under the fund of GoN are as follows:

i a permanent Intake at Karnali River which was completed in 2013 and operated since 2023

ii the main canal, settling basin, silt ejector completed and in operation.



iii about 2.9 km feeder canal completed and in operation.

iv a Hydropower Plant with capacity of 4.71 MW completed and in operation since 2024

v a new branch canal for extension of command area to the North of RJKIS i.e. Lamki Extension (14.65 Km) completed and in operation.

vi Command area development works in Lamki Area (CAD) is under tendering phase

vii Command area protection works are ongoing

viii Office buildings, furniture, vehicle and equipment, land acquisition etc are ongoing.

1.1.2 Work under IDA Funded Part

The major works implemented under the financial assistance of The World Bank (IDA) through the first and second phases of project development include the following:

i Scheme modernization of Rani, Jamara and Kulariya with construction of feeder canal, canal intakes & control structures, Command area development works (CAD), upgrading of agricultural village roads, command area protection works (CAP)

ii Strengthening of WUA, construction of WUA offices, Trainings etc

iii Agricultural production and market extension support activities

iv Project management support and preparation of next phase of the project.

1.2 Project Extension

Initially, the Government of Nepal had focused only on rehabilitation and modernization of Rani, Jamara and Kulariya Irrigation systems with total command area of 14,300 Ha. With availability of water and sufficient commanding head in the main canal, GON has intended to expand irrigation area in the northwest of RJKIS. It is envisaged that area in between the north of RJKIS and east of Patharaiya river known as Lamki Extension and the area in between Patharaiya River and Kandra River, known as Patharaiya Extension can be irrigated with the available water from the Chisapani Intake and head available in the main canal. So, the project has completed the construction of Lamki Extension Canal up to Patharaiya River and Karnali River water is already being augmented in the Patharaiya River since last year. The project has carried out the feasibility study for further extension of Lamki Extension Canal from the Patharaiya River to the Kandra River in the west, known as Patharaiya Extension Canal (PEC) for area in between Patharaiya and Kandra rivers.

1.2.1 Lamki Extension Canal System (LECS)

The Project has constructed a bifurcation structure at chainage of 8+875 of main canal for Lamki Extension Canal system (LECS) and Patharaiya Extension Canal System (PECS). Out of 80 cumecs water of Main canal, 40 Cumecs water is diverted from that bifurcation structure for LECS and PECS. The Project has completed the construction of Lamki Extension canal (LEC) which is 14.604 Km long from bifurcation point. Total command area of LECS is 6000 Ha which is completely a virgin area. There are 5 major off-taking canals in the LEC proposed. Water controlling structures for these off-taking canals have been constructed. The Command area Development Works (CAD) of LECS is under the preparation stage and will be executed under the GON budget. At present, water is being supplied in the Lamki Extension Canal and as there are no off-taking canals constructed, water escaped through the temporary tail escape into the Patharaiya River is utilized by the existing farmer managed irrigation systems of Patharaiya River such as Patharaiya and Bani IP.

1.2.2 Patharaiya Extension Canal System (PECS)

Patharaiya Extension Canal System (PECS) is an extended part of RJKIP, which is being developed under the RJKIP- Phase 3. This area lies to the West of Patharaiya River and to the East of Kandra River. The command area extends up to the Mohana River in the south and is bounded by Patharaiya Extention Canal itself in the North. The irrigation water for PECS is proposed to withdraw from tail end of Lamki Extension Canal (LEC). Some local sources like Patharaiya, Kandra Rivers and Ghaila Nala are used to fulfil the water deficit for the proposed command area. Total water coming from LEC to the PECS is 28.55 Cumecs, out of which 9.95 Cumecs is proposed to be escaped into the Patharaiya river for the Patharaiya system and the rest 18.60 cumecs will be used for other area. Total command area of the PECS is 17,500 Ha in which about 10,000 Ha is existing farmer managed system and remaining about 7,500 Ha is Rainfed area **(Figure 1).**

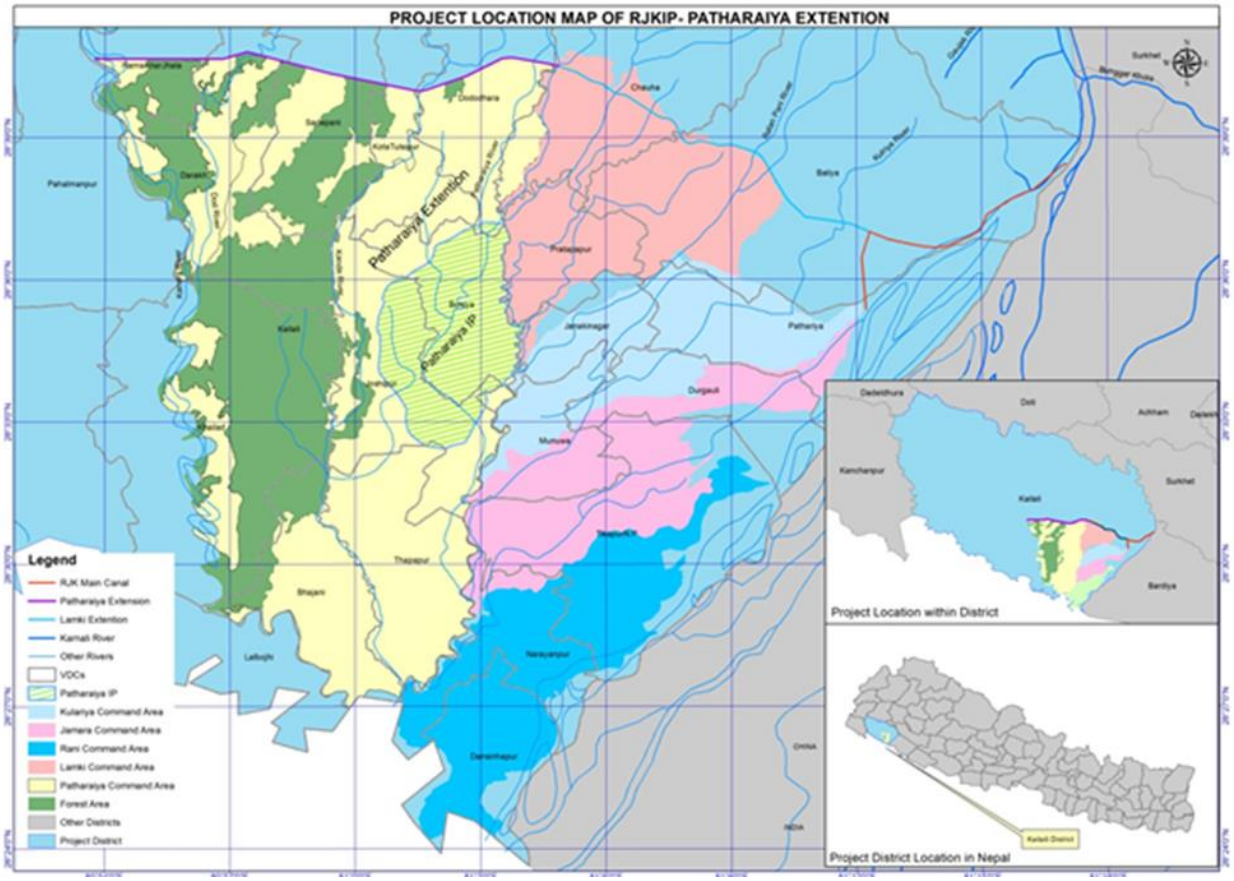


Figure 1 Location Map of Patharaiya Extension

The project has conducted a feasibility study of this area for the rehabilitation and expansion of irrigation facility in 2017 - 2019. The feasibility study has focused only up to sub secondary canal level i.e upto 500 Ha. Patharaiya Extension Canal 1 (PEC 1) and Patharaiya Extension Canal 2 (PEC 2) are two main canals provisioned in the study report. Patharaiya Extension Canal 1 (PEC1) will be constructed as main canal starting from end of Lamki Extension Canal (LEC) to the existing Rajbhaduwa canal near Sandepani bazar. The length and capacity of PEC1 is about 13 Km long and 18.60 cumecs respectively.

As mentioned above, Patharaiya river is treated as another main canal namely Patharaiya Extension Canal (PEC 2) in which there are two major existing irrigation systems namely Patharaiya IP and Bani IP. These existing irrigation systems are considered as secondary canals of PEC 2 separately. The Patharaiya river receives 9.95 cumecs water through the Lamki Extension Canal tail escape.

Under the PECS, there are 8 existing irrigation systems namely Patharaiya IS, Bani IS and Bhajani IS. Pirahawa IS, Rajbadhuwa IS and Laukah-Bhaukah IS, Hasnpur IS and Bagdhauli IS. Extension of command area of existing irrigation systems namely Patharaiya, Bani and Bhajani is proposed in the report.

Government of Nepal is seeking financial assistance from World Bank for the construction and modernization of Patharaiya Extension Canal System (PECS). The World Bank is ready to provide financial assistance for the Construction/modernization of Patharaiya Extension Canal System (PECS) under RJKIP Phase 3. The present task of consulting service is mainly focused on PECS.

2. OBJECTIVE OF THE ASSIGNMENT

The main objective of the assignment is to provide consulting service for the detailed engineering design and construction supervision of canal network system, Command area development works; associated command area protection works, rural agricultural road networks and water conservation and storages system for RJKIP Phase 3 Patharaiya Extension Canal System (PECS)

2.1 Specific Objectives

- To provide consulting service for detailed survey, planning, engineering design, cost estimation and bid document preparation of secondary, sub-secondary canal network system, Command area development works (CAD); associated command area protection works (CAP), rural agricultural road networks and water conservation and storages system for RJKIP Phase 3 Patharaiya Extension Canal System.

- To provide consulting service for construction supervision, quality control, safeguard monitoring & compliance and contract management for RJKIP Phase 3 Patharaiya Extension Canal System. In addition to this, this service includes institutional support and WUA strengthening works.

3. SCOPE OF THE CONSULTING SERVICES

The consulting firm will be an engineering and project management consulting firm which will provide all technical and management services, design, engineering, project management and construction supervision services, including, but not limited to:

The consulting service comprises of two parts namely (i) Part A- Detailed Survey, Planning and Design (Report Based) and (ii) Part B- Construction Supervision, (Time Based) which have been described hereunder.

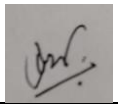
3.1 PART A – Detailed Survey, Planning and Design (Report Based)

This service comprises of detailed Survey & Planning, Engineering design, cost estimation and bid document preparation of secondary, sub-secondary canal network system, Command area development works up to water course level i.e 28 Ha; associated command area protection works, rural agricultural road networks and water conservation and storages system for RJKIP Phase 3: Patharaiya Extension Canal System (PECS).

The Net command area development under Patharaiya Extension Canal system (PECS) is 17,500 Ha in which 7,500 Ha is rainfed area and 10,000 Ha has some sort of irrigation facility by local rivers/rivulets. As per the feasibility study conducted by the project, the number and length of secondary canal are 9 and 78 km respectively whereas the number and length of sub secondary canal are 41 and 100 km respectively. Tentative length of tertiary and water course level canals are 180 Km and 270 km respectively. Tentative number of canal structures up to secondary and sub secondary levels are 338 and 372 respectively. The command area protection works includes the necessary protection works to be carried out to avoid the bank erosion as well as the inundation problem from Patharaiya, Kanda, Sukti Kanda and Kandra Rivers. The tentative length of the bank to be protected will be about 45 Km. Tentative length for upgrading of existing rural road networks is about 140 Km. The number of the storage/ponds/lakes system to be modernized and rehabilitated are about 8 to 10 nos. and height of the storage lakes are about 5 m high.

This part of the assignment requires the Consultant to carry out Planning and Design of RJKIP Phase 3 PECS, including but not limited to:

- Review of the relevant project documents such as PAD, PIM, and Safeguard documents, Project Completion Report (PCR) of Phase I and II, Lamki Extension Canal works including the assessment of the hydraulic performance of the structures constructed under Phase I and II, Lamki Extension Canal works and incorporate good practices and lesson learned while designing and reviewing RJKIP Phase 3 PECS; carry out review work of the report already prepared for the water storage system.
- Study the feasibility reports prepared for the Patharaiya Extension Canal System and update as necessary to meet the project requirements.
- Carry out the geotechnical investigation, soil samplings and testing.
- Carry out detailed survey, planning, design, drawings and cost estimation of secondary, sub-secondary canal and command area development works (CAD) of Patharaiya Extension Canal System.
- Carry out detailed survey, planning, engineering design, drawings and cost estimation of associated command area protection works (CAP).
- Prepare drainage development plan and design field, tertiary as well as secondary level drainage systems including associated structures, outfall to natural stream and protection works where found necessary.
- Carry out detailed survey, planning, design, drawings and cost estimation for upgrading associated rural agriculture road network.



- Carry out detailed survey, planning, design, drawings and cost estimation of water conservation and storages system within Kailali districts.
- Prepare layout plan of the secondary and lower order canals with location of appropriate outlet in branch canals to a level that will enable water delivery to a block of 28 ha.
- Overlay the whole planning of such irrigation system on the topographical map of scale 1:2500.
- Overlay the layout plan of secondary and sub-secondary canal on cadastral maps prepared by DOS.
- Preparation of Bidding Documents in line with WB procurement guideline and public procurement act and regulation of GoN.

As the system is planned to be implemented immediately after the production of design report, the layout of the canal systems (in topo map as well as in field), detailed design drawings, cost estimate of the canal systems and related structures based on the ground reality should be accurate and to the standard for being approved by the project/DWRI for implementation.

3.2 PART B – Construction Supervision (Time Based)

The second part of the assignment of the consulting services will be started in parallel with the Part A assignment. The Construction works for the Patharaiya Extention Feeder Canal PEC1 are likely planned to be contracted by the time of onboarding of this consulting contract. This part of consulting service includes providing consulting services for construction supervision, quality control, contract management, safeguard monitoring & compliance, and WUA strengthening works of RJKIP Phase 3 PECS. The key tasks include but not limited to:

- design Review of Patharaiya Extension Canal 1 (PEC 1) which is not included in the Part A scope of this assignment.
- construction supervision, quality control of contract management of Patharaiya Extension Canal (PEC1) which is not included in the Part A scope of this assignment.
- construction supervision, quality control and contract management of Canal Networks of PECS included in Part A
- construction supervision, quality control and contract management of upgrading of rural road networks.
- construction supervision, quality control and contract management of water conservation and storage systems.
- construction supervision, quality control and contract management of Command area protection works.

- ❖ safeguard monitoring & compliance works of all contracts executed under RJKIP phase 3 PECS,
- ❖ institutional strengthening and capacity building of WUAs and key farmers through formal and on-the-job training to enable them to manage the modernized and newly developed irrigation systems sustainably.
- ❖ Enhancing the sustainability of the modernized and newly developed irrigation systems through the preparation and institutionalization of the MOM plan consisting of canal operation plan, asset management plan, and resources (ISF and others) management plan covering the entire system (main, distribution, and water use systems).
- ❖ Helping enhance the water use efficiency at the farm level through training and in-field demonstration
- ❖ Developing the institutional mechanism for MOM of modernized irrigation system after project support by involving several key stakeholder institutions like WUA, WUA-cooperative, PIO, Local Government, and Provincial government, as appropriate.

4. DETAILED DESCRIPTION OF THE PROPOSED ACTIVITIES/TASKS

To ensure successful implementation of the Project, the consulting firm shall carry out the following but not limited to THE tasks/activities below:

4.1 PART A – Detailed Survey, Planning and Design (Report Based)

The Consultant shall review and update the report of Detailed Engineering Planning and Design of RJKIS Patharaiya Extention Project prepared by the project. Based on that report, the consulting team would carry out the delineation of command area under RJKIP Phase 3 Patharaiya Extension Canal system including extension area, preparation of a map showing existing command area under different canal systems, namely, Secondary/ Sub-secondary, Tertiary, Water course Canal systems, preparation for detailed investigation and survey required for rehabilitation/modernization of existing irrigation systems and extension, cross drainage works, command area protection works, and rural road networks, water conservation and storage system under RJKIP Phase 3. The consulting services shall include but not limited to the studies and recommendations for development in the following areas:

4.1.1 Review of the status of the Irrigation System developed by the Government and Farmer within study area.

The Consultant shall review all the related Reports prepared by the project and other agencies and shall collect data to the existing status of the project including the design concept, water management practices and existing conditions.

The consultant shall prepare list of outstanding matters to be studied.

The consultant shall mark possible site of command area extension (either in tail or sides of existing canal systems).

4.1.2 Field Survey, Data Collection and Preparation of Maps

A. Investigation of existing infrastructure

The Consultant shall investigate the condition and performance of the existing infrastructure, the reasons behind low performance or damage or vandalism, if any. The investigation and analysis shall be focused on utilizing the existing infrastructure to the possible extent and in case, an addition, extension, replacement, demolition, or retrofitting is proposed, the proposal shall be sufficiently substantiated.

Investigation works shall include but not be limited to the following:

- Investigating in terms of structural integrity, stability, safety,
- Investigation in terms of hydraulic performance and possibilities of upgrading to meet modernized service levels (serviceability)
- Assess the Capacity of existing Canals for extension of the irrigation services.

B. **Field Survey**

C. The existing irrigation canal systems considered for rehabilitation/modernization are at Operation and Maintenance stage, which makes use of available water from local River and irrigates about 10,000 ha. In addition, about 7,500 ha will be a new extension area for irrigation. In general, the following field survey must be conducted for data collection, planning, and designing of rehabilitation/ modernization of the canal networks, including new extension area and detailed engineering design:

- System Planning
- Benchmark/Control Point survey
- Command Area/Topographical survey
- Canal and Drain alignment survey
- Survey for Command Area Protection Works (CAP)
- Survey for upgrading of existing rural agriculture road networks
- Survey for Water Conservation and Storage systems
- Other Surveys

System Planning

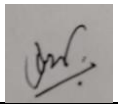
The Project has already prepared the report for detail planning and design up to sub secondary level. The Consultant shall review and update the report. The Consultant shall prepare layout plan from sub secondary canal to tertiary canal with water course outlet level and shall carry out the command development work. An interactive procedure shall be followed in the irrigation system rehabilitation and modernization planning and command area development planning for extension area. The planning shall be overlaid on recent Google Earth maps or other satellite images and refined considering recently added infrastructure and development in the area. Once the tentative plans are verified in the field during the field visit, more detailed planning for the modernization/rehabilitation of the irrigation and drainage system and planning for the extension area shall be started. The major activities that shall be carried out during the irrigation canal system rehabilitation, modernization and extension area planning are:

- Delineation of net command area covered by RJKIP Phase 3 Patharaiya Extension Canal System (PECS) including proposed extension area:
- Identification and marking of the natural features including existing drainage, high ground, roads, villages, forests and public places etc under both existing command area and extension area.
- Identification and marking the alignment of all canal networks and corresponding drains.
- Delineation of the present command area corresponding to the existing canal systems.
- Marking the locations of existing canal structures.
- Delineation of the proposed command area up to the water course level for new extension area as CAD program.
- Identification and locating the appropriate locations of water course outlets for new extension area

Benchmark/Control Point Survey

Reference bench mark and its value shall be taken from the project nearby working area at already fixed BM and the Consultant shall carry the level from these benchmarks provided by the project and establish new benchmark for modernization/rehabilitation purposes. However, for new extension area, specified benchmarks shall be established in the command area at the spacing of one BM per 50 ha and at 1 km interval along the canal alignment. The Consultant shall prepare D-card for such an established benchmark and attach it with the field report. Benchmark leveling shall be conducted precisely by reading all the three cross hairs and setting the instrument at an equal distance from back sight and fore sight. Each survey section shall be in two directions, and the level difference shall not exceed 7 $\sqrt{k}$ mm, where k is the distance between benchmarks in kilometers.

Command Area/Topographical Survey using Lidar



Command area/Topographic survey shall require a total Gross Command Area (GCA) of 28,300 ha. Topographic survey shall be conducted by Light Detection and Ranging (LiDAR) technology. The detailed specification for the LiDAR survey is attached in **Annex 1.**

The Consultant shall carry out the survey to produce the topographic map in a scale of 1:5000 with a contour interval of 0.25 m. The work shall start after BMs are established. Spot levels, including the positions (coordinates) of points preferably in grids, shall be taken with additional points where the change in relief is more than 0.25 m to ensure changes in slopes are accurately picked up.

All existing features, either natural or man-made, such as highlands, lowlands, natural and artificial channels, roads, structures, etc., shall be surveyed as points of detail, and the density of detailed points shall be such that topographical and other features can be accurately drawn. The detailing shall be accompanied by the sketches, which shall be neat, clear, and complete to facilitate data processing and preparing maps.

Topographic surveys in structure locations should be detailed and complete to accurately reflect conditions and elevations related to design requirements.

Canal/Drain Alignment Survey

The Consultant shall extract all the survey data information from the Digital Elevation Model (DEM) and Contour Maps generated from Lidar Survey. However, if it is required to carry out canal and drain alignment survey in the field, like in the area of dense forest, bush area, water impounding area or any such areas, the Consultant shall carry out the survey as follows:

a) Initially, a baseline shall be established for L-section survey along the existing canal alignment and refined canal alignment for new area by marking the turning points and other reference points on the ground using wooden pegs or concrete pillars as appropriate. Then the longitudinal survey at an interval of 50 m along the existing and proposed canal alignment shall be done using level instrument and tape.

b) X-Section survey along the existing and proposed canal alignment with reference to the baseline and the BMs shall be carried out using level instruments and tapes. The X-sections shall be taken at an interval of 50 m along the alignment or at closer intervals in case of sharp changes in the topography. In case of steep area, the X-sections shall be taken suitably by other methods, for which the consultant shall get prior approval from RJKIP/Employer. The width of each of the X-Sections shall cover an area at least 25 m to the left and 25 m to the right for extension area. However, for existing canal systems, the width of X-Sections required may be more depending on the size of canals. Each of the X-sectional readings shall bear latitude and longitude values along with elevation, which shall be compatible to the available topographic maps.

a) During detail Survey of the existing system, work inventory along the canal system shall be prepared, i.e., the existing number of major/minor structures and other related physical features, etc. Off-take points of the existing canal systems shall be located. For newly proposed canal systems, off-take points from the under consideration shall

be located. For this, the Consultant, along with the RJKIP representatives and beneficiary farmers, shall make a walkthrough along the canal alignment to identify and finalize the off-take points. The process shall be repeated for all the canals down to the water course level that shall supply water to an area of up to about 28 ha. The finalized new off-take points shall then be marked and superimposed on the topographic maps.

b) During the walkthrough, the Consultant shall also locate and mark important structures of the systems. Similarly, the Consultant shall carry out the topographical survey, marking the location of all the cross-drainage and road crossing points along the existing and proposed canal alignments. Detail cross section and profile for the cross-drainage work that requires rehabilitation shall be carried out independently where the consultant feels necessary as per their expertise. For new cross drainage works, the topographical survey shall cover an area up to 500 m upstream and up to 500 m downstream of the alignment for major cross drainage structures, i.e. cross drainage having a width more than 50 m. and an area up to 100 m upstream and up to 100 m downstream of the alignment for other cross drainage structures, i.e. span less than 50 m. Each of the topographical points shall bear latitude, longitude and elevation values compatible to the topographic maps of DOS. The topographic points shall be close enough to depict the geographical features and contours on a map of scale of 1:250.

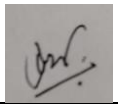
c) The L-section and X-section survey of the existing major natural drains in the area that could be used as the part of proposed drainage network shall be conducted. The extent and methodology of survey shall be in line with the Canal alignment survey mentioned above.

d) The inventory of structures, mainly structures for road crossings with canals and drains, shall be carried out. Photographic as well as detailed measurements with adequate sketches shall be made so that further work on the structures, as rehabilitation / replacement or new construction, could be carried out independently at the design office. The topographic survey of the proposed sites for cross drainage structures shall be carried out, which shall be utilized for design and layout of structures.

e) For new systems, all the private and public buildings that lie within the strip 100 m to the left and 100 m to the right of the proposed alignment shall be marked on the topographic maps.

f) Data pertaining to the existing canal systems, such as name and type of parent canal, canal capacity, area being commanded in summer, winter and spring, crops and status of canal system, etc., in a suitable format using means such as field enquiry or field measurement as appropriate, shall also be collected during the field survey.

g) All the longitudinal and cross sections shall be prepared using automated software such as Autodesk Land Development and AutoCAD environment, so that design parameters could be easily superimposed into these profiles.



All the engineering survey shall be carried out by competent Senior Surveyor/Experts, which shall be assisted by Irrigation and Water Management Engineers. The survey shall be carried out in accordance with the standard practices and acceptable to the Employer.

After the accomplishment of survey work, the Consultant shall interpret and analyze the field data and prepare the maps and drawings as required for detailed planning and designing of all canals and structures.

Survey for Command Area Protection Works (CAP)

The Consultant shall carry out field visit along the rivers nearby command area and shall identify the vulnerable points in terms of bank erosion and inundation. The major rivers located nearby command area are Patharaiya, Kanda, Kandra and Sukti Kanda etc. The potential vulnerable sites will be identified and provided by the Employer. The Consultant shall carry out the detailed survey works river section provided by the Employer for proposed CAP works. The Consultant shall carry L-Section, X-section, strip plan survey of rivers, hydrological and all other necessary survey for planning and design of command area protection (CAP) works.

Survey for upgrading of existing rural agriculture road network

To upgrade the agriculture road service networks within command area is one of the activities of the project. The Consultant shall carry out the identification of existing and potential rural road networks and in consultation and consent of the Employer, the detailed survey work will be carried out for the potential and major rural road networks. The Consultant shall carry out L-Section, X – Section and all other necessary survey of existing and potential rural road networks including cross drainage works within the command area for upgrading rural road networks.

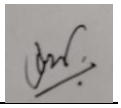
Survey for Water Conservation and Storage system

The Employer shall provide the potential list of about 10 numbers of the lakes/water conservation sites and the consultant shall carry out hydrological, geotechnical, topographical and all necessary survey required for planning and design of water conservation and storage system to utilize the water for multiple uses. The Consultant shall also carry out command area delineation, topographical survey of command area, canal network planning, L-section and x- section of the canal networks of each storage system.

D. Data Collection and Other Investigation

Geological investigation

Test pits shall be excavated for the geological study of the sub-soil along the proposed canal systems to water course level for new extension area and at places where the cross-drainage works are to be constructed.



The investigation work shall include the following activities:

- Engineering geological mapping at a scale of 1:10,000;
- Trial pitting at an interval of 1 km along the canal systems alignment for extension area. The size of the pit will be 1 m x 1 m in plan and 1.5 m deep;
- Trial pitting at the rate of 3 pits per drain crossing location for major drains (width of drain > 50 m)-1.5 below the lowest foundation level of the structures.
- Preparation of the log of each of the pits;
- Index testing of soil/rock samples.

The Consultant shall submit the logs of the test pits in a standard format to the Project. The Consultant shall design the canal and CD structures on the basis of these logs.

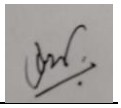
Hydro-Meteorological Survey

Hydro-meteorological survey is one of the important tasks for assessing crop water requirements of various crops to be proposed in the project area and the design flood discharge of the drain crossings. Under this task, the Consultant shall collect relevant hydro-meteorological data of the rivers/drains, if they are gauged, from secondary sources (published and unpublished data of DHM). The long-term data of these rivers shall be collected and the low flow as well as flood discharge will be analyzed. The hydrological analysis of these river systems shall be carried out with the help of frequency analysis in case the long-term data are available. In case of the absence of long-term data, other methods, such as regional, rational, or empirical methods shall be adopted to analyze the hydrological information. Correlation of future water availability with hydrological data shall be done for future measures.

Water Management Study and assessment of existing organizational structure/WUA to understand the existing water management practices.

The agency/farmers have developed certain rules and practices for acquiring, allocating and managing the water at different levels. The Consultant shall investigate the existing water management practices and existing WUA and prepare future plans adapting the existing good practices to the best possible extent. The Consultant shall investigate the followings:

- Existing water acquisition, allocation, distribution and drainage practices
- Water reuse practices
- Water use efficiency and cropping pattern
- Water availability in terms of adequacy, reliability and timeliness in head, middle and tail of the system
- Assess the prevailing organizational structures and the governing arrangements of the existing water users' groups /WUAs and benchmark their performance operation and management of existing irrigation systems for water management in their system.



- The irrigation users of the existing irrigation facilities and new users after the extension of the irrigation service from the project intervention, assessment on the requirement for the formation / of new WUAs lower order canal system (sub-branches committees) and in the extension areas, and for storage/water conservation areas, reformation of existing WUAs etc.

- Innovativeness and diversification in water use and agriculture practices

E. Preparation of Maps

Plot the canal alignment, strip covered by cross-section survey/ topographic survey, details around the proposed structures using appropriate software. Each of this information shall be plotted in suitable layers to be overlaid on the topographical maps.

Prepare strip contour maps of suitable contour interval of the strip covered by cross-section survey/topographic survey using appropriate software and make a separate layer of the same.

Prepare L-Section along the alignment using the canal alignment layer and strip contour layer using appropriate software and plot them in a scale of 1:5000 (H) and 1:100 (V) using AutoCAD. Plot on the L-section features such as design bed level, water level, bed width, freeboard, longitudinal slopes, side slopes etc as per existing condition. Prepare Cross-sections of all the canals based on the survey data and plot them using AutoCAD. Show in the cross-section the designed section of the canal, bed level, water level and top level of the canal embankment suitably.

Prepare detailed designed drawings/Maps of all the individual structures proposed for modernization/rehabilitation, and new construction, command area protection works, upgrading of rural agriculture road networks and water conservation and storage work.

4.1.3 Data analysis, evaluation, design and drawings

The detailed data obtained from field survey and investigation shall be analyzed and evaluated with respect to:

Available discharge in the source river and Lamki Extension Canal.

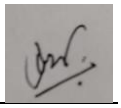
Maximum Flood discharge in the local river and flood marks

Command area and FSL in the main/parent canal

X-section, L-profile, berm width, side slope, bank top-width, service road and corresponding existing data

Capacity assessment of existing canal networks

Safety of canal section with respect to design discharge carrying capacity, surface drainage system, public encroachment and use, and structure life span, etc.



Riverbed level at, upstream, and downstream of all individual cross-drain structures,

Location of individual or combination of structures and their type (HR, CR, Drops, Escapes, VRBs, H-W Bridges etc.)

Storage volume, submergence area, input- output analysis of storage system, dam safety analysis with respect to sub surface, surface flows and flotation, Dam and Spillway design, etc.

The above-mentioned analysis and evaluation will be followed by the following detailed design:

On the basis of proposed cropping pattern and calculated field crop water requirement mentioned in the report prepared by the project, the design capacity of different canals shall be calculated for different reaches up to water course level (28 Ha) and their structures for existing and new extension area, flow diagrams will have to prepared for the whole command area under RJKIP Phase 3 PECS including proposed extension and L-section and x-section for all canals shall have to be designed accordingly. The capacity of existing offtakes of different canal systems, existing canals and their structures shall be assessed, and modernization/rehabilitation/modifications shall be proposed as required.

All the new canal structures in extension area and existing canal structures requiring rehabilitation/modification shall be designed and drawn individually by making use of Auto CAD software.

Design discharge of all cross-drains in extension area and existing cross – drains requiring modernization/rehabilitation/modification shall be estimated separately and the structures will be designed for the designated returned period flood for the CD structures.

Proposed command area protection works are designed to pass and withstand the design flood discharge with sufficient freeboard. Strip Plan, L-section, X-section for the protection works shall be prepared accordingly. Anti flood sluice structure shall be designed and located as per actual field situation.

Type, height, length and storage of dam of the proposed storage system shall be fixed and designed. Type and capacity of dam spillway shall be assessed. Dam safety analysis with respect to sub surface, surface flow and floatation as well as earthquake shall be carried out accordingly.

Prepare detailed designed drawings of all the individual structures proposed for modernization/rehabilitation, and new construction, command area protection works, upgrading of rural agriculture road networks and bridges, and water conservation and storage work.

Quantity calculation shall be done for individual structures. Earthwork calculation shall include different category for different haulage distance and lift.

4.1.4 Preparation of a Detailed Design Report (DDR)

After completion of required field surveys and data collection, data shall be processed, analyzed and evaluated exploring different alternatives for the design optimization, then most suitable and best option will be selected and finalize the design. Innovative idea shall be employed to address the present problems making allowances for the future prospect while carrying out design of canals and structures. PDSP (Planning and Design Strengthening Project) manuals, handbooks/text books, IS codes and relevant literature, shall be referred while designing and drawing the canals and structures. The study would include sound engineering designs, quantity of work, rate analysis and cost estimate as well as proposals and analysis related to the following matters: institutional management; implementation and beneficiary participation, arrangements in detailed design, construction, and operation activities. The detailed design report with cost estimate and detailed drawings of each package shall be submitted in the standard formats acceptable to the Employer and the development partners as prescribed in the deliverables schedule below. The DDR should clearly enunciate how the planned and designed work shall be implemented to fit in the present context making provision for the future prospect.

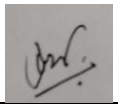
4.1.5 Preparation of Tender Documents and Specifications

The Consultant shall prepare the Tender documents as per WB procurement guideline, PPMO guide lines, Departmental practice, standard bidding documents for procurement of works prepared by FIDIC in the form acceptable to the Employer and the World Bank. Further, the Consultant shall prepare the specifications based on the National/International Standards, Guidelines, Manuals and Specifications as prescribed in the deliverables schedule and acceptable to the Employer.

4.2 PART B – Construction Supervision (Time Based)

The Consultant shall act as “the Engineer” for ICB contract packages of RJKIP phase 3, as per FIDIC General Conditions (Red Book) and as “the Project Manager” for NCB contract packages in accordance with the NCB Works contract. It is envisaged that construction of works would be implemented through at least 7 (seven) ICB contract packages (under FIDIC General Conditions) and at least 12 NCB contract packages (under national procurement arrangements). It is expected that one ICB contract would be awarded by October 2025, based on the available design for Patharaiya canal extension (PEC1). The Consultant is required to carry out detailed survey and design for other contract packages. Procurement for other packages would be initiated after the Consultant completes the design in a staggered manner as shown in the Reporting Requirements below.

The Consultant shall take full responsibility for the administration of works contracts awarded under the project in accordance with the Works contract provisions and provide all support to achieve the completion of works contracts within the contractual dates of completion and with



the fulfilment of all contractual requirements including specifications and Environmental, Social, Health and Safety (ESHS) requirements

4.1.6 Design/Review, Drawings and Estimate in Case of Change in Alignment

With the approval of the Employer, the Consultant shall carry out the detail survey, hydraulic and structural design and detail drawings of the portion of the canal alignment and/or associated structures if the alignment/structure needs to review or reroute other than the design route/structure during construction due to any reason. Further, the Consultant shall take approval from the Employer in case of modification/adjustment in any canal and associated canal structures to suit the site condition. However, no additional payment shall be provided for such modification/adjustments except change in alignment and completely new design of the structures.

4.1.7 Contract Management

The Consultant shall have overall responsibility to assist smooth execution of the project works for the timely and successful completion of the project. The Consultants shall be fully aware of contractual provisions and international best practices that foresee the contractor's claims, and, therefore, suggest the project management to avoid such causes well in advance so that the unreasonable claims may not be established. The Consultant shall act as “the Engineer” as defined in the FIDIC General Conditions (Red Book) for the implementation of ICB contracts and as “the Project Manager” for the implementation of NCB contracts. The Consultant shall be fully responsible for the administration of the Works Contracts under the Project in accordance with the contract provisions. The Consultant shall perform duties but not limited as mentioned below:

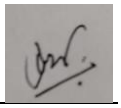
i) The Consultant shall supervise and manage the works contracts (tentatively 9 ICB contracts) to ensure that the construction is achieved in scheduled time period, within budget and that the work is carried out in complete compliance with the approved engineering designs, technical specifications within the terms and conditions of the contract documents and sound engineering practices.
ii) Review and approve Work Program and Schedules for Specific Activities (Design and Construction Supervision stages);
iii) Responsible for administration of the contract for the construction of works under FIDIC contract;
iv) Review and approve the contractor's proposed work Programme and deliverables, construction methods, drawings, source of materials, quality assurance plan, safety plan, ESMP, etc.;
v) Carry out regular inspections, including sample testing where required, of all materials and workmanship to ensure compliance with the design specifications;
vi) Issue instructions and additional or modified drawings to the Contractor, which may be necessary for the execution of the works and remedying of any defects;
vii) Carryout measurements of quantities jointly with the Contractor; review, certify the Contractor's payment statements for ICB contracts and check the measurements of quantities, recommend the contractor's payment statements for other contracts;
viii) Recommend to the Project on any changes in the plans and specifications, if required;

ix) Check cost estimates including cash flow on a regular basis;
x) Assess, examine and recommend to the Project for necessary actions to be taken on claims from the Contractor (e.g. for extensions of time, cost compensation, payment of extra work and all other similar matters);
xi) Assist the Project in fixing of rates for unscheduled items of works, if required;
xii) Prepare certificate of acceptance of each part of the work completed, according to the Contract Document for the Construction works;
xiii) Prepare and issue the "Taking Over Certificates" for works, which are substantially completed and also notify the Contractor of any defects in the work before the "Defects Liability Period" starts;
xiv) Check and approve "As built drawings" of all the activities carried out during the course of construction.
xv) Prepare "Contract Completion Report" after completion of the "Defects Liability Period";
xvi) Assist the Employer on preparation of documents and responses for the purpose of presenting to the hearings in case of DAAB, adjudication, arbitrations or other litigation process with the contractor.

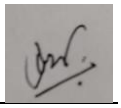
4.1.8 Construction Supervision and Quality Control

The Consultant shall carry out the functions but not limited to as mentioned below:

i) Prepare Construction Supervision and Quality Control Manual describing roles and responsibilities of the supervision and quality control staff, procedure of variation orders, reporting procedure, steps in completion in part of whole (substantial completion), role in defect liability period, and process in taking over and issuing completion certificate and Final Payment etc. The manual should also contain following:
    a. Check the layout of the structures and its components, reinforcement-bar placing, positioning, detailing, etc.;
    b. Be aware of contractor's claims and take necessary measures to avoid such causes well in advance so that the unreasonable claims may not be established;
    c. Ensure that adequate quantity and quality recording is made at the field level Assist in the design of concrete mix;
    d. Conduct site investigations of foundation materials, construction materials, and geotechnical investigations including laboratory testing and analyze investigation results;
    e. Review the material and plant purchased, source, quality vis-à-vis the quality assurance plan of the Contractor and the technical specifications;
    f. Locate possible materials spoil areas during construction;
    g. Evaluate the finished Works, witness and record tests, analyze and interpret the test results and recommend for the improvement, if found necessary;
ii) Supervising construction works with regard to layout/setting out and design and in examining the quality control measures with full responsibility;
iii) Ensure that contractor has submitted QAP and work plan including updating and endorse them by reviewing;
iv) Prepare a simple and diagrammatic quality control manual in close coordination with Project Director and ensure the quality test reports are included in the Interim payment certificates (IPC);



v) Develop training materials to be used in the quality control training of WUA and provide training on the best construction practices to Project officials;
vi) Suggest appropriate solutions to the project management in time on problems encountered during construction;
vii) Monitor the progress of works routinely and compare it to the anticipated work Programme and instruct the Contractor to submit corrective measures;
viii) Survey of each of the construction items to evaluate physical and financial progress of each item;
ix) Indicate the actual progress in a detailed bar chart and CPM network whichever is applicable;
x) Plot an overall progress in the "S" curve against the time period, carry out earned value analysis to determine actual earned value achievement and identify the constraints and hindrances that attribute to delay works;
xi) Instruct the Contractor to submit corrective measures or a revised work Programme to keep pace with the anticipated progress and inform the Project on measures adopted;
xii) Prepare monthly progress report highlighting the current progress, problems encountered, tests conducted, adopted corrective measures and estimate of likely completion time;
xiii) Appraise the project and other stakeholders of progress and issues in regular progress review meetings;
xiv) Audit all aspects of the quality assurance system;
xv) Expedite the progress and complete within the time for completion, in case of slow progress of construction works by the Contractor;
xvi) Responsible to ensure that effective implementation, monitoring and supervision tools are developed and implemented;
xvii) Ensure all technical inputs related to the construction components are accurate, and identify and manage risks and initiate corrective action where necessary, so that maximum benefit to Employer and stakeholders is achieved;
xviii) Suggest appropriate solutions to the project management in time on problems encountered during construction;
xix) Overall responsibility to assist smooth execution of the project works in a smooth manner for the timely and successful completion of the project;
xx) Participate and facilitate test run of the completed works/structures and ensure implementation of recommended corrective measures;
xxi) The Consultant shall carefully examine the subject matter and shall seek and obtain the Employer's specific approval/consent prior to undertaking following actions.
    - Issuing the notice to commence the works;
    - Revising the Time for Completion of the Works;
    - Approving any subcontracting of any part of the works;
    - Fixing new rates or prices
    - Approving proposals for PS items and,
    - Approving Contractor’s claim for additional time and/or cost,
    - Issuance of Taking Over Certificate,
    - Issuance of Performance Certificate,
    - Issuing a variation orders, changing the scope of the works that have financial implications and significant in quantities,



- Any other actions that would incur additional costs and time for completion of contracts

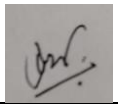
4.1.9 Documentation of Design Drawings, Reports, As-built Drawings and Correspondence

The Consultant shall be responsible for documenting all the design drawings, reports, as-built drawings and correspondence between the Project, the Contractors and the Consultants. The Consultant shall develop an appropriate documentation plan for this purpose. Based on the documentation plan, Consultant shall also carry out the actual documentation and filing of the design drawings, reports, any events, as-built drawings and quality monitoring certificates.

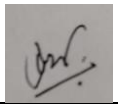
4.1.10 Safeguard Supervision, Monitoring and Compliance

The Consultant shall be responsible for ensuring timely and effective implementation of mitigation measures identified in the project's safeguard documents (Environmental Assessment, Biodiversity Impact Assessment, Integrated Pest Management Plan, Social Assessment and Vulnerable Community Development Plan, and social safeguard plans including Gender Action Plan, labor management plan etc). The Consultant shall provide technical support in detailing /preparing detailed implementation plans including site plans/ programs for the implementation of measures recommended in EA/EMP, BIA/BMP, IPMP, SIA, VCDP etc. Consultant shall guide and supervise the contractor in implementing the social and environmental mitigations measures, supervise their implementation including quality, and check contractor's compliance with the environmental and social requirements as well as periodically monitor and report the implementation status of safeguard measures. The Consultant shall assist the Employer in planning and implementing environmental and social awareness raising activities, in working with other stakeholders such as Forest Users Groups/ Forest offices, NGOs etc. supporting/ operationalizing Local Environmental Monitoring Committee; and in disseminating safeguard documents/ information. The Consultant shall have the sole responsibility for preparation of quarterly and annual environmental and social safeguard status and compliance report. The Consultant shall be responsible for drafting Training Needs Assessment Report showing the Required Training Modules based on factual evaluation etc. The Consultant shall perform duties but not limited as mentioned below:

i) Undertake the safeguard monitoring and reporting activities in accordance with the provision of GoN and IDA and Safeguard documents;
ii) Critically review the Environmental Management Plan (EMP), Biodiversity Management Plan (BMP) and Integrated Pest Management Plan (IPM) by conducting field verification and suggest any modification if required;
iii) Work closely and transfer knowledge to the staff of Environment and Social section of the PIU while undertaking all safeguard activities in the project;
iv) Actively participate in the LEMC meeting, prepare minutes of the meeting and facilitate for implementation of the agreed actions;
v) Develop a field monitoring checklist and a template of safeguards reporting in periodic progress reports and train quality control engineers' staffs in routine compliance monitoring;



vi) Prepare annual safeguard compliance monitoring report;
vii) Prepare annual plan for afforestation in the project command area;
viii) Prepare training manuals and act as a resource person in awareness training to the Water Users, Farmers groups and affected people;
ix) Ensure that EMP/IPM recommended activities are all implemented in the project;
x) Ensure required cost for implementation of EMP are included as BOQ item. Attach copy of EMP to the contract agreement document of the contractor;
xi) Periodically orient contractor's staff in complying to the EMP requirements;
xii) Support the PIU in re-networking with the WUAs/WUCs and develop customized WUA Institutional development and capacity strengthening program;
xiii) Prepare and publish impact stories of best performing WUCs;
xiv) Prepare training module for the institutional Strengthening of WUAs and support PIU in conducting relevant trainings;
xv) Keep a record of all WUCs and ensure that all water users are entitled with the membership cards;
xvi) Suggest approaches for improving the rate of collection of Irrigation Service Fee (ISFs);
xvii) With the aid of social mobilizers maintain the detailed socio-economic profile of all beneficiary in the command area;
xviii) Train and supervise Social Mobilizers in carrying out their responsibilities as per the TOR;
xix) Collection and analyze socioeconomic data from ACIU and PIU for inclusion in the progress reports;
xx) Ensure active participation of women and other vulnerable/disadvantaged groups such as marginal farmers, female headed households etc. in project activities;
xxi) Encourage WUCs for organization of monthly meetings and annual assembly;
xxii) Ensure enhanced coordination between WUAs, Farmer Groups, ACIU and PIU;
xxiii) Preparation of relevant reports as per the necessity;
xxiv) Assist in establishing the institutional linkage between the PIU and local government and elected authorities;
xxv) Technical assistance in crafting bye-laws, water distribution plan; O&M plan; ISF collection strategy etc.;
xxvi) Encourage women's participation in the farmers groups and cooperatives formed for implementation of WUA strengthening works;
xxvii) Critically review the Social Impact Assessment (SIA), Resettlement Planning Framework (RPF) and Vulnerable Community Development Plan (VCDP) and suggest any improvement in the mitigation measures based on the actual site condition during the project implementation;
xxviii) Ensure that the necessary social mitigation measures including labor influx management are incorporated in the civil works contract documents;
xxix) Take lead for the establishment of fully functional Grievance Redress Mechanism (GRM) in the project;
xxx) Responsible for ensuring effective local community engagement and participation throughout life of the project;



xxxi) Devise effective mechanism for information dissemination and consultation within the local community and project beneficiaries and ensure that effective communication mechanism is in place throughout the project period;
xxxii) Organize period workshop to aware and orient project official issues of vulnerable community and other social concerns which are integral part of the project;
xxxiii) Take the lead role on making aware on social issues and possible mitigating measures to all the stakeholders;
xxxiv) Responsible for the implementation and periodic monitoring of the Vulnerable Community Development Action Plan (VCDP);
xxxv) Undertake an assessment of resettlement and land acquisition needs for each project activity planned under phase-II of the project, institutional assessment of project to formulate and execute the plan in accordance with RPF;
xxxvi) Assist PIU in overall planning and budgeting for implementation of social safeguard measures;
xxxvii) Preparation of quarterly/annual social safeguard compliance report;
xxxviii) Work closely and transfer knowledge to the staff of Environment and Social section of the PIU while undertaking all safeguard activities in the project;
xxxix) Develop a field monitoring checklist and a template of social safeguards reporting in periodic progress reports and train quality social mobilizer in routine compliance monitoring;
xl) Develop field monitoring checklist and template of social safeguard reporting of agriculture component in periodic progress reports and train JT/JTAs in routine compliance monitoring;
xli) Periodically orient PIU staffs in implementation of social safeguard mitigation measures;
xlii) Periodically orient contractor's staff in complying to the social safeguard requirements;
xliii) Prepare training manuals and act as a resource person in awareness training to the Water Users, Farmer Group and affected people;
xliv) Assess the presence and vulnerability of indigenous people and ethnic minority groups in the concerned areas of the project.

4.1.11 Coordination with other Experts

To achieve the PDO, in additional to the Design review, construction supervision, quality control, contract management and safeguard monitoring the PIU will procure individual expert like procurement specialist, financial management specialist, Monitoring and Evaluation experts and agriculture related specialists. The Consultant shall have the responsibility of coordination with all the Individual experts to achieve the project objectives. The Consultant shall take necessary inputs from the individual experts as required for the preparation of the progress reports and Implementation Completion Report (ICR).

4.1.12 ES related Services

Ensure that the Contractor delivers its ES obligations under its contract. This includes, but is not limited to the following:

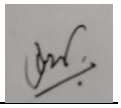
i. review the Contractor's Environment and Social Management Plan (C-ESMP), including all updates and revisions at frequencies specified in the Contractor's contract (normally not less than once every 6 months);
ii. review all other applicable contractor's documents related to ES aspects including the health and safety manual, security management plan and SEA prevention and response action plan;
iii. review and consider the ES risks and impacts of any design change proposals and advise if there are implications for compliance with ESIA, ESMP, consent/permits and other relevant project requirements;
iv. undertake, as required, audits, supervisions and/or inspections of any sites where the Contractor is undertaking activities under its contract, to verify the Contractor's compliance with ES requirements (including, where appropriate, its SEA and SH prevention and response obligations);
v. undertake audits and inspections of Contractor's accident logs, community liaison records, monitoring findings and other ES related documentation, as necessary, to confirm the Contractor's compliance with ES requirements;
vi. determine remedial action/s and their timeframe for implementation in the event of a noncompliance with the Contractor's ES obligations;
vii. ensure appropriate representation at relevant meetings including site meetings, and progress meetings to discuss and agree appropriate actions to ensure compliance with ES obligations;
viii. ensure that the Contractor's actual reporting (content and timeliness) is in accordance with the Contractor's contractual obligations;
ix. review and critique, in a timely manner, the Contractor's ES documentation (including regular reports and incident reports) regarding the accuracy and efficacy of the documentation;
x. undertake liaison, from time to time and as necessary, with project stakeholders to identify and discuss any actual or potential ES issues;
xi. establish and maintain a grievance redress mechanism including types of grievances to be recorded and how to protect confidentiality e.g. of those reporting allegations of SEA and/or SH.

4.1.13 Institutional support and WUA strengthening Works

- **General management of component 4a-Institutional Strengthening and Capacity Building**

a. In consultation with PIO, prepare annual program and budgetary requirements for all sub-activities under component 4.1, and oversee their implementation.

b. Prepare a comprehensive project performance monitoring system (PPMS), and monitor the subcomponent activities accordingly.



c. Prepare and submit a self-contained quarterly progress report (QPR) in an acceptable format covering progress achieved under all key thematic areas of component 4.1 including progress made in achieving PDO indicators, relevant issues, implementation challenges, and risks. A copy of the QPR should be submitted to the World Bank.

- **Preparation of baseline data**

a. Prepare a GIS-based parcellary map of the land parcels of each tertiary or further lower order canal of the existing and proposed new irrigation systems that provide information about the land parcels in terms of their areas, owners (or irrigators), type of tenancy, land type, and their access to the canal. Compile relevant databases in the appropriate format.

b. Map the irrigation areas belonging to one or more adjoining villages, locally known as Mauja, covered by the traditional village-based irrigation management systems. Compare the village/Mauja-based irrigation management system with the modern canals designed under the hydraulic canal network, and analyze the differences.

- **Formation, registration, and functioning of WUA organization for:**

The modernization of the existing irrigation systems

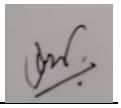
a. Assess the prevailing organizational structures and the governing arrangements of the existing water users' groups (or associations), and benchmark their performance

b. Prepare the list of irrigation users of the existing irrigation facilities and the likely new members of the irrigation systems under modernization and extension to arrive at the general members of the new WUAs (Fefer task 2a)

c. Prepare a concept proposal for the modernization of the prevailing water users' organizational structures and their governance system of the existing irrigation systems. The concept proposal should provide due consideration to the prevailing irrigation policy, regulatory provisions of the federal governance system of Nepal, indigenous irrigation management practices, and the local governance system of the Tharu community in Nepal.

d. Undertake a wider consultation on the concept proposal and obtain necessary approval from the Employer

e. Following the agreed concept proposal, support existing irrigation users' groups in amending their organizational structure, rules, regulations, and constitutions, if any, through the formulation of the required constitution amendment committee. Accordingly,



propose changes in their organizational structure and governance system for establishing modernized WUAs.

f. Support the existing irrigation users' group in organizing a special general assembly of irrigation users to endorse the new constitutions, rules, and regulations for restructuring of existing irrigation users' group and redefining their governance system

g. Support in forming new WUA committees starting from the lower level of the irrigation system up to the federated level of an existing system and help register them as per their new constitutions and prevailing local regulatory system

h. Support the new WUAs in undertaking their functions

The development of the new irrigation systems

a. Prepare a concept proposal for the formation and functioning of WUAs to manage new irrigation systems with adequate consideration of the provisions made by the prevailing irrigation policy, canal network of the concerned irrigation system, and geographical administrative boundaries of the local governments.

b. Undertake a wider consultation on the concept proposal and obtain necessary approval from the Employer.

c. Following the approved concept proposal, help organize water users starting from the smallest unit - outlet committee – to the block level committee encompassing sub-branch or branch canals depending on the infrastructural layout.

d. Support new water users' groups in drafting their constitutions, rules, and regulations, and help organize their general assembly to legally formulate WUAs at several levels of the irrigation system. Finally, help register them with the relevant government institutions

e. Support the new WUAs in undertaking their functions

- **Preparation and institutionalization of the MOM plan**

a. Assess the prevailing MOM arrangements of the existing irrigation systems and propose modifications to them by developing updated MOM plans following the irrigation policy and in consultation with the local stakeholders. The updated MOM plan should encompass the proposed extension of the existing irrigation systems and should cover

the canal operation plan, asset management plan, and resources management plan covering the entire system.

b. Help support the respective WUA in institutionalizing the updated MOM plan through on-the-job training (OJT) by developing water delivery schedules for each cropping season, asset survey and maintenance formats, resources collection and management checklist/formats

Note: it is assumed that the engineering section will fix flow measuring gauges in the canal hydraulic structure

c. Where required, calibrate the existing and newly built hydraulic water control structures of the canals.

d. Monitor and evaluate the institutionalization of the MOM plan

- **Capacity building**

➢ **Formal training to enhance institutional capacity of WUA**

a. Benchmark the performance of the water users' groups of the existing irrigation systems, and prepare and submit a performance assessment report

b. Undertake a comprehensive training need assessment (TNA) of the following groups of WUAs and key farmers in different time frames as required and prepare comprehensive capacity development plans.

i. WUAs of the existing irrigation systems
ii. WUAs of the new irrigation system

The capacity development plan, for each group of WUAs at their different tiers, should include technical, managerial, and organizational aspects including study tours. Technical aspects should cover all the thematic areas of MOM of the modernized and new irrigation systems. Likewise, the managerial and organizational aspects should cover, but not be limited to, the following thematic areas:

- Institutional capacity building – towards self-regulation, self-supporting and self-governing institution
- Managerial – capable of institutionalizing the MOM efficiently
- Financial – resource mobilization and management

c. Following the approved training plan, develop a comprehensive training manual covering all thematic areas (technical, institutional, and organization) as stipulated by the comprehensive training plans

d. Support PIO in delivering training and capacity-building activities as per the approved capacity-building plan

➢ **On-farm water management and its demonstration to enhance water use efficiency**

e. Develop a comprehensive guideline for the design and establishment of a demonstration farm at farmers' fields for the demonstration of improved on-farm water management techniques along with improved agronomic practices with a focus on cereal crops covering mainly maize, potato, and early paddy.

f. In consultation with the ACIU, design and establish one demonstration farm per year for each principal crop (maize, early paddy, and potato) within the command area for the demonstration of improved irrigation methods along with the improved agronomic techniques. Some of the likely demonstrations, but not limited to are:

- Controlled irrigation with monitoring of soil moisture following irrigation scheduling
- Land leveling and irrigation requirement
- Furrow irrigation (alternative and continuous)
- Small-sized basin irrigation for the selected crop
- SRI or controlled irrigation for the cultivation of early paddy
- Drip irrigation to vegetable farming

g. Demonstrate (with ACIU) the improved methods of irrigation to farmers to help enhance water use efficiency at farmers' field

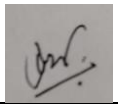
➢ **Study tours**

Following the approved training plan, help PIO in designing and managing study tours to WUAs and key farmers to demonstrate improved irrigation management and WUA governance of irrigation systems.

5. TEAM COMPOSITION AND QUALIFICATION REQUIREMENTS

5.1 Consultant's Qualification Requirements

The Consulting firm must have sufficient qualification and experience to carry out the assignment. The Consultant (each member, in case of the Joint Venture) must have minimum 10 years' experience in the civil engineering projects. The Consultant must have specific experience of design of irrigation project (covering 5000 ha of land or more) and construction



supervision of irrigation project covering 5000 Ha of command area or more. Availability of key technical and managerial (professional) staffs in the firm is also considered.

5.2 Team composition and inputs of key experts

The consulting services shall be carried out tentatively starting from October 2025 and selected through Quality and Cost Based Selection (QCBS) method. The consulting firm's team will include two sub-teams. The composition of the Consultant's Project team is set out below.

There shall be one common Team Leader (International Exposure) for both the assignments but two different teams of national Key Experts for Part A and Part B. National Key Experts proposed for Part A shall not be proposed for Part B. Any repetition will lead to disqualification of that Key Expert and his/her CV will be excluded from further evaluations. Team Leader will lead the team for both assignments as well as act as a contract management expert for the Part B assignment. Team Leader shall have an experience of at least one surface irrigation project having command area more than 2500 ha. outside home country as Team Leader

The expert positions and their tentative inputs are provided in **Table 1** below. The Employer expects proposals to be based on person-months estimated by the Employer as specified in the RFP.

Table 1 Team Composition with tentative Inputs

PART A – Detailed Survey, Planning and Design (Report Based)

S.N.	Position	P-Month	Remarks
A.	**Professional Staff**		
1	Team Leader	6.40	International Exposure
2	Senior Irrigation Engineer/Lidar Survey TL	18.00	National
3	Contract/Procurment Expert	1.20	National
4	Irrigation Engineer/ Hydraulic Engineer	23.70	National
5	Structural Engineer	3.50	National
6	Geotechnical Engineer	0.70	National
7	Geologist	8.50	National
8	Hydrologist	6.70	National
9	Road Engineer	2.20	National
10	Dam Engineer	8.00	National
11	Mechanical Engineer	3.20	National

12	Geomatics Engineer/Senior Surveyor	23.40	National
13	LiDar Data processing expert	16.80	National
14	GIS and Remote Sensing Expert	27.30	National
15	LiDar Operator	2.80	National
16	DGPS Operator/Surveyor	44.80	National
17	Economist	0.50	National
B.	**Support Staff**		
1	Sub Engineer	52.70	National
2	AutoCAD Expert	23.20	National
3	OfficeAssistant	33.60	National
4	Assistant/Support Staff	13.00	National
5	Office Helper/Labour	158.90	National

Part B: Construction Supervision and Quality Control

S.No	Details	P-Month	Remarks
A.	**Professional Staff**		
1	Senior Irrigation Engineer/Team Leader/Contract Management	45.0	International Exposure
2	Senior Construction Supervision Engineer/Deputy Team Leader (DTL)	53.0	
3	Construction Supervision and Quality Control Engineer (2 nos)	104.0	
4	Structural Design Engineer	6.0	
5	Hydraulics Design Engineer (1 nos)	12.0	
6	Dam Expert (1 no)	6.0	
7	Water Management expert (1 no)	9.0	
8	Environmental Expert	36.0	
9	Senior Institutional Development Specialist	18.0	
10	Social Development Specialist	30.0	
11	GESI Expert	14.0	
12	Road/Bridge Engineer	12.0	
13	Senior Surveyor	12.0	
B.	**Support Staff**		
1	Sub Engineer (6 pos)	330.0	
2	AutoCAD Expert	12.0	
3	Lab- Technician (2 nos.)	108.0	
4	Social Mobilizers (5 position, 2 for new secondary, 1 for storage & 2 for existing systems)	225.0	

5	Office Manager	72.0	
6	Assistant/Accountant	72.0	
7	Computer Operator	72.0	
8	Runner (2 Pos)	144.0	
9	Helper (2 Pos)	144.0	
10	Watchmen (3 Pos)	216.0	

For mobilization and demobilization of all international, national key and non-key experts for deployment, one-month prior RJKIP's written approval shall be a prerequisite.

RJKIP can mobilize or demobilize the key as well as non-key experts on a short notice as and when deemed necessary.

Any other staff deemed necessary to fulfil the consultant's obligations shall be provided by the Consultant at its own cost. Only key experts will be evaluated during the proposal evaluation stage, but the Consultant is required to submit the CVs of non-key experts meeting the qualification requirements in the RFP for the approval of the Employer before concluding the contract.

5.3 Qualification requirements of Key Experts

The Consulting firm is expected to propose adequately qualified and experienced experts to undertake efficiently the assigned tasks and responsibilities. The tasks and responsibilities assigned and detailed educational qualification and experience requirement for the respective experts are reported below.

Table 2 Qualification requirements of Key Experts

PART A – Detailed Survey, Planning and Design

S. N	***Position***	***Preferred Qualification and Expertise***
1.	*Team Leader*	*Master degree or higher in relevant fields; 20 years of professional experience, 15 years of experience in irrigation projects and experience of one irrigation project outside home country as Team Leader*
2.	*Senior Irrigation Engineer/Lidar Survey TL*	*Master degree or higher in relevant fields; 15 years of professional experience, 10 years of experience in irrigation projects*
3.	*Contract/Procurement Expert*	*Master degree or higher in relevant fields; 15 years of professional experience, 10 years of experience in Procurement/Contract Management*
4.	*Irrigation Engineer/Hydraulic Engineer*	*Master degree or higher in relevant fields; 15 years of professional experience, 10 years of experience in irrigation projects*

5.	*Structural Engineer*	*Master degree in Structural Engineering, 10 years of professional experience, 7 years of experience in irrigation/Hydropower projects*
6.	*Geo technical Engineer*	*Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in water resources projects*
7.	*Geologist*	*Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation or civil engineering projects*
8.	*Hydrologist*	*Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation or water resources projects*
9.	*Transportation/Road Engineer*	*Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in Highway/Road transportation or bridge projects*
10.	*Dam Expert*	*Master Degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation/Water Resources projects/Dam Projects*
11.	Mechanical Engineer	*Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in Gate Design of irrigation or water resources projects*
12.	Geomatics Engineer/Senior Surveyor	*B.E. in Geomatics Engineering/Survey engineering or Senior Surveying Course (or equivalent to senior surveying Course). At least 3 years' experience in Surveying work including establishment of Ground Control Marks for LiDAR Survey and have worked in minimum 2 LiDAR Projects*
13.	*GIS and Remote Sensing Expert*	*BE in Geomatic Engineering preferably Master's Degree with GIS/RS included and studied in course or having PG diploma in GIS/RS after the completion of Bachelor's Degree.*
14.	LiDar Data processing expert	*Master's Degree in Geoinformatics/IT/Computer Science/Engineering with minimum 3 years' experience in LiDAR Data Processing of the data captured by Helicopter.*
15.	LiDar Operator	*Bachelor in Geomatics with at least 3-year experience in operation of Lidar flight via Helicopter and airplane and had successfully completed at least 1 project in Nepal.*
16.	DGPS Operator/Surveyor	*One-year Junior Surveyor Course or Diploma in Geomatics with experience in operation of DGPS*
17.	Economist	*Master Degree in economics with minimum 5 years working experience in economic analysis of agriculture related sector.*

Part B: Construction Supervision

S.N	Position	Preferred Qualification and Expertise
1	Team Leader	Master degree or higher in relevant fields; 20 years of professional experience, 15 years of experience in irrigation projects and experience of one irrigation project outside home country as Team Leader
2	Senior Construction Supervision Management Engineer Deputy Team Leader/ Engineers' Representative (DTL)	Master degree or higher in relevant fields; 15 years of professional experience, 10 years of experience in irrigation projects
3	Construction Supervision/ Management Engineer (2 nos)	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation projects
4	Structural Engineer	Master degree in Structural Engineering, 10 years of professional experience, 7 years of experience in irrigation/Hydropower projects
5	Hydraulics Design Engineer (1 No)	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation projects
6	Quality Control Engineer (1 no)	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation projects
7	Dam Expert (1 no)	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation/Water Resources projects
8	Water Management Expert (1 no)	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation projects
7	Environmental Expert (Engineer Level)	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation or civil engineering projects
9	Senior Institutional Development Specialist	Bachelor degree or higher in relevant fields; 10 years of professional experience, 3 years of experience in irrigation or water resources projects
10	Social Development Specialist	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation or civil engineering projects
11	GESI Expert	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in irrigation or civil engineering projects
12	Road/Transportation Engineer	Bachelor degree or higher in relevant fields; 10 years of professional experience, 7 years of experience in transportation or bridge projects
13	Senior Surveyor (1 no)	Bachelor degree or higher in relevant fields

The Curriculum vitae (CV) of the professionals which will be submitted should be originally signed with recent date mentioning their commitment for the respective work. During the final presentation of the output to the proponent each professional as specified in the proposed team composition should defend their works by themselves.

CV of the professional can be verified during evaluation process either by physical presence or online if found any discrepancies during evaluation

6. REPORTING REQUIREMENTS AND SCHEDULE OF DELIVERABLES

During the performance of the services, the Consultant will prepare required reports in English for submission to the Employer in electronic form and/or hard copies as per RJKIP instructions.

Unless otherwise agreed, all deliverables are to be submitted as drafts for review and comment by the RJKIP and WB, and thereafter amended and submitted as final versions. Other occasional deliverables may be required from time to time on an informal basis. The Consulting firm shall assist to maintain an electronic safe backup of all contract related documentation and submit one electronic version of every report listed in Table 2 below.

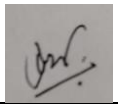
The reporting/submission format will be consistent with the requirements of WB and Government of Nepal and will be agreed between the Consultant and RJKIPP from time to time. The reporting formats shall further be subject to the amendment/modifications from time-to-time in consultation with the RJKIP and WB. The consultant will submit at least the following reports at periods stated hereunder in **Table 3**.

Table 3 List of Minimum Deliverable and Schedule

PART A – DETAILED SURVEY, PLANNING AND DESIGN (Lump-Sum)			
Reports	**Language**	**Number of Hard Copies**	**Time Schedule**
Inception Report	English	5	Starting from 1 months (and no longer than 2 months) from the date of issuance of Notice to Proceed (unless agreed otherwise during the Contract negotiation)
First Field Report (LiDAR Survey Report)	English	5	Starting from 6 months (and no longer than 8 months) from the date of issuance of Notice to Proceed (unless agreed otherwise during the Contract negotiation)
Final Detailed design and Drawings, cost estimate and specification, Bidding documents (package 2, 3 and 8 (CAP))	English	5	Starting from 8 months (and no longer than 12 months) from the date of issuance of Notice to Proceed (unless agreed otherwise during the Contract negotiation)
Final Detailed design and Drawings, cost estimate and specification, Bidding documents (package 4, 5 and 7 (road))	English	5	Starting from 12 months (and no longer than 18 months) from the date of issuance of Notice to Proceed (unless agreed otherwise during the Contract negotiation)
Final Detailed design and Drawings, cost estimate and specification, Bidding documents (package 6 and 9 (storage))	English	5	Starting from 18 months (and no longer than 24 months) from the date of issuance of Notice to Proceed (unless agreed otherwise during the Contract negotiation)

Reports	Language	Number of Hard Copies	Time Schedule
PART B – CONSTRUCTION SUPERVISION (Time Based)			
Inception Report:	English	5	Six weeks after signing of Contract
Monthly Progress Report	English	5	By first week of every month
Planning, design, layout, design, drawings of each component of the Project	English	5	As per the job requirements and at the end of consulting services
Implementation Completion Report (ICR)	English	5	By the end of Project
Consulting Services Completion Report	English	5	By the end of consulting services contract
Reports on any reason which affecting the schedule of the construction works	English	5	As and when necessary
Trimester and Annual Progress Report	English	5	By the first week of reporting period
Quarterly and annual safeguard compliance and status reports	English	5	By the first week of the end of reporting period
Mid- Term review report	English	5	In accordance with the mid term review mission

a) **Inception Report:** The Consultant shall prepare the Inception Report and submit it at the end of 6 weeks after the commencement of their services. The report shall describe the Consultants' overall understanding of the project implementation procedures and arrangements and detailed plan to effectively deliver the required consulting services.
b) **Trimester Progress Reports:** The reports shall briefly describe and include the project activities undertaken during the reporting period, financial situation, progress of implementation of physical infrastructures, any changes in the implementation schedule, problems and constraints associated with project implementation and suggested remedial measures, planned activities and expenditure forecast for the next four-month period. The third four-monthly progress report will be an annual report covering the entire one-year period. The reports shall be submitted within two weeks after the end of the reporting period.
c) **The Mid-term Review Report:** The Consultants shall prepare and submit a Mid-term Review Report at the end of 48 months of project implementation period or at the time of mid-term evaluation by the World Bank. The report will update the overall progress of implementation of various project components and will include the description of problems encountered in achieving the objectives, remedial measures adopted to address the problems, financial status of the Project, and suggestions for improvement of procedures/guidelines. The report will also make recommendation, if so deemed necessary, for the extension of project period. The Mid-term Review Report should provide a clear picture of the project status, which will guide the Bank and GON to take corrective and appropriate steps for achieving the desired objectives of the Project in the remaining project period.
d) **Implementation Completion Report (ICR):** At the end of project period, the Consultants shall prepare an Implementation Completion Report (ICR). The ICR will summarize, or accumulate as appropriate, the records of the four-monthly and annual reports. In addition, the ICR will analyze the constraints met in project implementation, measures adopted to resolve such constraints, document the achievements made by the Project, and suggest ways to improve implementation of such projects in the future. In short, the ICR will provide a brief but a complete picture of issues involved in project implementation. The ICR shall be submitted within two months of the end of the project period.
e) **Quarterly and Annual Environmental and social compliance and implementation status reports:** The Consultant shall prepare consolidated report covering implementation status/ progress and compliance of all environment and social Safeguard measures stipulated/ required under the project's safeguard documents (EA/EMP, BIA/ BMP, IPMP, SA, RPF, VCDP and GAP), safeguard training activities, construction supervision, quality control and other relevant activities covered/implemented during the period of assignment. The Consultants shall submit Five copies of each report to the PIU. The Consultant should develop reporting format acceptable to project and the World Bank.



7. MODE OF PAYMENT

The final payment shall not be made if the above-mentioned work is not completed as per TOR, and the consultant will be fully responsible ensuring the quality of report as per requirement. The amount shall be paid as per agreement to the consultant assigned for the work.

Part A: Detailed Survey, Planning and Design (Report Based)

The consultant claims the payment either in a single instalment after submission and acceptance of final report as per TOR or in instalment as follows:

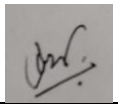
- First instalment, 10% of the contract amount shall be paid to the Consultant upon the submission and acceptance of Inception Report.
- Second instalment 30% of the contract amount shall be paid to the Consultant upon submission and acceptance of first field Report.
- Third instalment 20% of the contract amount shall be paid to the Consultant upon submission and acceptance of package 3(4 Lots) Report.
- Fourth instalment, 20% of the contract amount shall be paid to the Consultant upon submission and acceptance of package 4(3 Lots) Report.
- Final instalment, 20% of the contract amount shall be paid to the Consultant upon submission and acceptance of package 5(4 Lots) and all the remaining works report complying with ToR (Five hard copies and two electronic copies in two separate external hard disk drives).

Part B: Construction Supervision (Time Based)

The Consultant claims the payment based on inputs provided by the Consultant for supervision work. The monthly attendance of human resources involved in the supervision work shall be submitted while claiming the payments. The reimbursable amount shall be paid as per actual expenditures against the financial evidences (Bills, Tax Invoices, air fare tickets etc.)

Procurement of Additional Studies, Exposure visit, Equipment and Training

Consultants for additional studies will be recruited in accordance with WB's Procurement Policy: Goods, Works, Non-consulting and Consulting Services and shall follow the Procurement Act/Regulations for WB Procurement Guideline. Provisional sums have been included in the



consultancy agreement for procurement of various requirements that will support the project. The PIU will be responsible for preparing the exact implementation arrangements, TORs, specifications, and detailed cost estimates of the procurement which will be approved by the Project Director before initiating procurement. The tentative scopes of provisional items are summarized in Table 4.

Table 4 Indicative Provisional Items

Item	Description
International Knowledge sharing / Training program	Field Visit and training course on WB funded projects abroad to enhance and sharing of knowledge
Office Equipment	Procurement of office equipment including computers, software, printers, photocopiers, GPS power inverter, etc. for field office using the shopping procurement method.
Meetings, workshops and training	For routine meetings, workshops and training sessions convened by the PIU.
Communication Materials	Publishing of communication materials and media including the video diary of the investment program and development and hosting of the website.

8. EMPLOYER'S INPUT AND COUNTERPART PERSONNEL

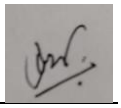
The Employer will provide all relevant existing reports and available data relating to the project to the Consultant at the commencement of the consultancy contract. The Employer will facilitate access of the Consultant to project site, and other Government's agencies for communications, collection of relevant information, data, documents, etc. and other activities related to the Consultant's assignment.

The cost for office and resident spaces for the Consultant shall be as per the Bill of Quantities (BoQ). Similarly, the cost of vehicular facilities and its operation & maintenance will be included in Bill of Quantities. Cost of necessary office furniture and office equipment shall be covered under Provisional Sums that shall be spent with prior approval of the Employer;
Since the Services consist of and include the supervision of civil works, the following actions require prior approval by the Employer:

The consulting firm shall price all cost direct or indirect that Consulting firm envisages to incurred for the performance of its services (except those stated above) in its financial proposal. No additional payments shall be made for such expenses

9. DURATION OF THE ASSIGNMENT

The Total estimated duration of the assignment is 72 calendar months and expected to commence in or about October 2025.



The duration of Part A assignment: Survey, Planning and Design (Lump-Sum) is 24 calendar months since the commencement of the Consulting service. The Consultant is entitled to the Liquidated Damage of total cost of Part A as per the contract provision if he fails to complete the Part A assignment within the stipulated time frame.

The duration of Part B assignment: Construction supervision is 72 calendar months since the commencement of the Consulting service.

10. CONSULTANT SELECTION METHOD

The Consultant shall be selected in accordance with the World Bank's Procurement for IPF Borrowers, July 2016, Revised September 2023, Public procurement act 2063 and Regulation 2064 using Quality and Cost Based Selection (QCBS) method of selection.

Annexes

Annex 1: Specification of LiDAR Surveying and Mapping Consulting Services for RJKIP Phase 3 Patharaiya Extension Canal System

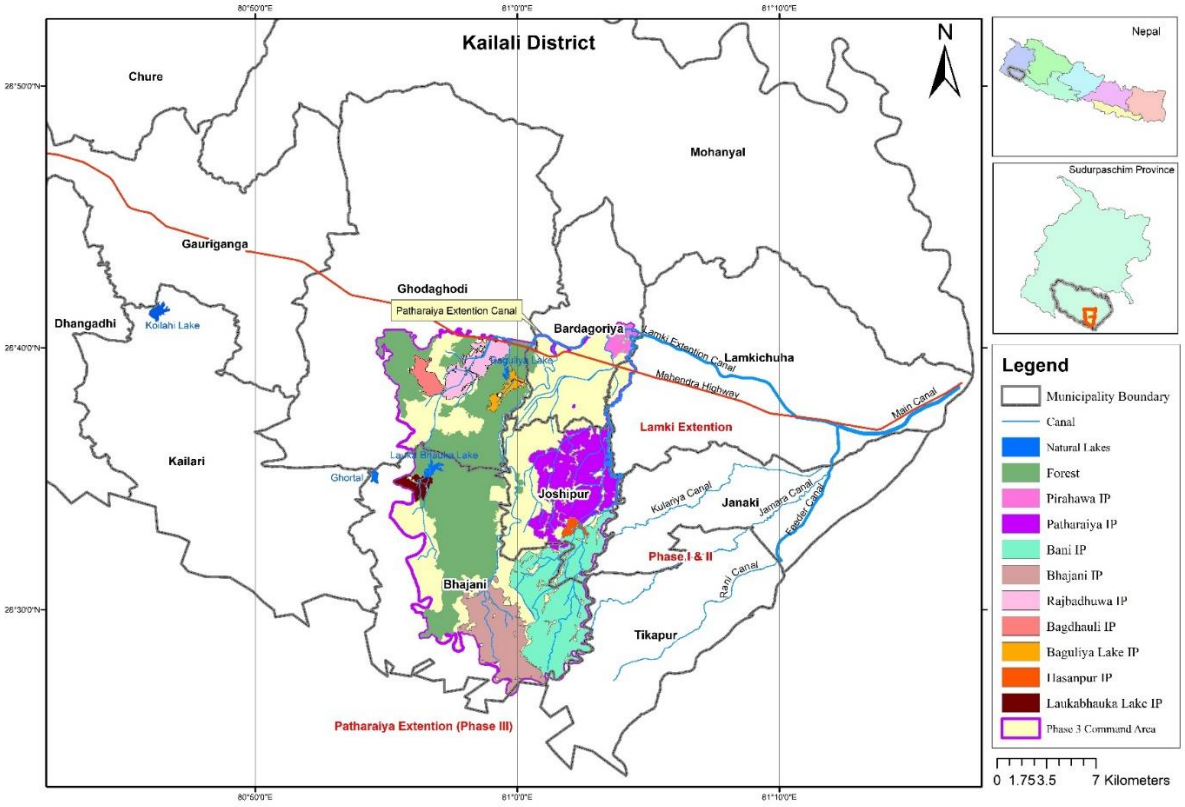
S.N.	Description	Specification	Remarks
1	**LiDAR Point Density**	At least 10 points/m^2 point density will be captured considering the nature of the topography and accuracy requirements as per the TOR.	
2	**Ground sample distance (GSD)and focal length of lens**	Medium frame camera with 100MP will be used to capture digital image, and GSD will be maintained at 10 cm.	Camera specification has been attached separately.
3	**Photographic Coverage**	1. The forward overlap (fore lap) between successive exposures in each run will be kept at a minimum 45 percentage. 2. The lateral overlap (side lap) between adjacent strips will be kept at a minimum 45 percentage.	
4	**Fundamental Spatial Accuracy**	1. Fundamental vertical accuracy: Root Mean Square Error <= +/- 0.15 m. Or better on clear or vegetated ground. 2. Fundamental horizontal accuracy of ortho photo will be maintained at <= +/- 0.10 m.	
5	**Coordinate Datum's**	1. WGS 84 with UTM 45N coordinate system 2. MUTM with Everest Spheroid system	
6	**Vertical Datum**	Elevation data will be adjusted to local height datum with the BM established by the Consultant	
7	**Ground Control System**	1. Maximum distance between the Reference GPS station on the ground and airborne GPS units will not exceed 10 kilometers during the flight. 2. All survey control data used or derived from this contract will be supplied to ensure independent Quality Assurance (QA) of the survey operations. All primary ground stations will be visible in photographs after the orthophoto is generated 3. The primary ground control and check point surveys will be referenced to survey control marks with geodetic control points (in terms of coordinates and height) demarcated by survey department. 4. Elevation data will be validated and corrected for	

S.N.	Description	Specification	Remarks
		systematic errors to ensure accuracy specifications are met.	
8	**LiDAR Data acquisition details**	1. A Draft Pre-Fight Agreement will be made to ensure that no LiDAR data over the Study Area will be collected during any period where extent of LiDAR ground returns in any part of the Study Area is likely to be significantly compromised e.g. flood, adverse weather etc. 2. The Draft Pre-Flight Agreement will include provision whereby the Project is notified of each proposed LiDAR collection flight with sufficient notice to enable consultation between the Project and the Consultant to determine if data capture by the Consultant should proceed. 3. Flight line overlap will be 45% or greater, as required to ensure there are no data gaps between the lines. 4. The spatial distribution of geometrically usable points will be maintained uniform and free from clustering in order to ensure consistent data densities throughout the project area. 5. Environmental conditions – during the data capture cloud and fog free condition between the helicopter and the ground will be ensured. 6. Details of the helicopter, navigation and mission planning activities for LIDAR and digital photography acquisition will include details of whether the photography and LIDAR will be acquired during the same mission (i.e. from the same helicopter) or from separate missions. If separate missions are required to satisfy the respective resolution requirements for LIDAR and photography (eg. Due to flying height constraints) then specify alternative mission scenarios based on a sensor type and platform.	
9	**Intensity Image**	1. 0.3 m grid intensity image or better to preserve required accuracy. 2. Mosaic will be generated using average laser intensity values from "first return" LiDAR points. 3. Tiled delivery, following the sheet numbering and extent as provided by the Project.	
10	**Digital Surface Model (DSM)(orthometric)**	1. 0.3m grid Digital Surface Model (DSM) will be generated from the "first return" LiDAR mass point data. This will include ground and non-ground points such as vegetation and buildings. 2. The DSM generation will employ a Point to TIN and	

S.N.	Description	Specification	Remarks
		TIN to Raster process with Natural Nearest Neighbor interpolation. 3. Void areas (i.e., areas outside the project boundary but within any tiling scheme) will be coded using a unique "NODATA" value.	
11	**Digital Terrain Model (DTM)(orthometric)**	1. 0.3m grid bare earth Digital Elevation Model (DEM) will be generated from the LiDAR mass point data classified as "Ground" only, so that it defines the "bare earth" ground surface. 2. The DEM generation will employ a Point to TIN and TIN to Raster process with Natural Nearest Neighbor interpolation. 3. Void areas (i.e., areas outside the project boundary but within any tiling scheme) will be coded using a unique "NODATA" value	
12	**DGPS Data collection**	1. GPS data for all base station occupations in excess of 4 hours or more will be provided in RINEX format (Receiver Independent Exchange Format). 2. GNSS observation log sheets which include the following details: (a.) Survey mark ID (b.) Occupation time & date (c.) Antenna height measurements (d.) Instrument /antenna types & serial numbers The GPS observation log sheets will be provided in pdf format or Excel spreadsheet if data is captured digitally. Where appropriate, some jurisdictions may find it useful to also request GPS data for any static primary control surveys.	
13	**Metadata**	1. For each supplied data product, a complete metadata Statement will be in consistent with the ISO Standard. 2. Metadata will be provided with every delivery including interim, partial and final deliveries.	
14	**Spatial Accuracy Validation**	1. The fundamental vertical accuracy of the point cloud data set will be determined with check points located only in open, relatively flat terrain, where there is a very high probability that the sensor will have detected the ground surface. 2. The vertical accuracy of the point cloud dataset will be tested using a TIN surface constructed from bare- earth LiDAR points compared against ground survey check points. 3. Check points will be surveyed independently of any LiDAR GPS operations. 4. The number of check points (locations) is dependent on the extent of the survey. The following strategy will be used as a guide:	

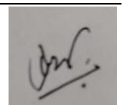
S.N.	Description	Specification	Remarks
		a. Check points will be established to adequately cover the full extent of the survey area and be representative of the project area landscape. b. A minimum of 10 check points (locations), with 1 point per 1 km² in 1 km * 1 km grid in different vegetation types. The checked result will have to lie within 90 percent confidence interval. 5. The proposed check point survey design will be submitted and approved by the Contract Authority prior to implementation. Acceptance of the post-survey spatial accuracy report discussed above is dependent on the quality, number and distribution of these check points. In the above circumstances a "compiled to meet" statement of horizontal accuracy at 95 percent confidence will be reported.	
15	**Data Processing**	Consultants will process all the acquired data (LiDAR and Ortho photo) in Data Processing LAB (Software and Hardware) inside Nepal.	
16	**Facilitation**	The Project will facilitate in administrative procedure (inter and intra governmental organizations).	

Annex 2: Overall Layout Map of the RJKIP Phase 3: Patharaiya Extension Canal



<u>Annex 3:</u> Human Resources Allocation Plan for Construction Supervision and Quality Control works

S. No.	Consultant Inputs	2025												2026												2027												2028												2029												2030												2031									DLP												Person Months
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	
Professional Staff																																																																																																		
1	Senior Irrigation Engineer/Team Leader/Contract Management												1		1		1		1	1					1		1	1	1		1	1					1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																	44
2	Senior Construction Supervision Engineer/Deputy Team Leader (DTL)											1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																1	53
3	Construction Supervision and Quality Control Engineer (2 nos)											1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																	104
4	Structural Design Engineer																		1												1												1												1												1											1																	6
5	Hydraulics Design Engineer (1 nos)											1							1												1	1											1	1											1	1											1	1										1	1																	12
6	Dam Expert (1 no)																1												1														1										1												1															1																6
7	Water Management expert (1 no)																																						1	1									1	1										1	1													1	1	1																		9
8	Environmental Expert										1	1	1	1	1	1							1	1	1	1	1	1							1	1	1	1	1	1												1	1	1	1	1	1							1	1	1	1	1	1							1	1	1	1	1	1															36
9	Senior Institutional Development Specialist											1	1	1										1	1	1										1	1	1														1	1	1										1	1	1										1	1	1																	18
10	Social Development Specialist										1	1	1	1	1								1	1	1	1	1								1	1	1	1	1													1	1	1	1	1								1	1	1	1	1								1	1	1	1	1																30
11	GESI Expert											1	1	1	1													1	1											1	1														1	1											1	1											1	1															14
12	Road/Bridge Engineer																																						1	1	1												1	1	1												1	1	1											1	1	1																12
13	Senior Surveyor										1							1												1	1											1	1											1	1											1	1										1	1																		12
14	Unallocated																								1	1											1	1											1	1											1	1											1	1	1																				11
Sub Total Key Expert																																																																																																367
National- Supporting Staff																																																																																																
1	Sub Engineer (6 pos)										1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1															330
2	AutoCAD Expert												1	1											1	1											1	1																1	1											1	1											1	1																	12
3	Lab- Technician (2 nos.)											1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1															108
4	Social Mobilizers (5 position, 2 for new secondary, 1 for storage & 2 for existing systems)											1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1						1	1	1	1	1	1	1	1						1	1	1	1	1	1	1	1				1	1	1	1	1																		225
5	Office Manager										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													72
6	Assistant/Accountant										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													72
7	Computer Operator										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													72
8	Runner (2 Pos)										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													144
9	Helper (2 Pos)										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													144
10	Watchmen (3 Pos)											1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1													216
Sub Total Supporting Staff																																																																																															1395
Total National Staff																																																																																															**1,762**



Annex 4: Details of Packages for Design Works

S.No.	Package	Lot	Contract Title, Description
1	Package 3	Lot 1	Rehabilitation, Modernization and Extension of Pathraiya Irrigation System (Pathraiya is a existing irrigation system with command area 3000 ha)
2		Lot 2	Rehabilitation, Modernization and Extension of Bani Irrigation System (Bani is a existing irrigation system with command area 3500 ha)
3		Lot 3	Rehabilitation, Extension and Modernization of Existing Irrigation Systems (3 Nos of Storage lakes of the Southern part of Kailali District).
4		Lot 4	Command Area Protection (CAP) and watershed management works in local rivers on the western part of command area
5	Package 4	Lot 1	Rehabilitation, Modernization and Extension of Bhajani Irrigation System (Bhajani is a existing irrigation system with command area 2000 ha)
6		Lot 2	Construction of Secondary Canals, Canal Structures and Service roads
7		Lot 3	Construction of Sub-Secondary Canals, Canal Structures and Command Area Development (CAD), Rural Road Improvement including rehabilitation, modernization and extension of existing irrigation systems within the western part of RJKIP-III.

8		Lot 4	Construction of Sub-Secondary Canals, Canal Structures and Command Area Development (CAD), Rural Road Improvement including rehabilitation, modernization and extension of existing irrigation systems within the Eastern part of RJKIP-III.
9	Package 5	Lot 1	Rehabilitation, Extension and Modernization of Existing Irrigation Systems (3 Nos of Storage lakes of the Western part of Kailali District).
10		Lot 2	Rehabilitation, Extension and Modernization of Existing Irrigation Systems (4 Nos of Storage lakes of the Northern part of Kailali District).
11		Lot 3	Command Area Protection (CAP) and watershed management works in local rivers on the central part of command area
12		Lot 4	Command Area Protection (CAP) and watershed management works in local rivers on the eastern part of command area