Government of Nepal
Ministry of Physical Infrastructure and Transport
Department of Roads
Bridge Branch
Notice No. 03/PCU/078/79

REQUEST FOR EXPRESSION OF INTEREST (REOI)

Name of project: Second Bridges Improvement and Maintenance Program (BIMP II)
IDA Credit No.: 6317-NP
Assignment Title: Feasibility Study for the Upgradation of Gorusinghe-Gaddachauki Section of East-West Highway (Mahendra Highway) and Detailed Design of Priority Sub-Section
Reference No.: NP-DOR-BIMPII-CS-QCBS-PP-01

The Government of Nepal has received financing from the World Bank toward the cost of the ***Second Bridges Improvement and Maintenance Program (BIMP II)*** and intends to apply part of the proceeds for consulting services. The main objective of the consulting service is to conduct Feasibility Study for the Upgradation of Gorusinghe-Gaddachauki Section of East-West Highway (Mahendra Highway) and Detailed Design of Priority Sub-Section.
The specific objectives of feasibility study and detail design are:

- *To review design and studies for upgradation of the Butwal to Gorusinghe road and bridges in it.*
- *To conduct detailed technical and economic feasibility study of about 392 km roads from Gorusinghe (Butwal-West) to Gaddachauki of Mahendra Highway for upgradation from existing 2-lane to 4-lane standard, considering the need to upgrade the existing road to a climate-resilient, safe and cost-effective transport infrastructure.*
- *To carry out the detailed engineering design, with detailed survey, investigations and design of roads, bridges, intersections, animal crossing and level crossing for the upgradation of priority road sub-section/s on the Gorusinghe - Gaddachauki section of Mahendra Highway from existing two-lane to four-lane road standards.*

Terms of Reference (ToR) is available in the website of the Department of Roads: https://dor.gov.np/home/notices
Anticipated date for commencement of the services is November 2022 and the tentative duration of the assignment is about **12 months**.
Second Bridges Improvement and Maintenance Program (BIMPII), Bridge Branch, Department of Roads under the Ministry of Physical Infrastructure and Transport now invites eligible International Consulting firms ("Consultants") to indicate their interest in providing the services. Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience to perform the services. The short listing criteria are:

- Business objective and years in business (minimum 5 years)
- Organizational capability of the firm for the assignment
- General Experience of the Firm
- Specific Experience relevant to the assignment.

The attention of interested Consultants is drawn to paragraphs 3.14, 3.16, 3.17 of the World Bank's Procurement Regulations for IPF Borrowers, dated July 2016, revised November 2020 ("Procurement Regulations") setting forth the World Bank's policy on conflict of interest.

A consultant will be selected in accordance with the Quality and Cost Based Selection (QCBS) method set out in the Procurement Regulations. It is intended that short listed consultants will be invited to submit their technical and financial proposal as per the Request for Proposal document to be issued to them.
Consultants may associate with other firms in the form of a joint venture or a sub-consultancy to enhance their qualification. Consultants shall clearly state their association if any whether in the form of joint venture or sub consultancy in the Expression.

Interested Consultant may obtain further information about the service from the address given below during office hours.
Expression of interest must be delivered in written form to the address below (in person, or by mail, or by e-mail) by **11 March 2022 AD (2078/11/27 BS)** within office working hours.

Second Bridges Improvement and Maintenance Program (BIMP II)
Bridge Branch, Department of Roads, Chakupat, Lalitpur, Nepal
Tel: +977-1-5528771, +977-1-5520107; Email: infobbpcu@gmail.com

TERMS OF REFERENCE (TOR)

FOR

FEASIBILITY STUDY FOR THE UPGRADATION OF GORUSINGHE-GADDACHAUKI SECTION OF EAST-WEST HIGHWAY (MAHENDRA HIGHWAY)

AND DETAILED DESIGN OF PRIORITY SUB-SECTION

UNDER

SECOND BRIDGES IMPROVEMENT AND MAINTENANCE PROGRAM (BIMP-II)

Contents

A. Background 3

B. Detailed Scope of Work 4

B.1 Part I – Review of design and studies of about 50 km road from Butwal to Gorusinghe 4

B.1.1 Objectives of the activity 4

B.1.2 Scope of the activity 4

B.2 Part II – Detailed Technical and Economic Feasibility study of about 392 km road from Gorusinghe to Gaddachauki 5

B.2.1 Objectives of the activity 5

B.2.2 Scope of the Activity 5

B.3 Part III – Detailed Design of Upgradation Works for the priority road sub-section on Gorusinghe - Gaddachauki section of East-West Highway and associated Bridges 7

B.3.1 Objectives of the Activity 7

B.3.2 Scope of the Activity 8

B.3.3 Detailed Survey, Investigations, and Design of Upgradation Road and Bridge Works on the priority sub-section 11

B.3.4 Additional Specification: Design Characteristics and Expected Surveys 14

C. Team Composition and Qualification Requirements for Professional Staff/ Experts 25

D. Reporting Requirement and Time Schedule 27

D.1.1 Reports and Submissions 27

D.1.2 Additional Details on Expected Outputs 29

D.2 Consultants Facilities, Client's Input and Counterpart Personnel 31

D.3 Data and Assistance to be Provided by the Client 31

E. ANNEX-1: List of Existing Bridges 32

F. ANNEX-2: Qualification Requirements of Professional'sExperts 39

A. Background

1. The Government of Nepal (the Government) is implementing Second Bridges Improvement and Maintenance Program (BIMP II) under International Development Association (IDA) credit support from World Bank. The objective of BIMP II is to provide safe, resilient, and cost-effective bridges on the Strategic Roads Network of Nepal. One of the project components of BIMP II operation is to acquire consultancy support for institutional development to Department of Roads (DOR) to prepare potential future projects for improvement of the Strategic Roads Network, such as, including but not limited to, preparation of baseline assessments, engineering studies, feasibility studies, safeguard assessments and technical designs.

2. The Government is committed to upgrade the entire East-West Highway (Mahendra Highway) from existing two-lane road to four-lane standard in order to enhance road capacity and efficiency along the highway corridor. The East-West Highway is the major strategic road of the country running from east (Kakarbhitta) to west (Gaddhachauki) side of the entire country with length of 1027 km. The upgrading to four-lane standards from Kakarbhitta to Gorusinghe (634 km) section are currently in different stages ranging from project preparation, detail design through to construction. The remaining section is approximately 392 km from Gorusinghe to Gaddhachauki.

3. The Government of Nepal, Department of Roads (DoR), intends to upgrade the Gorusinghe- Gaddachauki section (392 km) of East-West Highway from existing 2-lane to 4-lane standards (including roads and bridges along this section) **to build a more climate-resilient, safe, cost effective, environmentally friendly and inclusive road transport infrastructure**. The DoR, under the financing of BIMP II, intends to procure consulting services for conducting a feasibility study for the upgradation of Gorusinghe-Gaddachauki section of the East-West highway from existing 2-lane to 4-lane carriageway (including roads and bridges along this section).

4. The existing road from Gorusinghe to Gaddachauki is 392 km in length comprising of bituminous surfaced two-lanes and shoulders. The route has 222 no. bridges (129 minor and 93 major type). The road surface generally has good riding quality. As per the record in Department of Roads (DOR) Bridge Management System (BMS); the condition of 1 no. (1227.95m) bridge are in good condition; 77 no. (1,099.45m) in fair condition, 84 no. (1212.4m) in poor condition and 4 no (42.933m) bridges are in critical condition.. The road section passes through the Banke National Park. The road section passes through the following junctions/ intersections/places: Gorusinghe, Chakala, Chanauta, Dhankhola, Bhaluwang, Lamahi, Ameliya, Shivakhola, Kohalpur, Ramapur, Muda, Syauli Bajar, Attariya, Sama Daiji, Mahendranagar and Gaddachauki.

5. The required consulting services consist of three parts as briefly described below:

a. Part I – Technical Review of design and studies of about 50 km road from Butwal to Gorusinghe.

- Detailed review of designs and studies completed by a separate consultant on the upgradation of the corridor from Butwal to Gorusinghe. The review must also determine outstanding requirements, in line with World Bank requirements, to procure the works for construction.

b. Part II – Technical and Economic Feasibility study of about 392 km road from Gorusinghe to Gaddachauki.

- Detailed technical and economic feasibility study for the upgradation of the Gorusinghe-Gaddachauki section of the Mahendra Highway to four-lane standard from existing two-lane standard. One of the expected outcomes of the detailed technical and economic feasibility study is the identification by the Consultant of the most viable road sub-section to be selected for the detailed design phase under Part III.

c. Part III – Detailed Design of Upgradation Works for the selected priority road sub-section of the Gorusinghe-Gaddachauki highway section and associated Bridges as identified from the Feasibility study in Part II.

- Based on the findings and recommendations of the Part II study, Part III involves the detailed engineering survey, investigations and design of roads, bridges, animal crossing and level crossing for the upgradation of priority sections of about 80km on the Gorusinghe-Gaddachauki section of Mahendra Highway from existing two-lane to four-lane road standards along with detail design of construction of about 20 nos. of minor bridges and about 19 nos. of major bridges in the priority section.

6. **Strategic Environmental and Social Assessment (SESA)** of the Gorusinghe-Gaddachauki section and **Detailed Environment and Social Impact Assessment (ESIA)** of the selected priority road sub-section will be carried out through a separate consulting services package, as per applicable World Bank Guidelines and as per the DoR Reference Manual for Environmental and Social Aspects of Integrated Road Development, Acts and Regulations. The Consultant is required to take these safeguards assessments into consideration and coordinate with the *SESA/ESIA Consultant* accordingly. The Consultant is indeed expected to collaborate, share information and coordinate with the *SESA/ESIA Consultant* to ensure that the specific findings from the Environmental and Social Assessments, Environmental Management Plan, Social Action Plan, Resettlement Action Plan, Vulnerable Communities Development Plan and any others, as required under World Bank ESF policies and/or national legislation, are fully integrated into the detailed design and fully costed and included in bid documents, BOQs etc.

B. Detailed Scope of Work

B.1 Part I – Review of design and studies of about 50 km road from Butwal to Gorusinghe

B.1.1 Objectives of the activity

7. The primary objective of the consulting services under Part I is to review the studies and designs that was done on the Butwal to Gorusinghe road and bridges.

B.1.2 Scope of the activity

8. The Consultant is expected to carefully study the World Bank and DOR acceptable design standards, and review the proposed detailed design of the Butwal-Gorusinghe highway section.

9. From the review, the Consultant would need to determine whether the design adheres to the required standards acceptable by the World Bank and DOR and determine additional design elements/works required before the launch of construction of the works.

10. The Consultant is expected to provide an indicative timeline of the additional design/documentation requirements, if any. The design documentation should adhere to similar scope requirements as listed under Part III of this Terms of Reference.

11. Findings from the technical review should be compiled in a Detailed Technical Review Report.

12. Part I activity is expected to take 6 weeks and will be initiated in parallel with Part II activity.

B.2 Part II – Detailed Technical and Economic Feasibility study of about 392 km road from Gorusinghe to Gaddachauki

B.2.1 Objectives of the activity

13. The primary objectives of the consulting services under Part II are to:

a. Conduct detailed technical and economic feasibility study of about 392 km roads from Gorusinghe (Butwal-West) to Gaddachauki of Mahendra Highway for upgradation from existing 2-lane to 4-lane standard, considering the need to upgrade the existing road to a climate-resilient, safe and cost-effective transport infrastructure.

b. Evaluate, using an economic evaluation model (HDM-4) for the road, a series of project-alternatives considering different investment levels, which will be compared against a without project alternative that will represent a do-minimum scenario or do-nothing scenario.

c. Propose a phased investment plan (with proposed schedule and cost).

d. Justify decision to move ahead with Part III of the study based on the outcome of the detailed technical and economic feasibility study, with the identification of the most viable road sub-section to be prioritized for Detailed Design under Part III.

B.2.2 Scope of the Activity

14. The list of roads and bridges for the Feasibility Study are given in Table 1 below:

Table 1

S. No	Description	Length	Upgrading scope
1	Gorusinghe- Gaddachauki	392 km	Upgrading of roads and bridges from existing 2-lane to 4-lane standards.
2	Bridges on the above road section as listed in **Annex 1** to this ToR	8926.7 m	

15. The consultancy services will include but is not necessarily limited to the following:

a. Review studies and documents pertaining to the proposed feasibility study, including DOR planning documents; road traffic data and available forecasts (vehicle, cargo, and passenger); relevant environmental and social impact studies; and available survey data (including maps, aerial photographs, etc.).

b. Carry out a desk study for initial assessment of the feasibility of upgrading the Gorusinghe-Gaddachauki section to 4-lane standard from existing 2-lane. The desk study will include preliminary cost estimates and a preliminary economic assessment based on available traffic data and also possible environmental and social impacts.

c. Undertake a field survey of the road for upgrading.

d. The fieldwork will include reconnaissance (drive along at existing roads and walk over along the suggested alignment for proposed construction) surveys, socio-economic data collection, data on passenger and freight movements, an initial review of the environmental factors pertinent in the selected road corridor and mapping of affected socio-environmental assets. The Consultant should attempt to identify at this stage any particularly vulnerable groups whose social, economic or environmental capability could be threatened by the proposed road construction or land acquisition.

e. Conduct a field survey to ascertain existing condition of road (including drainage, bridges, and other physical structures); prepare an inventory of required works (including bridges), carry out geological/geo-technical/material survey, precisely identify climate and disaster risks and zones that are most vulnerable to landslides and flooding, and assess pavement design. Based on typical contracting arrangements and unit-based pricing, prepare a cost estimate of each project component including projected cost of bridges.

f. Conduct a field survey and establish alternative alignments, identify features affecting design (man-made and geographical), and conduct a geological/geo-technical/material survey. Establish typical cross sections in sufficient number and detail to develop cost estimates for the construction. Identify issues pertaining to land acquisition (if required) and recommend approaches to be taken.

g. Prepare a preliminary design of road components. For upgrading works this will include adjustments to alignments, improvements or new construction of drainage, bridges, etc. For new roads in connection with upgrading provide alignment, profile, and cross section on an appropriate scale and details for the terrain and conditions. The scale for the drawings must be agreed upon with DoR beforehand and not less than 1:25000.

h. The Consultant are required to specify work specifications, road geometric, bioengineering measures, cost effective road structures in their design.

i. The Consultant will evaluate, using an economic evaluation model (HDM-4) for the road, a series of project-alternatives considering different investment levels, which will be compared against a without project alternative that will represent a do-minimum scenario or do-nothing scenario.

j. Develop methodology to forecast passenger and freight traffic movements on the proposed roads to be used in the economic analysis. These should be based on the populations served and anticipated trip production and freight generation rates. Forecasts of traffic levels on the sections of road to be upgraded will be based on surveys of existing demands and future growth estimates.

k. In consultation with the DoR, develop a comprehensive list of unit item rates to form the basis of the project cost estimates. In order to develop the Rates and Cost Estimates, Consultants are required to apply appropriate GoN Norms and Specifications with proper and timely interactions with concerned Branches/Sections of DoR.

l. The Consultant will prepare detailed economic feasibility and sensitivity analyses for the road based on estimates of transport benefits and costs (construction and maintenance). The economic analyses will include Internal Rates of Return, Net Present Value calculations, first year Benefit-Cost ratio, and sensitivity analyses to one-year delays in construction, increases in construction costs, decreases in benefits, and staged approach possibilities. The benefit calculation will estimate transport cost savings resulting from the replacement of foot paths, tracks and air transport with truck and bus transport, and agricultural producer surplus (using methodologies acceptable to the World Bank) resulting from road upgradation and improved level of service.

m. These analyses will be based on vehicle operating cost savings attributable to existing traffic movements. The work will entail traffic surveys and traffic forecast based on seasonality factors and calculation of the current number of closure days per year.

n. Include consultation with local communities affected by the project, possibly through community meetings, local leaders, and non-government and other community organizations. Mitigate adverse social impacts to the extent possible through the project design with costs incorporated in the economic evaluation. Identify positive benefits to, for example, human resource development. If resettlement is required, advise the Government on the requirements for a resettlement plan and assist with defining the basis for the plan.

o. Throughout the study, involve the local communities and residents within the areas of influence of the proposed roads in a program of consultations and community involvement. This will require liaison with local community leaders, local NGOs and local officials, as well as interviews and dialogue with the local populations particularly disadvantaged and vulnerable groups in the affected areas.

p. The objectives of the community involvement activities should be to maximize the potential benefits, minimize the adverse impacts, and to gain the acceptance, commitment and participation of the individuals and groups affected by the road. The voluntary participation of local communities is also desirable as a means to increase their commitment with future maintenance requirements.

q. Mitigate adverse impacts to the extent possible through the project design (inclusive of such measures as supporting DOR's Geo Environmental and Social Unit), with costs incorporated in the economic evaluation. In addition to negative impacts (such as blasting construction techniques) assessments, explore the opportunities to support environmental enhancement measures, such as forest and other natural resource conversation along the road corridor.

r. Following the completion of the feasibility study, cost estimates, and environmental studies and economic appraisals, the Consultant will develop and present their recommendations regarding the timing, phasing of the upgrading of the relevant sub-sections (i.e., phased investment plan), and implementation of the proposed project components for each sub-section. Specifically, this will include recommendations regarding the most appropriate contracting procedures and packaging of the project components. The Consultant will also develop, in conjunction with Department, the necessary organizational requirements both within the Department and also regarding the contractors and supervision consultants.

s. Prepare a Project Appraisal Document at the end of study period, which will bring together all the main findings in respect of the various components in such a form as to assist with possible project appraisal by the World Bank. The document would include details of each project sub-component, economic and financial costing, estimated benefits, and overall economic and technical justification as well as project implementation schedule and implementation arrangements.

t. The Consultant will identify the priority section along the corridor that will be recommended for Part III of the consulting services package.

B.3 Part III – Detailed Design of Upgradation Works for the priority road sub-section on Gorusinghe - Gaddachauki section of East-West Highway and associated Bridges

16. This part of the study will proceed only if the project is found technically and economically viable based on the outcome of Part II of the study. This part is to be applied to the section that was identified as priority section in the feasibility study conducted under Part II.

B.3.1 Objectives of the Activity

17. The main objectives of the consulting services under Part III are to:

a. carry out the detailed engineering design, with detailed survey, investigations and design of roads, bridges, intersections, animal crossing and level crossing for the upgradation of priority road sub-section/s on the Gorusinghe - Gaddachauki section of Mahendra Highway from existing two-lane to four-lane road standards.

b. The Detailed Project Report (DPR) would inter-alia include detailed highway design, design of pavement, design of cross drainage structures and bridges, design of Junction Improvement

structures, design of service roads, design of wildlife crossing structures, measures for maintenance and /or rehabilitation and/or replacement of existing bridges etc. incorporating road safety features and relevant environmental and social measures based on World Bank ESF, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social study, social and environmental action plans as appropriate and prepare the necessary Standards, Specifications, Cost Estimates, Bill of Quantities, Contract packaging and preparation of Bid documents for international/ local competitive bidding.

c. Ensure detailed project preparation incorporating aspects of value engineering, quality audit and road safety audit requirement in design and implementation.

d. Conduct detail condition assessment of the existing bridges and design of measures for remedial maintenance and rehabilitation measures, and improvement measures for pedestrian safety at existing bridges in urban areas e.g., providing pedestrian footpath to existing bridge having no footpath.

e. Conduct alternative analysis of the alignments, design, construction techniques, etc. analyzing a) environmental and social b) climate resiliency and longevity c) constructability d) safety e) cost and f) other relevant risks and impacts for each alternative. The analysis would have to be done in close collaboration and in consultation with the separate consultant (*ESIA Consultant*) engaged to undertake the social and environmental assessments and planning in accordance with the World Bank ESF.

f. Integrate relevant recommended environmental and social measures and recommendations of road safety assessment and audit analysis e.g., wildlife passes, safety features, etc. into the detailed engineering designs and bid documents. The Consultant shall also integrate recommendations of the human capital assessment and analysis into the detailed engineering designs and bid documents.

g. Maintain closest uniformity in data management with the HMIS.

B.3.2 Scope of the Activity

18. The consultancy services will include but not necessarily be limited to the following:

a. The Consultant shall refer to the Feasibility Study (prepared under Part II) for the Upgradation of the road for investigation and recommendations for the alignments including bridges and other road related structures in terms of socio-economic factors of the influence area, traffic, topography, geology, climate resilience, environmental and social aspects, soil and other related factors along the alignment with maps, sketches wherever necessary for the detailed engineering survey, investigations and design.

b. The Consultant shall thoroughly inspect the existing road sections including bridges and structures, including geometric features, and type and condition of drainage structures, River Training Works/Protection works and other major features and shall prepare a report about their condition including all the parameters in the *Standard Condition Assessment Format*. The condition and structural assessment survey shall be carried out under close supervision of senior experts of the Consultant.

c. The Consultant shall carry out engineering surveys and investigations, including topographic surveys, as required to prepare detailed engineering designs, drawings as appropriate to prepare bills of quantities within reasonable accuracy.

d. The Consultant shall take into consideration the necessary environmental and social studies with due consultations with relevant stakeholders and with separate *ESIA Consultant*, during

the design processes, and identify sensitive areas and features such as climate vulnerability, wildlife corridors, cultural heritages, natural habitats and/or critical habitats etc. as well as screen for potential direct, indirect and induced impacts, and define required mitigation measures as part of the design including cost.

e. The Consultant will coordinate, interact and share information on design and assessment on environment and social aspects with the *ESIA Consultant*. Integration of environmental and social findings and recommendations from the *ESIA Consultant* in the technical design, cost estimate and bid documents is very important. For better coordination the Consultant, besides regular meetings and sharing of data / information, shall be needed to organize workshops, consultation/ dialogues with stakeholders, joint working sessions with *ESIA Consultant* team.

f. The Consultant shall prepare detail design and drawings for the road pavement sections, retaining structures, slope protection measures, drains, cross drainages structures, bridges and intersections, flyovers, noise barrier walls, and all other items necessary for construction of a safe, efficient, resilient and inclusive road; applying sound engineering practices and integrating environmental and social measures in accordance with the ESIA/ESMP prepared separately and the World Bank ESF 2017 and Government's related regulations and policies.

g. The Consultant shall identify sources, quarry sites and borrow areas, undertake field and laboratory testing of the materials to determine their suitability for various components of the work and establish quality and quantity of various construction materials and recommend their use based on techno-economic principles. The Consultant shall prepare mass haul diagram for haulage purposes giving quarry charts indicating the location of suggested/selected borrow areas, quarries and the respective estimated quantities.

h. The Consultant shall collect details of important physical features along the alignment affecting the proposed project activities and should normally include buildings and structures, monuments, burial grounds, cremation grounds, places of worship, railway lines (existing/planned), stream/ river/ canal, water mains, sewers, crossings, trees, plantations, utility services such as electric and telephone lines and poles, existing/planned optical fiber cables (OFC) etc. within the designated right-of-way of the road.

i. The Consultant shall conduct hydrographic survey, utility survey, identification of Underground Structures and Other Obstacles Structure. Preconstruction Survey shall be carried out throughout proposed/agreed alignment.

j. The Consultant shall conduct road safety audit and carry out assessment analysis and incorporate the findings and recommendations into the detailed designs. The Consultant is required to follow the state of art/ technology in managing/improving the road safety in design for road and bridges including other interventions. The Consultant shall also make assessment and make sufficient provisions for managing road safety aspects and traffic management during construction including work-zone safety protocols, that to be included in the bidding documents.

k. The Consultant shall adopt practical and cost-effective geometric (horizontal, vertical, intersection etc.) designs and pavement structural designs based on projected traffic levels, pavement structure studies, axle-load considerations, considering previous studies, traffic safety, environmental and social impact assessment, biodiversity management plan including relevant input and information.

l. The Consultant shall prepare designs and drawings for major intersections and junctions with safety features based on international best practice.

m. The Consultant shall prepare drone survey video of current status of road section and bridges including other structures throughout the road so that it could be compared to the status after project implementation.

n. The Consultant shall prepare a short animated video of road, bridges and intersections presenting the details of designs, features, concepts, traffic flow etc. with voice over and music

appropriately. The Consultant shall prepare design visualization, still images and videos of proposed roadway and bridges.

o. The Consultant shall determine the most cost-effective improvement option for the proposed road section. The Consultant shall prepare a Pavement Preservation Schedule and Instruction Manual adopting the latest technology in pavement management with forecast future maintenance needs that presents the most cost-effective overlay, crack sealing, and other treatments at the right times, in order to extend the life of the pavement for as long as possible in a cost-effective manner.

p. The Consultant shall study the hydrological regime in detail, based on the catchment area, a vulnerability assessment and analysis of rainfall and flood records and future projections, supplemented by engineering field investigations, to establish the adequacy of road embankment levels, culverts, and side ditches, and design bed and slope protection for the drainage structures and bridges.

q. The Consultant shall assess possible use of water from roads for productive use in safe manner plus recharge and the design shall include provisioning of necessary crossing structures like culverts in consultation with local people, especially where roads pass through existing/ potential agriculture areas.

r. The Consultant shall assess cross-drainage structure requirements and propose new additional structures (bridges, culverts, and causeways as appropriate) or improvements/replacement to structurally unsound structures, if any.

s. The Consultant shall conduct detailed geotechnical field investigations, materials laboratory analyses, and prepare geotechnical design recommendations with bore logs as necessary to facilitate the resilient design of bridges and other structures.

t. The Consultant shall prepare record of inventory of geologically sensitive areas like slip prone areas, areas subject to landslides, rock fall, erosion, activity etc.

u. The Consultant shall prepare detailed plan for slope stabilization of existing as well as potential landslide areas, with detailed engineering for proposed civil engineering structures and bio-engineering measures, prepare costs estimates and include them in bills of quantities.

v. The Consultant shall prepare and document standard and technical specifications for each work item, taking into account of relevant specifications and best practices in use in the country and internationally for similar works and relevant environmental and social measures based on the ESIA/ESMP and related plans.

w. The Consultant shall prepare detailed engineering designs of road, pavement, bridges and other structures, and bills of quantities, and evaluate engineering, environmental and social management costs estimates for civil works with details of foreign and local components input.

x. The Consultant shall integrate, as appropriate, environmental and social measures to avoid/ minimize/ mitigate and offset adverse impacts into the detailed plans and designs and fully evaluate for cost for mitigation measures/interventions and include in Bill of Quantities and Bidding Documents etc.

y. The Consultant shall prepare appropriate number of contract packages taking into account of the location of the project roads and findings of capacity assessment of the local construction industry.

z. The Consultant shall prepare and document a practical and resource-based project schedule taking into account the implementation of works in each contract package with detailed analysis and graphical representation showing critical construction activities and floats using CPM/PERT which shall justify the project duration of each contract package. The schedules shall accommodate seasonal climatic effects at the work sites and take into account typical outputs based on similar earlier road projects.

aa. Once the generic bid documents are discussed, agreed and finalized, the Consultant shall prepare and submit the bidding documents for each contract packages in soft copy (original version) and hard copy (5 sets).

bb. The Consultant shall conduct capacity development activities through regular interaction activities with the client team for the purpose of discussions and knowledge transfer on latest technologies, applied procedure, methods etc. on road/ bridge/other related structures' design & construction and current international practice on contract administration, contract management, disputes and its resolution.

cc. The Consultant shall develop Project Quality Management Plan for the Client's application during the Contract Management.

dd. The Consultant shall comply with the applicable Occupational Community Health and Safety (OCHS) Policies and Guidelines [available] or shall refer to suitable best practices and include the applicable provisions in the bidding documents. Furthermore, the Consultant shall ensure that any sub-service providers appointed by the Consultant also adheres to the applicable OCHS Policies and Guidelines.

B.3.3 Detailed Survey, Investigations, and Design of Upgradation Road and Bridge Works on the priority sub-section

a. Detailed Design of the Priority Road Sub-Section

19. Detailed Survey, Investigations, and Design of Road shall be based on the recommendations of the Feasibility report and the best alternative as agreed with DOR. The road design should accommodate the future generated traffic volume of at least 20 years considering it as a major highway in Nepal that joins East to West and trade routes linking Indian borders at South and China towards North. The required measures to address the concerns of environmental, social and road safety are to be incorporated in design.

20. The Consultant shall prepare the Detailed Engineering Design for execution of the upgradation of road works which shall include upgradation of road geometry, side drains, drainage structures, retaining and protection structures, slope stabilization and bioengineering works, road pavement works and miscellaneous ancillary works, such as toll facilities, rest areas, fueling station, pedestrian overpasses/underpasses, road safety features, special structures such as underpasses/overpasses to facilitate wildlife movement, and other relevant design measures for a wildlife friendly road (informed by ESIA), etc.

21. Design should refer the Nepal Road Standard 2070 (2013), Pavement Guidelines, Bridge Design Standard and other relevant standards of Department of Roads, International Standards and Practices and engineering analysis and judgement.

22. All the design works shall be substantiated by design calculations and verified by international best practices especially for design of pavement thickness, retaining walls, cross drains, size and type of drains, capping layers for wet area and poor sub-grade strata.

23. As regards road safety, the Consultant should:

a. Review present practices followed in the highways on road safety issue and recommend site specific upgradations, where necessary. The consultant shall also review *Manual for Safety at Cross Drainage Structure*, being prepared by Department and support for its finalization.

b. Identify road location stretches requiring Upgradation works for road safety and prepare appropriate and cost-effective designs.

c. Identify the requirement of safety measures along the bridges prepare the appropriate cost-effective designs

d. Incorporate road safety measures in the design based on international Research outcomes and Road safety audit or assessment Report. Incorporate the international best practices on road safety treatments with a particular focus on safety treatments for (a) head on crashes, (b) run off the road crashes, considering both the daytime and night traffic.

e. Identify the requirement of safety Crash Barriers along the vulnerable sections and other safety measures as necessary including cats eyes and reflective paints at permanent structures.

f. Identify the stretches, places and prepare appropriate plans for conducting awareness program for drivers, public, and children on road safety (taking into account stakeholder feedback through the consultation process).

g. Design suitable traffic safety features and road furniture including traffic signals, signs, markings, overhead sign boards, crash barriers, delineators etc. The locations of these features shall be identified and detailed in the reports and also shown in the drawings, according to international standards including amendment in DoR standards for road signs, if necessary.

h. Identify the requirement of safety measures along the bridges and proper recommendation for the design and Upgradation in existing bridges.

i. Evaluate construction-related traffic management and road safety issues, and propose a plan to address road safety concerns during the construction/upgrading phase of recommended upgradation works for road segments and bridges.

j. Prepare a detailed prioritized activity plan for each road section to address the road safety issues identified/ encountered during the safety audit, which may include structural/design recommendations, awareness raising and educational campaigns, emergency response plans and measures, institutional aspects / institutional strengthening measures to conduct monitoring and enforcement, provide emergency response in case of accidents, etc. (taking into account stakeholder feedback as appropriate through the consultation process).

k. Prepare a plan for effective post-crash response mechanism development considering both humanitarian and physical aspects.

24. Design shall consider the intersections at major junctions at areas like Gaddachauki, Ameliya, Lamahi, Bhaluwang, Chanauta, Gorusinghe and other locations as necessary to maintain a Level of Service (LOS) B at the design speed of 100 kmph, referring to relevant International Standards and Practices.

25. Design shall consider the provision of controlled access lanes at market areas and multiple lanes shall be separated by standard median throughout with greenery plans. Designs should consider the physical treatments for speed reductions in the urban areas of the corridor.

26. Design shall consider the provision of separated footpaths, railings and pedestrian crossings (taking into account stakeholder feedback through the road safety consultation process) at market areas considering the concept of "universal access" and equality to all road users.

27. Design should consider providing holding lanes, entry lanes and exit lanes at suitable locations as per the suggestions of the stakeholders' consultation during ESIA study and recommendation of feasibility study referring to the relevant International Standards and Practices

28. The road alignment should be properly designed harmonizing to the highway standards accordingly.

29. The Consultant shall design suitable Bus bays/stops, Toll stations, Truck lay byes, weighing stations, parking areas, rest areas, pedestrian crossings, wildlife crossings, noise barrier walls, and other

ancillary items and prepare suitable separate designs. Rigid Pavement or any other appropriate pavement should be considered at the bus-bays/ parking lots. The bus stops/stations shall be spacious, with shades, chairs, friendly to differently abled people, accommodating several components like Digital Information boards, Digital maps and information, Restrooms (gender friendly), cabin for Security personnel etc.

30. All the design works must follow the requirement and standard acceptable to DoR and should be based on current proven and accepted national and international practices.

31. The Consultant shall use the data collected during the hydrological survey and determine the type of the cross-drainage structure and its capacity, roadside drainage and subsurface drainage. Existing drainage structures should be used wherever possible.

32. The Consultant shall prepare the design drawings with sufficient detail for bidding purpose and also for execution of the construction works in appropriate size, scale and format acceptable to DoR.

33. Prepare appropriate and cost-effective designs, cost estimates, specifications.

34. Before finalizing the design drawings, the Consultant's team needs to agree the quality assurance procedures for finalizing design drawings with the DoR and the DoR forms a Departmental Team to finalize the design drawings with proper verification in the field by checking the alignment and verify the survey details and the design drawings with proper verification in the field by checking the alignment.

35. Final design and drawings shall be prepared and submitted only after field verification and approval from DoR. The final design and drawings as well as other documents incorporate site-specific environmental mitigation measures.

36. The Consultant shall furnish the important documents, reports, drawings and other necessary information in the DoR acceptable format in soft copies compatible with DoR's Management Information System. At a minimum, all deliverables shall be furnished in both the original document format (for example, MS Word, Excel, AutoCAD, etc.), PDF format, and hard copies.

b. Detailed Design of the Bridges

37. In the same manner as for the road sections, the detailed design of bridges will also require close collaboration with the separately contracted Environmental and Social Assessment Consultant.

38. The location of new bridges shall be chosen so as to eliminate the need to close the Mahendra Highway for any length of time, harmonize with the highway geometric standards, and ensuring the safety of the existing bridge.

39. The design of bridges should be carried out to enhance the capacity of bridges and other cross drainage structures to match the upgradation works to enhance the road capacity, resilience and road safety, with consideration for additional widening, if cost effective.

40. The existing **222 bridges** have varying carriageway widths of 5.8 m, 6.2, 6.8 m, 7 m, 7.5m, 8 m etc. The table in **Annex 1** lists the various features of bridges on this section.

41. All bridges along the road section will be considered for new construction works. The design of the new bridges must be compatible with the proposed design relative to the upgradation works of the adjacent road section considering the geometry, geotechnical, road safety and road congestion studies. The Consultant should propose innovative ideas considering national context and the latest technology.

42. The design should be climate-resilient, safe, reliable, wildlife-friendly, and cost effective with maximum use of appropriate technology minimizing any environmental and social risks and impacts associated with new bridge construction and/or bridge dismantling. The type, feature and

condition of existing bridges should be given due consideration while designing any alternatives. The design shall, at a minimum, consider the following factors:

- Suitably matching to the upgraded road alignment.
- Type, size, lane width and span of the proposed bridge.
- Present condition of each component and general features of the existing bridge.
- Load carrying capacity of the existing bridges.
- Theoretical structural analysis of the existing bridges and its make.
- Topography, locations, environmental sensitive areas such as wildlife corridors and surrounding land uses at bridge site.
- Nature and structure of the soil underneath
- Other structures in proximity to each bridge
- Aesthetics of the surrounding area
- Availability of space for traffic diversion for traffic management during construction
- Road safety measures to be introduced after provision of proposed bridge
- Climate resilience and robustness
- Constructability
- Time to construct
- Use of Precast superstructure construction technology
- River training and other protection works required
- Social and environmental issues and mitigation measures as identified in the ESIA/ ESMP and related plans such as the biodiversity management plan
- Road users and pedestrians' expectations
- Other information as needed

43. Alternative design options should be presented, discussed, and the best option to be finalized based on the consultation and discussion with the DoR. The final report should document the process of identification and assessment/ranking of all alternatives considered related to bridges and justifying the proposed best alternative.

B.3.4 Additional Specification: Design Characteristics and Expected Surveys

a. **Climate Resilient and Inclusive Design**

44. Given extreme climate and weather uncertainties in Nepal, the Consultant shall consider climate and weather resilience in all aspects of the detailed design, and especially in bridge and drainage design. At a minimum, consider: i) innovative bio-engineering and nature-based solutions where possible, i) scour protection at all substructure units and streambanks adjacent to abutments beyond that which is normally required by standard, iii) river training works, iv) additional freeboard to account for hydrologic and design flow uncertainty due to catchment area conditions and climate change, v) design bridges, culverts, and approaches to withstand overtopping, vi) ensuring that all drainage structures are designed to be self-cleaning to the extent possible, and vii) oversizing large culverts to provide an additional factor of safety. The Consultant is required to add these or similar recommendations in the report accordingly.

45. Inclusive design (also called universal design) makes places usable by everyone, regardless of age, ability and circumstance. It is based on the simple principle that designing for the widest range of people creates better designs and benefits everyone. The road and bridge detailed design should ensure that the proposed infrastructure is more inclusive and amenable, particularly to pedestrians and cyclists.

b. Design of Road

46. Design of Road shall include the following:

a. Design of the vertical and horizontal alignment for a design speeds appropriate as per NRS 2070 and subsequent revision if any.

b. Design of highway cross-section. Drawings shall include proposed vs. existing cross sections every 20m.

c. Based on the data collected from reconnaissance and topographic surveys, the sections with geometric deficiencies, if any, should be identified and suitable measures for improvement should be suggested for implementation.

d. The data on accident statistics should be compiled and reported showing accident type and frequency so that black spots are identified along the project road section. The possible causes of accidents should be investigated into and suitable cost-effective remedial measures suggested for implementation.

e. Inclusion of 2 x additional ducts at signalized intersection crossings to allow for the installation of services such as fiber optical telecommunication lines in the future.

f. Design of cut and fill slopes.

g. Structural design of retaining structures (Gabion, Masonry, Plum concrete, etc.).

h. Structural design of all RCC structures (including of bridges, grade separated interchanges and underpasses).

i. Slope protection, bio-engineering and green road.

j. Service lanes along settlement areas and bus bays.

k. Identification and design of road crossings for pedestrians and Vehicles from one side of road to another side.

l. Identification and design of wildlife passes/crossings.

m. Identification of roadside service area and its design like bus lay by, weighing stations etc.

n. Production of design drawings (A0 size or appropriate) showing plan in 1:1000 scale, Longitudinal profile in 1000H to 200 or 100V scale, cross-sections at 20 m interval in 1:200 or 1:100 scale

47. Road alignment designed on Digital Terrain Model (DTM) shall be set out at the site with staking the central line and taking levels with verification of design. The Consultant may use internationally recognized software for the road and bridge design. However, availing the software for the design purpose and any errors arising thereof during construction shall be the responsibility of the Consultant. All the coordinates in the drawings shall be in reference to the coordinate value acquired from Department of Survey.

c. Design of Pavement

48. While designing the pavements, the Consultant shall:

a. Maximize the use of existing pavement layers (scrapping only in case of strength deficiency)

b. Design axle load as per NRS 2070.

c. Design shall consider the AADT data which needs to be collected by the Consultant at the particular junction/road sections, direct traffic counting at critical junctions.

d. Design of pavement on the bridges and approach roads.

49. The pavement design task shall also cover working out the maintenance and strengthening requirements and periodicity and timing of such treatments.

d. Design of Drainage Structures

50. While designing the drainage structures, the Consultant shall use the data collected during the hydrological survey and road safety audit and determine the following:

a. Type of surface and sub-surface drain;

b. Type of the cross-drainage structure;

c. Structural design of slab and box culverts;

d. Size and location of road-side drainage and cross drainage structures (appropriate side drains and cross drainages such as pipe culverts);

e. Design of the water conduit/rainwater inlets/manholes to take storm water safely to the nearby natural stream;

f. Maximize the use of the existing structures.

e. Design of Bridges

51. Based on the collected information and results of the discussions mentioned above, the Consultant shall design the bridges following the standard codes of practice, norms and guidelines acceptable to the DoR. In addition, the designer shall take into considerations of general aesthetics and architectural perspectives of the bridges to be designed. In respect of span arrangement and type of bridge at least three different alternatives (functionally and structurally) with cost benefit analysis considering environmental and social aspects shall be submitted to the client with recommendation of best alternate for each and every bridge.

52. The Consultant shall conduct a thorough condition survey of existing Bridges and estimate the remaining life of the bridges. The Consultant shall assess the need for strengthening/rehabilitation of existing bridges or for bridge replacement/new construction. Then, the Consultant shall study the possibility of construction of the following alternatives:

a. Singular 4-lane bridge
b. Singular two-lane bridge on either side of the existing bridge
c. Two separate singular two-lane bridges

53. Each option above to be presented with detailed cost benefit analysis and a report to Client for approval.

54. In case of major Bridges with length more than 300m, the Consultant shall design long span landmark bridge (suspension, cable stayed, network arch bridge etc.) or shall design Signature Bridge as appropriate in consultation with client.

55. The Consultant shall prepare General Arrangement Drawing (GAD) and Alignment Plan showing the salient features of the bridges and structures proposed to be constructed/ reconstructed along the road sections covered under the Study. The width of bridges shall be double lane or 4 lanes (depending upon the width of the road) with footpath. The Consultant shall also carry out the design and make suitable recommendations for protection works for Bridges as well as river training works. The design of bridge shall also include design of approach road with proper geometric design to connect with existing road alignment including road safety provision.

56. Utilize hydraulic modeling software (e.g., HEC-RAS, various 2D modeling solutions) to inform design and to analyze scour potential at and near bridge substructure units (for example abutments, piers, and bents) given climate risks and include climate resilient scour mitigation measures in design. Develop a cohesive strategy for the movement or restriction of movement of water

underneath the roadway embankment, in accordance with DOR standards and international best practices, and incorporate into design.

57. The Consultant shall produce detailed quantity estimate of the bridge and its accessories. They shall collect information on sources of materials and their lead distances and prepare rate schedules and cost estimates based on the standard norms and prevailing district rates.

58. All activities related to field studies, design and documentation shall be done as per the latest guidelines, standard codes of practice (Nepal Bridge Standards) and norms. The Consultant shall work in close coordination with the Bridge Branch of Department of Roads in every step of design of bridges.

59. The design Consultant is required to liaise and cooperate in a proactive manner with the DoR Bridge Branch and Bridge Design Checking Expert (as available), supplying design information for checking in accordance with an agreed schedule. It is the design Consultant's responsibility to resolve all technical issues raised by the checking expert (as available) and DoR relating to the design in order to get the approval from DoR.

f. Topographical survey and mapping

60. The topographical survey shall collect adequate data to show the following details in the subsequent topographical map:

a. Topography survey with details such as: trees & forest, water bodies, wildlife habitat and movement corridors, sacred/ cultural & religious sites (including natural features with cultural values, e.g., trees, cliffs, etc.), existing infrastructures and other land features

b. Existing road details such as: formation width, paved area, access roads, bus bays, footpath, parking places, traffic signs, islands, signals and right of way (RoW) limits (Buildings, Taharas, shops etc.)

c. Details of existing cross-drainage structure details such as: length, width and heights of culverts, bridges, details about bridge spans, pier, abutment, railing and vertical clearances, existing access under the bridge, river training works and riverbank structure details

d. Existing power line (electricity transmission line) alignments and elevations (if buried) such as: high-tension poles, low-tension poles, transformers, sub stations, Streetlights poles, underground electrical supply (if any) etc.

e. Existing telecommunication alignments and elevations (if buried) such as: telephone lines, poles, cabinets, towers and underground lines (if any)

f. Existing water supply line details such as: supply mains, distribution lines, valves, valve chambers, underground water storage, fire hydrants, etc.

g. Existing sewer line details such as: trunk sewers, branches, manholes, location/position of septic tank and soak pit of the adjacent building on both sides of road within the RoW

h. Existing buildings and structures details such as: religious shrines, tangible cultural heritage, community building governmental building, and residential building, type of foundation and tentative depth of foundation of the building

i. Existing or potential flood prone zones/ spots, low laying areas and riverbank cutting areas

j. Survey and Production of a map of a minimum 100 m wide road corridor in 1:1000 scale and with 0.20m contour interval and clearly showing the centerline of existing roads and all features. The Consultant may consider and propose wider bandwidth or additional survey areas, if necessary, for design.

61. While conducting Survey works, the survey team should be accompanied by a highway engineer. The Consultant shall acquire the reference coordinate points from the Department of Surveys and referencing of all the survey works shall be made on these references. It should establish benchmarks at a distance of every 300m along the road and on both sides of the riverbanks in case of bridges.

62. While conducting the topographical survey for bridge design, the survey area should cover a minimum distance of 500m upstream, 200m downstream and 200m from the riverbanks on either side of the river at the proposed bridge site or more if necessary, for analysis and design. In case of the topographical survey of the bridge site, the topographic map should show the following:

a. Contours at 0.2 m intervals;
b. Flood lines on either side of the river in the entire area surveyed;
c. Both banks of the river;
d. River cross section at 25 m intervals, or less if required for modeling, analysis, and/or design; one cross section along the proposed bridge axis showing cross profile of 1m interval using suitable method;
e. Details of government and/or public establishments on the riverbanks, details of existing river training works (if any);
f. Traverse lines, benchmarks reference lines and/or points with respect to which the present topo map is prepared;
g. The angle and direction of skew, if the bridge is proposed to be aligned skew;
h. The foundation type and zone of influence of the existing foundation of the bridge or any other structures adjacent to the proposed bridge site;
i. Other information relevant to design, construction and/or maintenance of the bridge.

g. Hydrological survey

63. For determination of all design data the Consultant shall carry out a detailed hydrological survey and study of the river and bridge sites, which shall include the following:

a. Catchment area of the river up to bridge site;
b. Nature, size and quantities of debris carried by the river;
c. Intensity, duration and distribution of rain in the catchment;
d. Existing bridge or other hydraulic structures across the river in the vicinity of the proposed bridge site with their details as much as possible;
e. General slope of the river from the critical point (origin) of the river up to bridge site and general slope of the catchment in both sides of the river;
f. Cross sections covering 100m on either side. Beyond flood lines of the river at proposed bridge site, at about 500m. u/s and about 200m d/s, wherein HFL, LWL, LBL, area of the cross section, wetted perimeter and geological profile with silt factor of each strata (at proposed bridge site only) shall be indicated. (Horizontal and vertical scale of the cross section shall be the same.);
g. Bed slope of the river which must start from 100m up of the U/S cross section and end at 100 m. down of the d/s. cross section;
h. Maximum discharge calculated by established formulas with different return periods and the peak discharge observed over a period of 100 years;
i. Velocity and depth of flow at the time of survey;
j. Shifting of the river in the past at proposed bridge site and in its vicinity;
k. River-bed degradation or aggradation (covering 500 m upstream and 500 m downstream);
l. Use of river as migration corridor of wildlife and fisheries;

m. Other information required for river control, design, construction and maintenance of the bridge.

64. The hydrological survey shall collect secondary data, preferably from the governmental sources, to determine the following:

a. Unit hydrograph for the catchment of River for bridge construction

b. Size of the opening and location of cross drainage structure

c. Minimize modification to the natural drainage pattern

65. After the selection of the proposed bridge site with alternatives and preparation of topographic maps, the Consultant shall discuss the collected hydrological and other data and decide the following points with the client for final decision of the bridge site:

a. Design discharge

b. Scour depth, Maximum Scour depth

c. Linear waterway needed to be provided

d. Anticipated soil condition for foundation

e. The most feasible proposed bridge site

f. River- training & approach roads

g. Type of proposed foundation, substructure and superstructure

66. The Consultant shall also carry out a detailed hydrological survey and study along the road alignments and identify catchment, discharge in drain, cross drainage, seepage area etc.

h. Geotechnical Survey

67. For the pavement design, structures and buildings, the following geotechnical tests should be performed as per site requirement:

a. Determine the sub-soil condition through pitting (1m x 1m x1m) and Dynamic Cone Penetration (DCP) tests at 2 locations each 100m of the road alignment.

b. Determine the sub-soil condition through 2m deep pitting and DCP test at each 25 m interval where a retaining wall of height more than 3 m is required.

c. Determine the stability of the cut slopes using appropriate stability analysis or through study, field surveys and investigation of materials at site.

d. Conduct other tests as required by the geological, geotechnical survey and study.

e. Benkelman Beam test for existing pavement evaluation including visual assessment for surface distress.

68. For the design of the bridges, the Consultant should conduct sub surface exploration. The subsurface exploration shall include the following:

a. <u>Test pits and auguring</u>

Test pits and auger-holes in the riverbed to a depth as required by the site condition or scouring criteria of the river shall be made and the required samples shall be taken for lab testing.

b. <u>Bore-holes, field tests and laboratory tests</u>

The properties of the underlying soil are determined by field and laboratory tests of the soil samples obtained from the boreholes drilled to a depth as mentioned in the next paragraph. As far as possible, the locations of the boreholes shall be under each abutment and piers. Generally, the tests listed in Table 2 are conducted for determination of soil properties:

Table 2: Type of tests and sampling frequency

SN	Type of Tests	Sampling Frequency
1	Undisturbed Soil Sampling	at least 2 at each borehole
2	Standard Penetration Test	as required but the interval not less than 1.5 m
3	Grain size analysis	at least 2 at each borehole
4	Hydrometer analysis	at least 2 at each borehole
5	Moisture content	at least 2 at each borehole
6	Bulk and dry density	at least 2 at each borehole
7	Unconfined compression test	at least 2 at each borehole
8	Consolidation test	at least 2 at each borehole
9	Direct shear test	at least 2 at each borehole

c. Depth of soil exploration

The depth of soil exploration from ground level shall be as follows (Table 3):

Table 3: Tentative depths of soil exploration

SN	Type of soil	Governing depth
1	Silty, sandy, clayey soil	3 times the design scour depth, or 1.5 times the least dimension of the foundation footing, or 25 m, whichever is maximum
2	Granular soil (gravels, boulders	dimension of the foundation footing, or 20 m, whichever is maximum
3	Rocks (soft or hard)	Not exceeding 8 m and minimum 5 m

The above-mentioned depths are indicative. The Consultant shall decide the actual required depth of soil investigation according to the field condition and design parameters. If rock is found at the beginning or at mid-depth, then the drilling works shall not exceed the depth as mentioned in the table above.

d. Changes in soil strata

During the boring, if there is any change of soil strata, the number of sampling of soils for different tests will be increased and the Consultant shall carry out the entire test required for each layer of soil. No additional payments will be made for such tests.

e. Soil exploration works to be certified

The client, if required, may ask the Consultant to submit the soil/rock samples obtained from the drilling works in core boxes and/or a bore-log certified by the concerned personnel at site. The Consultant shall take site photographs, video or other documentation as appropriate for all site investigation, surveys and studies.

i. Seismological Study

69. The Consultant shall collect and refer to the available data regarding the seismic records of the area. The Consultant shall conduct seismic vulnerability analysis of all structures and incorporate the findings in the design. While considering seismic forces on the bridge design, the Indian Standard

Criteria for Earthquake Resistant Design of Structures, IRC: 6 along with other international codes may be followed.

j. Material Availability Survey

70. The Consultant shall conduct the material availability survey and study. It shall determine the quality and quantity of the materials required for construction. The availability of the necessary material shall be surveyed to determine the following:

a. Suitable quarry site for boulder, sub-base/base/pavement aggregates, concrete aggregates, sand, fill materials

b. Material to be transported from elsewhere

c. Material to be imported from outside Nepal, their source and route of transport

d. Source of water for construction, location of boring if ground water to be used

71. The Consultant shall conduct study on the availability of construction materials like: sand, gravel boulders, timber, etc. with their engineering properties, quantities and lead up to the road works site and bridge site. Quarry site of materials with their available quantities should be shown on a sketch plan with reference to bridge /road construction site.:

k. Traffic Study and Analysis, Axle Load Survey

72. For the design purpose, the traffic study at the critical points and intersection shall be made. Conduct traffic counts in strategic locations (e.g., adjacent to major junctions) along the Section, validate these counts against DoR data and the limited count data presented in the feasibility study report, adjust the forecast analysis from the feasibility study as appropriate, and update feasibility study recommendations, as appropriate, during detail design. The Consultant shall make traffic demand estimates and establish possible traffic growth rates in respect of all categories of vehicles, taking into account the past trends, annual population and real per capita growth rate, elasticity of transport demand in relation to income, estimated annual production increase. socio-economic development plans and the land use patterns of the region having impact on the traffic growth, the projections of vehicle, manufacturing industry in the country, development plans for the other modes of transport, commodity movement behavior should also be taken into account while working out the traffic demand estimates, and other factors as appropriate. Consider peak hour volumes, peak hour factors, seasonal adjustment factors, passenger vehicle equivalent conversions, and other adjustments as appropriate to recommend widening scenarios.

73. Axle load surveys in both directions shall be carried out at suitable location(s) in the project road stretch on a random sample basis and deduce the result. While selecting the location(s) of axle load survey station(s), the locations of existing bridges with load restrictions, if any, should be taken into account and such sites should be avoided. The Consultant shall ascertain from local enquiries about the exceptional live loads that have used the highway in the past in order to assess the suitability of existing bridges to carry such loads.

74. Conduct turn movement volume counts at all major junctions and selected minor junctions with substantial traffic volume, as appropriate to inform design options and to incorporate into design. Junction survey information shall be collected and thoroughly analyzed prior to starting work on the preliminary and detailed design. This is necessary to adequately inform access control decisions, which need to be made prior to the start of detailed design in order to avoid rework and design schedule delays.

75. In-person surveys, community engagement, and coordination with E&S Consultant and others as appropriate to propose pedestrian crossing and other ancillary feature locations.

76. Based upon the above-mentioned studies and investigations, the Consultant shall make the best use of their technical know-how and professional skill to arrive at conclusion and recommend the

most cost-effective design parameters. The Consultant shall discuss with comparative study in detail all possible options and shall recommend the most appropriate option.

l. Condition Surveys for Bridges, Culverts and Structures

77. The Consultant shall thoroughly inspect the existing Bridges, Culverts and Structures and shall prepare a report about their condition including all the parameters in the approved format. The condition and structural assessment survey of the bridges /culverts /structures shall be carried out by senior experts of the Consultant for the bridges identified to be in a distressed condition based upon the visual condition survey, supplementary testing. Selection of tests may be made based on the specific requirement of the structure. The Consultant shall assess the maintenance intervention and the report shall include all necessary information regarding short, medium- and long-term works, work plan with the details regarding quantity, necessary specification, cost etc.

m. Inventory survey of Road and Roadside structures

78. The Consultant shall thoroughly survey existing alignment of Roads and prepare a detailed inventory report. The Consultant shall prepare detailed drawings of the existing alignments showing plan, profile, drainage, structures, cross-section, roadside barriers, and other details.

n. Design of Major Intersections

79. The Consultant shall conduct all traffic volume surveys, origin-destination surveys, and other surveys as necessary to inform the design of Major Intersections. The Consultant shall utilize one or more state of the art traffic modeling software packages (such as VISSIM, Synchro, SimTraffic, or others) to model the existing condition and proposed options using the traffic volumes and turn movements forecasted at different points in time. Prepare and present short traffic simulation videos depicting options for each junction to the DOR.

o. Road Safety Audit, Traffic Safety Features, Road Furniture and Road Markings

80. The Consultant shall conduct a complete road safety audit and analysis, and design suitable traffic safety features and road furniture including traffic signals, signs, markings, overhead sign boards, crash barriers, delineators etc. The locations of these features shall be given in the reports and also shown in the drawings. The road safety audit shall consider forecasted crash numbers and severities, the cumulative economic costs of crashes without mitigation, and the costs and benefits of mitigations measures.

81. DPR shall undergo the exercise of Road Safety Audit through the Road Safety Auditor (separate from design team) and recommendations mentioned be incorporated.

82. All roadside signs and other furniture placed or retained within the proposed roadway clear zone shall be crashworthy or protected by roadside barrier.

83. Ensure that all auxiliary lanes (including turn lanes, ramp acceleration / deceleration lanes, and others) have adequate deceleration/acceleration length, storage length, and taper length in the design year to mitigate the risks of rear end collisions and traffic delays.

84. Based on proposed site conditions, the Consultant shall conduct a thorough roadside barrier warranting process considering whether the hazard is within the clear zone, hazard severity, roadway geometrics, and an economic analysis.

85. The Consultant shall i) conduct a systematic and thorough safety analysis presenting existing deficiencies, ii) set road safety performance improvement goals for the designer to include during detailed design, iii) collect, analyze, forecast and consider vehicle crash/fatality history in developing the list of road safety mitigations.

p. Weighing Station, Parking Areas and Rest Areas

86. The Consultant shall select suitable sites for weighing stations, parking areas and rest areas and prepare suitable separate designs in this regard. The common facilities like petrol pump, first-aid medical facilities, police office, restaurant, vehicle parking etc. should be included in the general layout for planning.

87. The Consultant should take into consideration the provisions for persons with disabilities in way side amenity centers /rest areas and provide ramp facilities, exit /entrance door with minimum clear opening of 900 mm and special toilet facilities for use of handicapped persons.

q. Wildlife Survey

88. The Consultant with Wildlife Expert will conduct a wildlife study for the areas under Protected Area of East West Highway during the Design stage to determine the location, design and numbers of underpasses that will be required to be constructed. The study will involve suitable methods such as field surveys, transect survey, public & stakeholder consultations, camera trapping (making 2x2 km^2 grid), habitat mapping, GIS based analysis etc. to establish the biodiversity baseline conditions (locations and number of wildlife crossings, wildlife species crossing the road and their seasonal behavior, number of wildlife–vehicle collisions etc.). This will be done in close consultation with Banke National Park, Bardiya National Park, Suklaphata National Park and other local forestry officials and Forestry User Groups. The Consultant with Wildlife Expert shall coordinate with the Environmental Specialist and include his/her findings in the EMP and EIA Reports.

r. Economic Analysis

89. The Consultant will carry out the following tasks but are not limited to:

i. Review existing traffic data, conduct traffic counts and origin-destination and axle-load surveys, and forecast traffic for each candidate road sections for 20- and 30-year projections.

ii. Prepare an economic analysis of the proposed road improvements using the Highway Development and Management model (HDM, version 4). Calculate the Economic Internal Rate of Return (EIRR), individually and overall.

iii. Quantify all economic benefits, including those from reduced congestion, saving in time value travel distance, road maintenance cost savings and reduced incidence of road accidents

iv. Undertake sensitivity analysis on the risk factor basis for various scenarios such as changes to the cost, generated and diversion traffic, modal shift, construction period, etc.

v. For selected priority road sections with impact on the sub regional transport system, assess the economic impact and outcome/benefits – derived from or attributable to the improved sub regional transport system/network (especially between India and Nepal).

vi. Measurable effect on trade competitiveness through delivery costs, transit times, and supply reliability – identify relevant baseline indicators and predict achievable target outcomes.

vii. Estimated increase to regional traffic volume and trade volumes generated by the enhanced road network by improving project roads.

viii. Prepare and submit Economic Assessment Report, presenting the following:

(a) Introduction
(b) General Considerations
(c) Input Data for Vehicle Operating Cost Components and Other Components for Economic Analysis
(d) Economic Benefits (including those due to regional implications)
(e) Construction and Maintenance Alternatives and Cost Estimates
(f) Economic Analysis
(g) Sensitivity Analysis

(h) Conclusions – summarizing the economic assessment, approach & methodology, findings (EIRRs and sensitivity analysis), and overall economic viability.

Appendices:

A. Project road details (should be available from main report)
B. Traffic studies (base year traffic, traffic generation, traffic diversion assessments)
C. Economic growth trend and traffic forecast (including the basis)

ix. Develop a project impact monitoring framework and carry out baseline survey for all roads.

s. Utility shifting proposal and estimates

a. Identify type and location of all existing utilities within the proposed ROW

90. The Consultant will review information available with all utilities agencies in the region, consult maps/plans available with DOR, Nepal Electricity Authority and other necessary bodies, consult with locals and municipal bodies to ascertain the presence and location of utilities and future plan, including but not limited to water-mains, telephone, electricity and fiber-optic installations in and around the project road.

b. Plan for utilities in future road design

91. The Consultant is required to identify utilities that will require shifting to enable construction of the proposed project road.

92. The Consultant shall incorporate space required for elevated and under-ground utilities corridors and utilities crossings as required for existing and future utilities in consultation with user departments.

c. Develop a utilities relocation plan

93. The Consultant is required to develop and submit a utilities relocation plan in consultation with DOR and user departments clearly identifying current utilities and suggested relocations along with crossings as required.

94. The Consultant shall plan, and conduct discussions, consultations and joint site visits required for the planning of utilities shifting and the development of required drawings and proposals.

95. The Consultant shall prepare all necessary details including costing, documents and suggested relocation plan to be submitted to user department and agreed with the user department for facilitating the upgradation of the road.

t. **Procurement Assistance**

96. Procurement of works shall be carried out in accordance with WB's Procurement Procedure or as agreed with DoR. The Consultant shall prepare bidding documents, necessary standard/special specifications, contract packaging and any other appropriate assistance. Multiple civil works bid packages are anticipated.

u. **Capacity Development**

97. The consulting services shall include organizing in house, national training for capacity development of DoR personnel in different disciplines (Training should be conducted by each International key Expert on their respective topic).

98. The Consultant shall propose the capacity development component in their technical proposal and include the cost in their financial proposal. At a minimum, at least 6 capacity development workshops are required and up to 10 are possible if warranted.

v. Miscellaneous Studies/Investigations

99. If not covered by aforesaid, the Consultant shall perform other studies, explorations, tests surveys, calculations, etc. required to produce full and complete set of working drawings, specifications, bills of quantities, requirement of materials and complete cost estimates for the bridge/s including related works based upon which construction activities can be started to complete without further study and/or reference to them.

C. Team Composition and Qualification Requirements for Professional Staff/ Experts

100. Consultants are encouraged to form association with national Consultants.

Consultant shall have minimum five (5) years of experience. Consultant with past experience of conducting feasibility study for upgrading/improvement/new construction of 300km length of two-lane road (or equivalent), detailed design of road for upgrading/improvement/new construction of 60km length of four-lane road (or equivalent), detailed design of 15 no. of major bridges is encouraged to submit Expression of Interest. Estimated 57 person-months of professional experts with international experience, 180 person-months of other professional experts are estimated to carry out the assignment. However, the firm should assess their own estimates of professional input requirements. The qualification requirement for evaluation of key experts is set out in **Annex 2**. Tentative person-month detail required for assignment is provided under Table 4, however, the Consultant is free to assess and propose the required input to complete the scope of services.

Table 4: Staff Input

A. PROFESSIONAL EXPERTS WITH INTERNATIONAL EXPERIENCE

Position	Quantity	No. of Person-Months			Total Person Months	Remarks
		Design Review	Feasibility Study (FS)	Detailed Design		
Team Leader/ Sr. Highway Engineer	1	1.5	2.5	8	12	Key Expert
Sr. Bridge Design Engineer- 1	1	0.5	1.5	8	10	Key Expert
Sr. Bridge Design Engineer- 2	1		1	8	9	Key Expert
Sr. Geotechnical Engineer	1	1	1	4	6	Key Expert
Sr. Highway /Pavement Engineer	1	1	1	8	10	Key Expert
Sr. Road Safety Specialist	1	1	1	4	6	Key Expert
Sr. Transport Economist	1		2	2	4	Key Expert
Sub-Total	**7**	**5**	**10**	**42**	**57**	

B. OTHER PROFESSIONAL EXPERTS

Position	Quantity	No. of Person-Months			Total Person Months	Remarks
		Design Review	Feasibility Study	Detailed Design		
Deputy Team Leader/ Highway Engineer	1	1.5	2.5	8	12	Key Expert
Highway Engineer-1	1	1.5	2.5	8	12	
Highway Engineer-2	1	0.5	2.5	8	11	
Highway Engineer-3	1			8	8	
Bridge Design Engineer- 1	1	1.5	2.5	8	12	
Bridge Design Engineer- 2	1		3	8	11	
Bridge Design Engineer- 3	1			8	8	
Bridge Design Engineer- 4	1			8	8	
Bridge Design Engineer- 5	1			8	8	
Structural Engineer	1	1	1	4	6	Key Expert
Sr. Geologist	1		2	3	5	Key Expert
Geotechnical Engineer -1	1	1	2	8	11	
Geotechnical Engineer -2	1			8	8	
Material Engineer	1	1	2	4	7	Key Expert
Road Safety/Traffic Engineer	1	1	2	7	10	
Hydrologist-1	1	1	3	6	10	
Hydrologist-2	1			6	6	
Transport Economist	1		2	4	6	
Procurement Specialist	1			4	4	Key Expert
Environmental Specialist	1		1	3	4	
Social Development / Resettlement Specialist	1		1	3	4	Key Expert
Sr. Electrical Engineer	1		1	3	4	
Sr. Cadestral Surveyor	1			3	3	
Legal Expert	1			2	2	

Position	Quantity	No. of Person-Months			Total Person Months	Remarks
		Design Review	Feasibility Study	Detailed Design		
Sub-Total	**24**	10	30	140	180	

Note:

1. *The above professional staff composition and estimated total professional staff man-month is Client's estimate. The Consultant is advised to assess their own requirement and propose their own staff composition and staff input requirement for efficient performance of their job as per the Terms of Reference. If the proposed consultant's team is found inadequate or not sufficient during the performance of the services, then additional staff shall be provided by the Consultant at their own cost.*
2. *The Professional Staff composition and estimated total Professional Staff man month for detail design has been estimated for detail design of improvement of about 80km of priority section/s, detail design of construction of about 20 nos. of minor bridges and about 19 nos. of major bridges. The Professional Staff composition, total Professional Staff man month input and the reimbursable cost will be subject to adjustment depending upon the final scope for detail design as per provision of B.3.*
3. *A Technical Proposal shall be considered unsuitable and shall be rejected for further evaluation if it does not respond to important aspect of TOR.*

D. Reporting Requirement and Time Schedule

101. The consulting services shall be implemented over 15(fifteen) calendar months from the commencement date.

102. The Consultant shall submit the reports minimum 10 hard copies and soft copy in specified manner and as enumerated in Table-5: Reports and Submissions.

103. The Consultant shall initially submit 2 copies of documents/reports as draft in ring/spiral binding form. After approval from the client, the Consultant shall submit the remaining 10 copies of each report in book binding form. The Consultant shall sign and stamp on all the pages of Design documents, drawings, estimates, rate analysis, investigation report etc., before submitting to the client. All the reports shall also be submitted on electronic copy compatible with respective program on which they are prepared. All the alignments, including bridges, shall be tracked on GPS and shall be submitted on compatible format. The Consultant shall also produce separate-colored posters in appropriate paper size of each roads and bridge showing detailed plan, profile and other relevant information.

D.1.1 Reports and Submissions

Table-5: Reports and Submissions

No.	Preparatory Outputs	Submission Deadline (no. months after the commencement date)	Remarks
Part I – Technical Review of the Detailed Design of Butwal-Gorusinghe Section			

No.	Preparatory Outputs	Submission Deadline (no. months after the commencement date)	Remarks
i	Review Report with detailed technical feedback on the Butwal-Gorusinghe Detailed Design	1.5 month	Review of Design to be completed in parallel of the Feasibility Study below
Part II - Feasibility Study of the Gorusinghe-Gaddachauki Road Section			
i	Inception Report	1.0 month	Feasibility Study
ii	Condition Survey Report	2.0 month	
iii	Economic Analysis and Feasibility study report of all roads and bridges – **Draft Report** (identifying road sub-section to be prioritized for Detailed Design)	3.0 month	Draft report
iv	Economic Analysis and Feasibility study report of all roads and bridges – **Final Report** (identifying road sub-section to be prioritized for Detailed Design)	4.0 month	Final report
Part III - Detailed Design of the Selected Priority Road Sub-Section			
i	Inception Report	5.0 month	
ii	Submission of Concept Design Report with possible alternatives for road and bridges to initiate presentation/ discussions with the DOR team. The Concept Design should be based on the Field Survey Reports: Inventory, Condition Survey, Ground Survey Mapping, Traffic Volume Counts and Updated Recommendations, Hydrological, Geological and Soil Investigation Reports, Environmental data, Social data, Road Crash data, Road Safety audit. Also, the Concept Design should take into consideration the preliminary assessment report on environmental and social issues along the road and bridges (to be done by a separate consultant).	7.0 month	The Consultant may propose the timeline for submission of various design reports for road and bridges in different segments for road and bridges respectively
	Small-scale workshop to present, review, discuss the concept design and alternative selection, and finalize/ select the design concept for road alignment, pavement, geometric standards, structures, drains, cross drainage structures, junctions, road safety features, bridge design including the approach and the river training works, as necessary	7.0 month	To be completed as soon as possible to move forward for detail design. DoR may use individual experts to review the concept design

No.	Preparatory Outputs	Submission Deadline (no. months after the commencement date)	Remarks
iii	**Draft Detailed Design Report**: based on the selected concept and standards, prepare and submit Draft Detailed Design Reports for the selected road sub-section and bridges including the Design, Drawings, geological/ geotechnical, hydrological, construction material, rate analysis, cost estimate, draft bidding documents with specification. Also, the Detailed Design should take into consideration the assessment reports on environmental and social issues along the road and bridges (to be done by a separate consultant).	11.0 month	
	Small-scale workshop to present, review, discuss the detailed design	11.0 month	
iv	**Final Detailed Design Report**: Based on the review, feedback and comments provided on the Draft, finalize and submit the Final Detailed Design Report for the selected road sub-section and bridges including detailed design, the drawings, geological/ geotechnical, hydrological, road safety audit, construction material, rate analysis, cost estimate, bidding documents with specification and EMP. The final report shall also include the animated video showing the existing road/ bridges improved with the proposed design. Including the updated drone information, they need to update based on final design.	12.0 month	
v	Monthly Progress Report	Expected within one week of the end of each calendar month	

D.1.2 Additional Details on Expected Outputs

a. Inception Report

104. Complete report detailing the Consultant's intended means, methods, design standards, reference documents to be used, and assumptions for design. The report should effectively demonstrate that the Consultant possesses a firm grasp on the required scope of work.

105. Thoroughly review the feasibility study / planning reports prepared by a separate consultant and provide a summary of the reasonableness of these studies and their recommendations. Prepare a detailed plan for how these recommendations will be designed and implemented, to include color coded location maps, a summary of each improvement, and a narrative plan for how design will be carried out for each improvement.

106. Prepare a quality assurance / quality control (QA/QC) plan for the necessary, investigation and design review process. Ensure that all major project deliverables conform to accepted design practices

and comply with national and international design standards and best practices as appropriate. The QA/QC Plan shall contain procedures that will be used to ensure that a quality product is provided for each design component and deliverable and shall list what documentation will be submitted to verify that the procedures have been followed. Include sample checklists, or similar documentation, that will be used to indicate that an internal quality review has been performed.

107. Prepare a survey plan that summarizes the methodologies and instrumentation proposed to provide the survey mapping accuracies required for effective design and construction. It is incumbent upon the Consultant to ensure that the survey plan and survey will result in sufficient mapping to complete all design and environmental permitting activities associated with this project.

108. Prepare a field investigation plan. This shall include pavement condition surveys proposed, drilling and sampling of existing pavement, proposed geotechnical drilling and soil sample location maps, and a narrative summary.

109. Prepare a complete schedule (Gannt or bar chart) of the survey, investigation and designer's activities to complete all items required in this scope, clearly depicting the critical path(s) and the float for each activity. Provide a narrative detailing any foreseen schedule risks and the designer plan for mitigating any future schedule issues.

110. Prepare for the construction cost estimate.

b. Concept Design Submission

111. Prepare conceptual level drawings and reports depicting preliminary items of work and impacts that include:

a. High-level location maps that include plan view schematic locations of the work.

b. Roadway drawings that include typical sections, plan and profile sheets (where the alignment is changing) or straight-line schematic sketches with chainage (where the alignment is not changing), critical cross sections, locations of existing and proposed key features such as bridges, flyovers, pedestrian crossings, wildlife crossings, bus lay-bys, buildings, retaining walls, noise walls, median crossing locations, roadside barrier, and other ancillary features, locations of existing and proposed culverts and drainage structures, horizontal and vertical locations of all existing utilities, and mapping and topography, represented on plan and profile sheets.

c. Plans and cross sections for all major and unique junctions.

d. Typical plans, typical cross sections, and locations for all minor junctions.

e. Conceptual-level type, size, and location drawings for each proposed bridge, flyover, wildlife crossings, pedestrian crossing, and other structures.

f. Complete detailed benefit cost analysis and life cycle cost analysis for each bridge, considering different bridge types, alignments, widths, and other design features.

g. Preliminary land acquisition plans if required for the work, depicting the proposed limits of work, the existing and proposed right of way, proposed full and partial, land acquisition takes, and summary table of proposed takes for each impacted parcel.

h. Include detailed geotechnical report providing boring logs, materials lab analyses results, geotechnical analyses, and design recommendations. Recommendations are to be incorporated into concept and final design.

i. Prepare concept design report, including information on the proposed design standard and with the design work completed at this stage.

j. Provide information necessary for designer and stakeholders to make key decisions prior to starting work on detailed design. Key decisions requiring DoR approval prior to proceeding with detailed design may include but are not limited to: i) locations of flyover ramps, pedestrian

crossings, wildlife crossings, bus lay-bys, etc., ii) junction types, turning lanes, and conceptual plan drawings, iii) bridge construction schematics (i.e. concentric vs. eccentric, iv) bridge types selected for each bridge, v) whether to design structures and the roadway to accommodate cost-effective future widening, and vi) other items as appropriate.

k. The designer shall prepare concise and informative summaries informing each decision using decision matrices summarizing the key benefits, risks, and costs for each option, the designer's recommended option, and a narrative summarizing the reasons for the designer's recommendation.

D.2 Consultants Facilities, Client's Input and Counterpart Personnel

112. The Consultant shall be fully responsible to mobilize the necessary professional (key and non-key) expert and also should arrange all the administrative, technical and support staff needed to carry out the services. The inputs provided in part 4 of this ToR are the minimum inputs required and the Consultant is required to assess the works requirement and may add additional inputs (Engineers, Technical Support, Administrative Support, specialists etc.), as required and should propose the additional inputs in their technical proposal and financial proposal. The Consultant shall also be responsible for providing all other necessary facilities and logistical support for its staff including accommodation, transportation, office equipment, communications, utilities, office supplies and other miscellaneous requirements that are required to complete all the tasks to fulfill the objective and scope of woks, and it shall be included in their financial proposal.

113. The Consultant shall arrange the necessary air transportation, land transportation including necessary vehicles for all type of surveys to deliver their services, effectively. The Consultant shall also arrange accommodation, travel and visas necessary for International staffs.

114. The Consultant shall establish an office space at Kathmandu (within 2 Km radius of DoR Office at Chakupat, Lalitpur for better coordination) and other sub offices as necessary to complete the job. The Consultant shall arrange necessary furniture, fittings, equipment and materials in order to provide fully functioning and usable facilities and to provide the Consultant's staff with the necessary resources for the administration, detail study and reporting of the works.

D.3 Data and Assistance to be Provided by the Client

115. The Client will provide all the available study reports and related information available with the Client. The Client will also help the Consultant team to coordinate with the DOR offices, Bridge Branch, and other governmental offices for related activities, as necessary. For the approved international staff, the Client may support the Consultant to process visa.

E. ANNEX-1: List of Existing Bridges

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
1	Kundra Khola	Kapilbastu	633.2	29	7	1	RCC T-Beam	Major	
2	Dry Nala	Kapilbastu	633.8	21.3	7	1	RCC T-Beam	Major	
3	Ghorai Nala khola	Kapilbastu	636.218	21.5	7	1	RCC T-Beam	Major	
4	Dry Nala	Kapilbastu	639.31	13.3	7	1	RCC T-Beam	Minor	
5	Belwagardwa nadi.	Kapilbastu	639.797	63.5	6.9	3	RCC T-Beam	Major	
6	Agiya Nala (Dumara nala)	Kapilbastu	641.125	7.6	6.15	1	RCC Slab	Minor	
7	Kusma Nala	Kapilbastu	641.685	7.4	6.1	1	RCC Slab	Minor	
8	Dry Nala	Kapilbastu	647.67	13.3	7	1	RCC T-Beam	Minor	
9	Bel nadi	Kapilbastu	648	64.7	7	3	RCC T-Beam	Major	
10	jawai Khola	Kapilbastu	648.775	16.6	7	1	RCC T-Beam	Major	
11	Dry Nala (Irrigation canal)	Kapilbastu	650.26	7.7	5.7	1	RCC Slab	Minor	
12	Dry Nala (Banatiya Nala)	Kapilbastu	651.13	7.15	5.65	1	RCC Slab	Minor	
13	Jangali Khola	Kapilbastu	667.715	8.6	8.6	1	RCC Slab	Minor	
14	Chor Khola	Kapilbastu	668.28	38.8	7.6	1	RCC T-Beam	Major	
15	Dry Nala (Thade khola)	Kapilbastu	668.61	7.5	9	1	RCC Slab	Minor	
16	Dry nala	Kapilbastu	669.38	7.1	9	1	RCC Slab	Minor	
17	Mama Khola	Kapilbastu	669.74	6.7	8.8	1	RCC Slab	Minor	
18	Kaila khola	Kapilbastu	670.14	7	7.5	1	RCC Slab	Minor	
19	Dry nala	Kapilbastu	670.61	6.8	8.8	1	RCC Slab	Minor	
20	Surai naka (Surai Khola)	Kapilbastu	670.84	84	7	3	RCC T-Beam	Major	
21	Nala no. 1	Kapilbastu	671.26	8.6	8.6	1	RCC Slab	Minor	
22	Tintre khola(Nala no.2)	Kapilbastu	671.6	10.6	8.5	1	RCC Slab	Minor	
23	Nala no.3	Kapilbastu	673	10.6	8.3	1	RCC Slab	Minor	
24	Dry Nala no. 4	Kapilbastu	673.6	10.7	8.9	1	RCC T-Beam	Minor	
25	Dhan Khola	Dang	675.9	26.5	7	1	RCC T-Beam	Major	
26	Kali Khola	Dang	677.8	8.7	9.4	1	RCC Slab	Minor	
27	Jharauni Khola -1	Dang	679.74	9.6	7.9	1	RCC Slab	Minor	
28	Jharauni Khola -2	Dang	679.865	8.8	7.8	1	RCC Slab	Minor	
29	Jharauni Khola -3	Dang	680.13	9	6.8	1	RCC Slab	Minor	

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
30	Dry Nala	Dang	681	9.9	7.4	1	RCC Slab	Minor	
31	Dry Nala	Dang	681.15	15.5	W-7	1	RCC T-Beam	Major	
32	Kunta Khola	Dang	682.355	13.3	7.1	1	RCC T-Beam	Minor	
33	Rana Sing	Arghakhanchi	683.95	103.2	7	4	RCC T-Beam	Major	
34	Dhodre Khola	Arghakhanchi	684.26	22	7	1	RCC T-Beam	Major	
35	Dry Nala	Arghakhanchi	686.77	7.1	9.3	1	RCC Slab	Minor	
36	Rapti River	Dang	687.72	290.1	7	8	Prestress	Major	
37	Fairie Khola	Dang	688.4	16.3	7	1	RCC T-Beam	Major	
38	Moitre Khola	Dang	688.56	19.5	7.1	2	RCC Slab	Minor	
39	Katesh Nala	Dang	690.44	10.8	7.1	1	RCC Slab	Minor	
40	Gopi Nala	Dang	696.98	21.5	7.1	1	RCC T-Beam	Major	
41	Dolai Nala	Dang	700.38	53	7	2	RCC T-Beam	Major	
42	lathowa Kulo	Dang	700.7	10.4	10.2	1	RCC Slab	Minor	
43	Shingai Khola	Dang	703.14	70.5	7	3	RCC Slab	Major	
44	Shingai Khola Branch	Dang	703.29	10.7	7	1	RCC Slab	Minor	
45	Narte Nala	Dang	703.88	10.75	7	1	RCC Slab	Minor	
46	Kauria Khola	Dang	706.67	26.4	7	1	RCC T-Beam	Major	
47	Bagai Sota	Dang	711.22	26.6	7.1	1	RCC T-Beam	Major	
48	Arnwa Khola	Dang	712.26	26.7	7.5	3	RCC Slab	Minor	
49	Arjun Khola	Dang	715	165.45	7	5	Prestress	Major	
50	Padmini Khola	Dang	716.32	11.5	7.35	1	RCC Slab	Minor	
51	Kari Sota	Dang	720.34	21.2	7	2	RCC Slab	Minor	
52	Unchanimbhu Khola	Dang	722.8	32	7.5	3	RCC Slab	Minor	
53	Hattisar Khola	Dang	725.58	10.75	7	1	RCC Slab	Minor	
54	Bhauka Khola	Dang	726	21.6	7	2	RCC Slab	Minor	
55	Bathaniya Khola	Dang	729	21.5	7	2	RCC Slab	Minor	
56	Bhatarkunda Khola	Dang	730.89	26.5	7	1	RCC T-Beam	Major	
57	Rehar Khola	Dang	733.76	26.65	7.1	1	RCC T-Beam	Major	
58	Tilkanya Branch	Dang	739.48	11	7.5	1	RCC Slab	Minor	
59	Chow Khola-1	Dang	741.875	10.8	7	1	RCC Slab	Minor	
60	Chow Khola-2	Dang	741.95	24.3	7	1	RCC T-Beam	Major	
61	Chow Khola-3	Dang	743.151	24.5	7	1	RCC T-Beam	Major	
62	Simal Sota	Dang	745.44	26.5	7	1	RCC T-Beam	Major	
63	Bakhari Khola	Dang	745.8	21.4	7.1	1	RCC T-Beam	Major	

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
64	Kali Khola	Dang	747.79	21.4	7.1	1	RCC T-Beam	Major	
65	Godia Khola	Dang	749.655	21.9	7	2	RCC Slab	Minor	
66	Sirangi Khola	Dang	750.5	42.9	7.1	4	RCC Slab	Minor	
67	Firangi Khola	Dang	751.15	21.6	7	2	RCC Slab	Minor	
68	Gangari Nala	Dang	753.17	21.4	7	2	RCC Slab	Minor	
69	Shiv Khola	Dang	753.39	32.1	7	3	RCC Slab	Minor	
70	Loki Khola	Banke	755.09	16.4	7	1	RCC T-Beam	Major	
71	Bharley Khola	Banke	756.51	42.8	7	4	RCC Slab	Minor	
72	Skew	Banke	756.71	15.3	7	1	RCC Slab	Major	
73	Gothelawa Nala	Banke	756.91	21.2	7	1	RCC T-Beam	Major	
74	Tilkanya Khola	Banke	758.87	17.6	7	2	RCC Slab	Minor	
75	Ooj Khola	Banke	761.81	53.75	7	5	RCC Slab	Minor	
76	Bains Khola	Banke	763.98	29.4	7.1	2	RCC Slab	Minor	
77	Dapariya	Banke	766	10.7	7	1	RCC Slab	Minor	
78	Ranigajari	Banke	766.68	11.7	7	1	RCC Slab	Minor	
79	Bairiya	Banke	767.69	42.65	7	4	RCC Slab	Minor	
80	Dongi nala	Banke	769.04	29.2	7	1	RCC T-Beam	Major	
81	Skew	Banke	769.99	9	6.8	1	RCC Slab	Minor	
82	Sauri	Banke	770.88	43.2	7	4	RCC Slab	Minor	
83	Khochani	Banke	771.32	21.45	7	1	RCC T-Beam	Major	
84	Kale Khola	Banke	773	10.7	7	1	RCC Slab	Minor	
85	Gabar	Banke	775.55	53.2	7	2	RCC T-Beam	Major	
86	Bhatti Khola	Banke	776.37	16.4	7	1	RCC T-Beam	Major	
87	Lumba Khola	Banke	781.34	64.2	7	3	RCC T-Beam	Major	
88	Gantahawa	Banke	784.05	17.4	7	2	RCC Slab	Minor	
89	Thin Kholi	Banke	785.38	21.4	7	2	RCC Slab	Minor	
90	Jhuri Khola	Banke	785.66	64.2	7	3	RCC T-Beam	Major	
91	Skew	Banke	786.26	12.6	6	1	RCC Slab	Minor	
92	Skew	Banke	786.675	11.45	7	1	RCC Slab	Minor	
93	Gandhali	Banke	787.3	32.1	7	3	RCC Slab	Minor	
94	Sukhar	Banke	787.39	105.8	7	4	RCC T-Beam	Major	
95	Khairi	Banke	789.01	104.7	7	4	RCC T-Beam	Major	
96	Skew	Banke	790.045	12.6	6.98	1	RCC Slab	Minor	
97	Muguwa	Banke	798.96	44.5	7.5	5	RCC Slab	Minor	

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
98	Obhary Bridge	Banke	805.1	20.5	7.5	1	RCC T-Beam	Major	
99	Paruwa Sota	Banke	807.5	40.3	7	2	RCC T-Beam	Major	
100	Changai Nala	Banke	811.39	21.3	7.1	2	RCC Slab	Minor	
101	Naya Gaon	Banke	813.21	10	7	1	RCC Slab	Minor	
102	Geruaa Nala	Banke	815.19	21.35	7	1	RCC T-Beam	Major	
103	Jhijhari Khola	Banke	815.74	63.4	7	3	RCC T-Beam	Major	
104	Rohini	Banke	822.35	43.27	7	2	RCC T-Beam	Major	
105	Duduwa nala	Banke	823.63	43.2	7	2	RCC T-Beam	Major	
106	Kiran Khola	Banke	827.14	36	7.35	3	RCC T-Beam	Minor	
107	Maitihawa Khola	Banke	829	6.2	5.9	2	RCC Slab	Minor	
108	Khanjua Khola	Banke	829.46	9.4	6.1	2	RCC Slab	Minor	
109	Jethi Khola	Banke	833.73	36	7.35	3	RCC T-Beam	Minor	
110	Jhamriniya khola	Banke	835.713	7.7	5.8	2	RCC Slab	Minor	
111	Man Khola	Banke	836.41	72	7.35	4	RCC T-Beam	Major	
112	Phohiya Khola	Bardiya	836.88	36	7.35	3	RCC T-Beam	Minor	
113	Dundwa Khola	Bardiya	838.75	72	7.35	4	RCC T-Beam	Major	
114	3 Cell	Bardiya	842.735	6.9	5.7	3	RCC Slab	Minor	
115	3 Cell Slab	Bardiya	843.068	7.9	5.9	3	RCC Slab	Minor	
116	Thulo Kulo Bridge	Bardiya	843.625	7.7	5.9	2	RCC Slab	Minor	
117	Bokahani Khola	Bardiya	845.08	7.2	6.4	1	RCC Slab	Minor	
118	Jurinya	Bardiya	846.39	9	5.9	2	RCC Slab	Minor	
119	Three Cell Slab	Bardiya	848.04	13.6	6.3	3	RCC Slab	Minor	
120	Gang River	Bardiya	850.72	35.8	7.35	3	RCC T-Beam	Minor	
121	Double Cell	Bardiya	851.32	7.8	6.2	2	RCC Slab	Minor	
122	Bhada River	Bardiya	853.99	66	7.4	4	RCC T-Beam	Major	
123	2 Cell	Bardiya	856.154	7.7	6	2	RCC Slab	Minor	
124	Pathriya Khola	Bardiya	858.16	45	7.15	3	RCC T-Beam	Minor	
125	Auri Khola	Bardiya	859.66	36	7.15	3	RCC T-Beam	Minor	
126	Jakar Khola	Bardiya	860.69	13.4	6	3	RCC Slab	Minor	
127	Phardangwa Khola	Bardiya	862.57	48	7.15	3	RCC T-Beam	Major	
128	2 Cell Slab	Bardiya	863.448	7.7	6.1	2	RCC Slab	Minor	
129	Triple Cell	Bardiya	863.816	9	6	3	RCC Slab	Minor	
130	Theni Khola	Bardiya	864.56	30	7	2	RCC T-Beam	Minor	
131	Three Cell Slab	Bardiya	864.974	16.2	6.5	3	RCC Slab	Minor	

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
132	Budhi Khola	Bardiya	868.75	44.1	6.2	3	RCC T-Beam	Major	
133	2 Cell Slab	Bardiya	869.71	7.5	6.7	2	RCC Slab	Minor	
134	Babai Bridge	Bardiya	870.73	315	7	18	RCC T-Beam	Major	
135	Janata Khola Bridge	Bardiya	872.404	21.2	6.5	4	RCC Slab	Minor	
136	Babai Pool	Bardiya	874.417	9.5	6.3	2	RCC Slab	Minor	
137	Triple Cell	Bardiya	877.884	7.8	5.8	3	RCC Slab	Minor	
138	Triple Cell	Bardiya	879.483	9	6.3	3	RCC Slab	Minor	
139	Ambasa River	Bardiya	880.66	50	7.1	3	RCC T-Beam	Major	
140	Triple Cell	Bardiya	883.91	9	6.2	3	RCC Slab	Minor	
141	2 Cell Slab	Bardiya	885.782	9.2	4.8	2	RCC Slab	Minor	
142	AuraiKhola	Bardiya	886.86	76.5	7.55	3	RCC T-Beam	Major	
143	2 Cell Slab	Bardiya	887.3	7.8	5.8	2	RCC Slab	Minor	
144	4 Cell Slab	Bardiya	887.838	21.8	6.5	4	RCC Slab	Minor	
145	Triple Cell	Bardiya	888.46	11.5	6.2	3	RCC Slab	Minor	
146	4 Cell Slab	Bardiya	889.746	22.7	6.5	4	RCC Slab	Minor	
147	Double Cell	Bardiya	892.265	7.9	6.6	2	RCC Slab	Minor	
148	Two Cell	Bardiya	892.292	7.9	7	2	RCC Slab	Minor	
149	Four Cell	Bardiya	892.496	21.5	6.3	4	RCC Slab	Minor	
150	Gumnaha	Bardiya	894.24	40.8	7.5	2	RCC T-Beam	Major	
151	Four Cell Slab	Bardiya	895.382	11.8	6.5	4	RCC Slab	Minor	
152	Karnali	Bardiya	901.115	500	7.2	2	Cable Stayed	Major	
153	Baula Khola	Kailali	901.4	41	7.5	1	Prestress	Major	
154	Dry Nala	Kailali	901.5	20.6	7.5	1	Prestress	Major	
155	Dry Nala 2	Kailali	901.635	6.7	7.3	1	RCC Slab	Minor	
156	Dry Nala 3	Kailali	901.968	20.6	7.5	1	Prestress	Major	
157	Dry Nala 4	Kailali	902.145	7.2	7.5	2	RCC T-Beam	Minor	
158	Dry Nala 5	Kailali	902.338	10.4	7.5	1	RCC Slab	Minor	
159	Dry Nala 6	Kailali	902.755	41	7.5	1	Prestress	Major	
160	Dry Nala 7 (Baar Khola)	Kailali	903.171	93.55	7.5	2	Prestress	Major	
161	Dry Nala 8	Kailali	903.633	93.5	7.5	2	Prestress	Major	
162	Dry Nala 9	Kailali	904	83.6	7.5	2	Prestress	Major	
163	Dry Nala 10	Kailali	904.48	15.65	7.5	1	Prestress	Major	
164	Dry Nala 11	Kailali	904.669	15.5	7.5	1	Prestress	Major	
165	Dry Nala 12	Kailali	904.86	10.4	7.5	1	RCC Slab	Minor	

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
166	Dry Nala 13	Kailali	905.13	6.8	7.3	1	RCC Slab	Minor	
167	Dry Nala 14	Kailali	905.55	20.6	7.5	1	Prestress	Major	
168	Dry Nala 15	Kailali	906.817	83.6	7.5	2	Prestress	Major	
169	Dhobiniya Khola	Kailali	911.46	62.25	7.6	3	RCC T-Beam	Major	
170	Dry Nala 16	Kailali	911.81	7.2	7.3	1	RCC Slab	Minor	
171	Rora River	Kailali	915.65	70	7.1	4	RCC T-Beam	Major	
172	Chori River	Kailali	920	40.9	7.5	1	Prestress	Major	
173	Charela Khola	Kailali	921.805	96.6	7.5	3	RCC T-Beam	Major	
174	Pathariya Khola	Kailali	923.415	50	7.2	3	RCC T-Beam	Major	
175	Karha Khola	Kailali	928.6	96.6	7.5	3	Prestress	Major	
176	Suktikada Khola	Kailali	931.71	51	7.2	3	RCC T-Beam	Major	
177	Doda River	Kailali	935.69	50	7.2	3	RCC T-Beam	Major	
178	Ghodaghodi Khola	Kailali	938	13.2	6.35	4	RCC Slab	Minor	
179	2 Cell Slab	Kailali	938.315	7	6.35	2	RCC Slab	Minor	
180	Kandra River	Kailali	941.14	240	7.2	8	RCC T-Beam	Major	
181	3 Cell Slab	Kailali	942	13.6	6	3	RCC Slab	Minor	
182	Amkhaiya -1	Kailali	944.58	7.8	6.1	2	RCC Slab	Minor	
183	Amkhaiya-2	Kailali	944.89	7.8	6.2	2	RCC T-Beam	Minor	
184	Kateni Khola	Kailali	947.16	16.6	6.2	3	RCC Slab	Minor	
185	Badka Khola	Kailali	948.07	10.2	6.2	3	RCC Slab	Minor	
186	Likma River	Kailali	950.37	240	7.2	8	RCC T-Beam	Major	
187	Amkhaiya Khola	Kailali	954.64	12.3	6.2	2	RCC Slab	Minor	
188	Gauri Ganga	Kailali	957.35	225.4	7.5	7	Prestress	Major	
189	Chanaura Khola	Kailali	958.9	11.3	6.2	2	RCC Slab	Minor	
190	2 Cell Slab	Kailali	960	10.3	6.2	2	RCC Slab	Minor	
191	Chaumala River	Kailali	961.23	55	6.5	3	RCC T-Beam	Major	
192	ShivGanga River	Kailali	964.58	193.2	7.5	6	Prestress	Major	
193	Khutia River	Kailali	971.8	257.6	7.5	8	Prestress	Major	
194	Hardia Khola	Kailali	974	14.2	6.2	2	RCC Slab	Minor	
195	Gardhobi Khola	Kailali	975.52	9.2	6	2	RCC Slab	Minor	
196	Gayamadi Khola	Kailali	976	9.3	6	2	RCC Slab	Minor	
197	Manhara River	Kailali	977.08	225.4	7.5	7	Prestress	Major	
198	Biyar Khola	Kailali	977.875	9.2	6	2	RCC Slab	Minor	
199	Narmada Ganga River	Kailali	979	39.2	7.1	3	RCC T-Beam	Minor	

S .No.	Bridge / River Name	District	MRM Chainage (Km)	Length of Bridge (m)	Carriageway Width(m)	Span No	Bridge Type	Category	Remarks
200	Godabari River	Kailali	981.17	90	7.1	3	Prestress	Major	
201	Mohana River	Kailali	984.285	50.2	7.1	3	RCC T-Beam	Major	
202	Baluwa Khola	Kanchanpur	988	11.2	7.7	2	RCC Slab	Minor	
203	Amkhhaiya Khola 1	Kanchanpur	991.378	9.2	6.2	2	RCC Slab	Minor	
204	Amkhhaiya-2	Kanchanpur	992.17	6.9	7.2	1	RCC Slab	Minor	
205	Donda River	Kanchanpur	992.825	181	6.9	6	Prestress	Major	
206	Band River	Kanchanpur	995.29	40.8	7	2	RCC T-Beam	Major	
207	Banara River	Kanchanpur	998.4	240.8	7	8	Prestress	Major	
208	Sunbara River	Kanchanpur	1003.575	70	7	4	RCC T-Beam	Major	
209	Syali River	Kanchanpur	1006.25	71	7.2	4	RCC T-Beam	Major	
210	Radha River	Kanchanpur	1010.125	53	7.2	3	RCC T-Beam	Major	
211	Pathariya River	Kanchanpur	1011.2	50	7.2	3	RCC T-Beam	Major	
212	Daiji Khola	Kanchanpur	1013.445	10	6	1	RCC Slab	Minor	
213	Chaudhar Khola	Kanchanpur	1014.85	179.4	7.2	6	RCC T-Beam	Major	
214	Slab	Kanchanpur	1016.19	11.3	6	2	RCC Slab	Minor	
215	Suda Chok Khola	Kanchanpur	1016.608	7	7	1	RCC Slab	Minor	
216	Slab -2	Kanchanpur	1018.05	7	7	1	RCC Slab	Minor	
217	Kangla River	Kanchanpur	1019.38	22.8	7.3	1	RCC T-Beam	Major	
218	Bhasi River	Kanchanpur	1020.67	22.5	7.5	1	RCC T-Beam	Major	
219	Bhansi Khola	Kanchanpur	1021.39	7.3	7	1	RCC Slab	Minor	
220	Canal Crossing	Kanchanpur	1023.435	21	6.7	3	RCC Slab	Minor	
221	Bangaun Khola	Kanchanpur	1026	10.2	7	1	RCC Slab	Minor	
222	Bhujela River	Kanchanpur	1027.8	45.6	7.5	2	RCC T-Beam	Major	

F. ANNEX-2: Qualification Requirements of Professional'sExperts

I. Team Leader/Sr. Highway Engineer (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering/ Construction Management
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works	
Minimum	10 years
Preferable	15 years
B3. Specific Experience (In the capacity as a Team Leader in design of road/bridge works)	
Minimum	5 years
Preferable	10 years
B4. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum 2 highway projects of size equal or more than US $ 70 million	
C2. Experience in wide geographic regions	
D. **Language**	
• Communicate fluently in English Language	

II. Sr. Bridge Design Engineer -1 (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works	
Minimum	10 years
Preferable	15 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer of projects related to road/bridge works)	
Minimum	5 years
Preferable	10 years
B4. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum of 2 no. of Major Bridges as network arch bridge or steel bridge of span more than 50m or PSC bridges of span more than 60m or concrete arch bridge	
C2. Experience in wide geographic regions	
D. **Language**	
• Communicate fluently in English Language	

III. Sr. Bridge Design Engineer -2 (Experience of the last 20 years will only be considered)

E. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
F. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works	
Minimum	10 years
Preferable	15 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer of projects related to road/bridge works)	
Minimum	5 years
Preferable	10 years
B4. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
G. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum of 2 no. of Major Bridges as network arch bridge or steel bridge of span more than 50m or PSC bridges of span more than 60m or concrete arch bridge	
C2. Experience in wide geographic regions	
H. **Language**	
• Communicate fluently in English Language	

IV. Sr. Geotechnical Engineer (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Geotechnical Engineering
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works as a Geotechnical Engineer	
Minimum	10 years
Preferable	15 years
B3. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum 5 road/bridge projects.	
C2. Experience in wide geographic regions	
D. **Language**	
• Communicate fluently in English Language	

V. Sr. Highway Engineer/Pavement Engineer (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works	
Minimum	10 years
Preferable	15 years
B3. Specific Experience (In the capacity as a Senior Highway Engineer of projects related to road/bridge works)	
Minimum	5 years
Preferable	10 years
B4. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum 2 highway projects (2-lane) of length 60 km or equivalent	
C2. Experience in wide geographic regions	
D. **Language**	
• Communicate fluently in English Language	

VI. Sr. Road Safety Specialist (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering/ Traffic Engineering
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works	
Minimum	10 years
Preferable	15 years
B3. Specific Experience (In the capacity as a Road Safety Specialist)	
Minimum	5 years
Preferable	10 years
B4. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum 5 road projects.	
C2. Experience in development of minimum 2 standards/code related to road safety works	
C3. Experience in wide geographic regions	
D. **Language**	
• Communicate fluently in English Language	

VII. Sr. Transport Economist (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering/ Economics/ Development Economics/ Transport Economics
Preferable	Master's degree in Economics/ Development Economics/ Transport Economics
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience (In the capacity as a Transport Economist in road/bridge works)	
Minimum	10 years
Preferable	15 years
B3. International Experience in the proposed position	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum 5 road/bridge projects.	
C2. Experience in wide geographic regions	
D. **Language**	
• Communicate fluently in English Language	

VIII. Deputy Team Leader/ Highway Engineer (Experience of the last 20 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering
B. **Experience**	
B1. General Experience	
Minimum	15 years
Preferable	20 years
B2. Specific Experience in road/bridge works	
Minimum	10 years
Preferable	15 years
B3. Specific Experience (In the capacity as a Deputy Team Leader in highway projects)	
Minimum	5 years
Preferable	10 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 5 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

IX. Highway Engineer-1 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Highway Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 4 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

X. Highway Engineer-2 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Highway Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 4 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XI. Highway Engineer-3 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Highway Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 4 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XII. Bridge Design Engineer-1 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum 4 bridge (2 lane) projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XIII. Bridge Design Engineer-2 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum 4 bridge (2 lane) projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XIV. Bridge Design Engineer-3 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum 4 bridge (2 lane) projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XV. Bridge Design Engineer-4 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum 4 bridge (2 lane) projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XVI. Bridge Design Engineer-5 (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Bridge Design Engineer)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in design of minimum 4 bridge (2 lane) projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XVII. Structural Engineer (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Bridge Engineering/ Structural Engineering
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	7 years
B3. Specific Experience (In the capacity as a Structural Engineer)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 4 road/bridge projects.	
C2. Experience with in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XVIII. Sr. Geologist (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Geology
Preferable	Master's degree in Engineering Geology or equivalent
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience (In the capacity as a Geologist)	
Minimum	5 years
Preferable	10 years
B3. Specific Experience in road/bridge works	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road/bridge projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XIX. Geotechnical Engineer-1 (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Geotechnical Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Geotechnical Engineer)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road/bridge projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XX. Geotechnical Engineer-2 (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Geotechnical Engineering/ Engineering Geology
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Geotechnical Engineer)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road/bridge projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXI. Material Engineer (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Highway Engineering/ Geotechnical Engineering/ Engineering Geology
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	7 years
B3. Specific Experience (In the capacity as a Material Engineer/ Pavement Engineer)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXII. Road Safety/Traffic Engineer (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Highway /Traffic Engineering / Transportation Engineering
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience (In the capacity as a Road Safety/Traffic Engineer in road/bridge works)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXIII. Hydrologist-1 (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Hydrology/ Engineering Hydrology/ Civil Engineering
Preferable	Master's degree in Hydrology / Water resource management/ Water resource Engineering
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience (In the capacity as a Hydrologist in road/bridge/hydropower works)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road/bridge projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXIV. Hydrologist-2 (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Hydrology/ Engineering Hydrology/ Civil Engineering
Preferable	Master's degree in Hydrology / Water resource management/ Water resource Engineering
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience (In the capacity as a Hydrologist in road/bridge/hydropower works)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road/bridge projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXV. Transport Economist (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering/ Economics/ Development Economics/ Transport Economics
Preferable	Master's degree in Economics/ Development Economics/ Transport Economics
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Transport Economist)	
Minimum	5 years
Preferable	7 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXVI. Procurement Specialist (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering
Preferable	Master's degree in Transportation Engineering/ Highway Engineering/ Contract Management/ Construction Management
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as a Procurement Specialist)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXVII. Environmental Specialist (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Civil Engineering/ Environmental Engineering/ Environment Science
Preferable	Master's degree in Environmental Engineering/Environmental Science
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	7 years
B3. Specific Experience (In the capacity as an Environmental Specialist)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXVIII. Social Development/Resettlement Specialist (Experience of the last 10 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Social Science
Preferable	Master's degree in Social Science
B. **Experience**	
B1. General Experience	
Minimum	5 years
Preferable	10 years
B2. Specific Experience (In the capacity as a Social Development Specialist/ Resettlement Specialist/ Livelihood Specialist)	
Minimum	5 years
Preferable	7 years
B3. Specific Experience in road/bridge works	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in minimum of 3 road projects.	
C2. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXIX. Sr. Electrical Engineer (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Electrical Engineering
Preferable	Master's degree in Electrical Engineering
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in road/bridge works	
Minimum	5 years
Preferable	10 years
B3. Specific Experience (In the capacity as an Electrical Engineer)	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	

XXX. Sr. Cadastral Surveyor (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Certificate level with training or Bachelor level
Preferable	Master's degree in Surveying or equivalent
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience (In the capacity as a Cadastral Surveyor)	
Minimum	5 years
Preferable	10 years
B3. Specific Experience in road/bridge works	
Minimum	2 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in the Proposed Field.	
D. **Language**	
• Communicate fluently in English Language	

XXXI. Legal Expert (Experience of the last 15 years will only be considered)

A. **Education Qualification**	
Minimum	Graduate in Law
Preferable	Master's degree in Law or equivalent
B. **Experience**	
B1. General Experience	
Minimum	10 years
Preferable	15 years
B2. Specific Experience in infrastructure related works	
Minimum	3 years
Preferable	5 years
C. **Experience in the Proposed Field of Expertise**	
C1. Experience in Infrastructure Projects supported by development partners.	
D. **Language**	
• Communicate fluently in English Language	