

SCHEDULE-1

(See Clause 1.1.3)

CONSULTANCY FOR A DETAILED PROJECT REPORT FOR MONO RAIL
TERMS OF REFERENCE (TOR) FOR TECHNICAL CONSULTANT

1. GENERAL

- 1.1 The Authority seeks the services of qualified firms for preparing a DPR for Development of Monorail / Light Rail Transit (LRT) or any other appropriate system in Bangalore on Design, Build, Finance, Operate and Transfer (DBFOT) basis. The Monorail / LRT would though act as an independent transit system would facilitates integration with other modes of transport like feeder to other rail based systems, bus systems and other inter-modal transit system. The stretches identified for the development of the Project are set out in the table below:

Corridor	Name of the Corridor	Length (km)
Corridor 1	JP Nagar to Hebbal (starts from Ganapathy Temple of Banneraghatta Road runs along outer ring road, crosses Kanakapura Road and enters Mysore Road via Kathriguppe. After crossing Mysore Road enters into Jnanabharathi Campus and crosses Magadi Road and enters Peenya Industrial Area. After, crossing Tumkur Road near Peenya passes through BEL Circle, Lottegollahalli and terminates at Hebbal near proposed HSRL Station) along Western Portion of Outer Ring Road.	31
Corridor 2	Peripheral Ring Road to Toll Gate, Magadi Road (Starts from Toll Gate on Magadi Road and runs all along the Magadi Road for a distance of 9 KMs till it touches the proposed Peripheral Ring Road crossing Magadi Road).	9

The Terms of Reference (the “TOR”) for this assignment are specified below.

- 1.2 The Consultant shall be guided in its assignment by the Specifications and Standards set by American National Standards Institute and European Norms in case of Monorail and in the case of other technology, appropriate specifications & standards provided for that technology. The design relating to fire safety and escape shall be in accordance with the requirement of NFPA 130 standard for fixed guide-way systems. The reference of standards indicated above are solely for guidance of the consultant and the consultant may choose to refer other better international standards & specifications depending upon the technological options. The Consultant shall also be guided by the Applicable Laws.
- 1.3 The Consultant shall be responsible for preparing the technical Schedules of the Concession Agreement and for bringing out any special feature or requirement of the Project referred to in the Concession Agreement. The details and particulars to be specified in the Schedules shall be duly addressed and incorporated therein.

Selection of Technical Consultant for Preparation of DPR of Monorail/ LRT Project

- 1.4 The Consultant shall assist the Authority and its Financial Consultant and the Legal Adviser by furnishing clarifications as required for the financial appraisal and legal scrutiny of the Project and Bid Documents.

- 1.5 The Consultant shall also participate in the pre-bid conference with the Bidders of the Project and assist the Authority in clarifying the technical aspects arising from the Bid Documents including the DPR.

2. OBJECTIVE

The objective of this consultancy is to undertake feasibility studies and prepare a DPR for the Project with a view to examine:

- (i) enhanced safety and level of service for the Monorail / LRT / any other proposed system users;
- (ii) superior operation and maintenance enabling enhanced operational efficiency of the Project;
- (iii) minimal adverse impact on the local population and road users due to construction of the proposed system;
- (iv) minimal adverse impact on environment;
- (v) minimal additional acquisition of land; and
- (vi) phased development of the Project for improving its financial viability consistent with the need to minimise frequent inconvenience to traffic that may be caused if additional works are undertaken.

3. SCOPE OF SERVICES

The Consultancy shall be taken up for preparation of individual DPRs for the 2 Corridors (Corridor 1 & Corridor 2) proposed. The Scope of Services have been divided into 2 tasks viz Task A activities and Task B activities.

3.1 Scope of Services

The scope of services shall comprise:

I. Task A: Preparation of Option Report

1. Task A activities would comprise assessment and evaluation of different technology options for the proposed services & identification of appropriate technology. The Consultant shall be required to evaluate the technology options and thus examine the appropriateness of developing Monorail / LRT system or any other appropriate technology. The activities that would need to be undertaken for the same would include:
 - a. assessment of traffic based on review of secondary data including studies undertaken, by government agencies;
 - b. updation of the data / information appropriately in view of lapse of time after the surveys were undertaken for preparation of such reports. The Consultant shall undertake preliminary survey as required to validate the traffic data and for assessing the ground conditions;
 - c. Assessment of various technologies for provision of the Services envisaged;
 - d. identification of issues with respect to development of the Project under the technologies proposed;
 - e. estimation of cost of all components of the Project for such identified technologies;
 - f. assessment of O&M expenses for the technologies proposed.

2. The Consultant shall, based on the above activities, submit an Option Report to the Authority which should detail the merits and demerits of possible systems and recommend a suitable technology.

The Task B activities shall be undertaken by the Consultant only after approval by the Authority to proceed with Task B activities.

In an event the Authority does not give its approval for undertaking Task B Activities, the Agreement shall be terminated and the Consultant shall be paid the amounts set out under Task A Activities in Clause 6.2 of this Schedule.

II. Task B: Preparation of DPR

Upon approval of the Options Report and the technology recommended, the Consultant shall be required to undertake a detailed study and prepare DPR to enable the Authority to implement the same. The activities that would need to be undertaken for the same would include topographic, alignment and land use surveys, technology survey, soil and geotechnical investigation, GAD of the suggested & approved track alignment, construction methodology, typical design of proposed structures, stations & depot, design parameters & specifications of rolling stock, train operation plan, ticketing system, traction system, power supply arrangement, signaling & telecommunication system, safety system, environmental impact assessment studies & management plan, train maintenance depot, operation & maintenance plan. The Consultant shall also prepare the land plan and utility schedules. The DPR shall also include the detailed cost estimates of all the components (the land cost, capital cost estimates of the project and applicable taxes and duties). After estimating the detailed costs the consultant has to furnish financing options, fare structure and financial viability with implementation strategy, institutional arrangement and legal cover for the project implementation.

The Consultant shall, based on the above activities, submit a comprehensive draft DPR to the Authority. On the suggestions on of the Authority, the Consultant shall revise the draft DPR and submit the final DPR. The consultant shall assist the authority in further bid process.

The details of the activities to be undertaken under Task A and Task B are discussed below.

I. Task A Activities

3.2 Traffic Study and demand assessment

The Consultant shall undertake secondary data analysis, and in-order to update the secondary data with the lapse of time, following surveys shall be undertaken, viz., all the necessary surveys (Classified directional traffic Volume Count, Origin Destination Survey, Willingness to Shift Survey , Willingness to Pay Survey, etc.).

The Consultant shall, upon award of the Consultancy, submit its proposal regarding the proposed traffic studies and the locations of survey stations / locations for each of the above activities along with an index plan giving the rationale of its proposal. The secondary data analysis shall act as a reference in arriving at the traffic study locations. Care shall be taken in proposing the locations in a manner that they capture the traffic in the identified corridors. This proposal consisting secondary data analysis & proposed locations shall form part of the Inception Report. The Authority may, within reasonable time of receiving the Inception Report, modify the traffic and the locations of traffic survey stations, if required, in accordance with the provisions of this Terms of Reference (ToR) and the Consultant shall comply with the same.

3.2.1 Secondary Data Analysis

As part of the study process a socio-economic analyses (limited to the secondary data analysis) to be developed for the corridor with reference to the Bangalore development. It will contain population, employment and income forecasts on a zonal basis. The Consultant shall forecast the demand by developing the necessary models based on secondary data (including studies undertaken by government agencies such as Comprehensive Traffic and Transportation Study (CTTS), BMRCL report, DPR for High Speed Rail Link etc) and the primary surveys being taken up. The Consultant shall be responsible for updation of the data / information appropriately in view of lapse of time after the surveys were undertaken for preparation of such reports. The Consultant shall also provide their analysis relevant to the mentioned corridors and alternate corridors.

3.2.2 Classified Directional Traffic Volume Count

The classified directional traffic volume count shall be within five weeks of the commencement of the Consultancy. For conducting the Classified directional traffic Volume Count, the Consultant shall comply with the following:

- (a) The classified directional traffic volume counts shall be carried out for 7 (seven) continuous working days at the selected survey stations along the corridor. The following classes of vehicles shall be captured separately.
 - 1. Two wheelers
 - 2. Three wheelers
 - 3. Cars (include jeeps, vans)

4. mini buses, Ambulance, funeral vans
5. Buses
6. Light commercial vehicles
7. Trucks
8. Multi Axle trucks
9. Tractors
10. Others:, fire tender, etc

- (b) The classified directional traffic count data would be analysed to depict hourly and daily variations. The abstract of traffic data would also be provided for each survey station.

3.2.3 Origin Destination Survey

The Origin Destination Survey shall be carried out for 3 (three) continuous days at the selected survey stations. The survey needs to provide time-wise, mode wise and purpose wise trips and also, other required characteristics of the trip maker. The Origin Destination Survey will be undertaken from 0700 hours to 2100 hours. The survey shall be for both directions and the sample size shall not be less than 10% (ten percent) of the users of the corridor as estimated in Classified Volume Count. Based on the data collected of the trip maker, demand forecasting model will be developed utilising socio-economic details of the trip maker, trip details, etc.

3.2.4 Willingness to Shift Survey (Modal Shift)

The willingness to Shift Survey shall be carried out along with the Origin – Destination survey, for 3 (three) continuous working days at the selected survey stations along the proposed alignments (minimum 2 alternatives) of Project. The survey shall be undertaken from 0700 hours to 2100 hours. The survey shall be for both directions. Sample size shall not be less than 10% (ten per cent) of the users of road network on such alignment. The Survey shall also be carried out on prominent bus stops for 3 (three) continuous working days.

The survey is envisaged to estimate the modal shift to the Project from each of the alternate modes of transport considering various scenarios of tariff rate, cost & travel time variation of trips, etc.

3.2.5 Willingness to Pay Survey

The Willingness to Pay Survey shall be carried out along with the Willingness to Shift survey, among those who are willing to shift to Monorail/LRT. The survey would estimate their present cost & travel time of trips and the price which potential users of the Project would be willing to pay for the proposed system with better service. Other traffic surveys as required including parking survey, opinion surveys of passengers at bus stops, etc. may be conducted.

3.2.6 Traffic demand assessment

- (a) The Consultant shall make an assessment / forecast of the traffic demand for the Project for a period of 10 (ten) years, 20 (twenty) years and 30 (thirty) years

respectively by modelling based on the traffic data, trend growth and growth in the influence area (land use – present & future) of the Project.

- (b) The Consultant shall also assess the annual growth rate, which has to be justified with reasons, including analysis of past trends and the travel / trip forecast model being developed.
- (c) Based on the assessment of the traffic demand on the various Corridors of the Project, the Consultant shall also provide sensitivity analysis due to change in assumption of traffic projections & land use (Optimistic, Realistic and Pessimistic).
- (d) The Consultant shall provide a broad assessment of the years in which augmentation of the facilities will be required. All the details to be analysed and provided in the report.

3.3 Feasibility Study

The Consultant shall undertake reconnaissance survey, comparison of technologies, cost estimate, identification of issues and viability for the technology options suggested.

3.3.1 Reconnaissance survey

The Consultant is expected to study in detail the suggested alignments as well as alternate alignments and determine the critical points that would affect the implementation of the Project. Based on the same, the Consultant shall suggest any change in alignment, to capture additional traffic, decrease land acquisition, decrease capital and or O&M cost, etc. The alignment suggested shall be plotted on Google maps.

3.3.2 Comparison of technologies

The Consultant is required to undertake a comparative study with various technology options for the estimated ridership for the Project.

3.3.3 Cost estimate

The consultant shall prepare cost estimate for development of all the Project components for each of the technology suggested.

3.3.4 Revenue and O&M estimate

The consultant shall estimate the revenue based on the ridership that can be served for each of the technology suggested. The Consultant shall also determine the corresponding operational and maintenance expenses for the technologies proposed.

3.3.5 Alignment Study

The Consultant shall identify a minimum of 2 (two) alternate alignment options for each of the identified corridors and also map the corridor characteristics: right of way, curvature, gradients, location, of building line, utilities on the corridor, etc. The suggested alignment options should ensure minimum land acquisition and higher ridership. The Consultant shall also provide a merits and demerits of each of the alignment option and also suggest the best alignment based on detailed study.

3.3.6 Identification of issues

For each of the alignment and technology options, the Consultant is expected to list the issues / concerns which would impact the implementation of the technology in the given alignment. All the issues in implementation of project shall be submitted, such as indicative alignment, requirement towards land acquisition, maximum capacity that the suggested technology can handle, special structures required (such as obligatory spans, RUB, ROB), integration with existing and proposed rail based system etc

3.3.7 Integration of Stations / Points

The proposed system should be integrated with other mass transit systems, including Metro, Bus system, etc. Requisite park & ride facility to be provided at each station. Effortless transfer from one mode to another is to be achieved. Integration should also examine the tariff structure for multi modal travel situation. The bus stop locations, major bus stations, metro stations, High Speed Rail stations are the integration locations.

3.3.8 Preliminary viability

Based on the cost estimate of the components (Capital and O&M expenses), ridership (based on demand estimation / forecasting, model split, assignment, etc.) and suggested tariff, the Consultant shall undertake financial analysis in projecting the IRR. For the above, following assumptions can be considered

- Capital cost shall be adopted as per estimates of construction cost to which 25% shall be added for physical and price contingencies, interest during construction (IDC), other financing costs, etc;
- debt equity ratio may be assumed as 70:30;
- O&M costs may be estimated as per norms practised internationally

Task B Activities

3.4 Engineering surveys and investigations

3.4.1 The engineering surveys and investigations shall be divided into the following components:

- Topographic, alignment and land use survey
- Technology survey
- Soil and geo-technical surveys

3.4.2 Topographic, alignment and land use survey

The activities and Deliverables forming part of the topographic, alignment and land use survey are described below (see also Attachment A to the TOR):

- (a) Locate the layout for stations, depot and other structures in the finalised alignment.

- (b) Locate and prepare layout, functional plans for integration of other modes of transport for all the stations.
- (c) As far as possible, the alignment would be retained within the Right of Way (RoW) subject to the following requirements:
 - (i) Identify stretches which do not meet the criterion of ruling design speed, i.e. where radii of horizontal curves are less than desirable minimum. Prepare realignment plans for improving geometrics in such stretches.
 - (ii) Sections where station buildings and depot are proposed to be built.
 - (iii) Identify stretches where the structure or station buildings are partially or completely blocking the carriageway and hence the carriageway has to be diverted / widening to retain the width of carriageway.
 - (iv) Work out proposal for location of such structures and alignment of approaches
- (d) Based on the plans of horizontal and vertical alignment prepare General Alignment Drawing (GAD), L-Sections and cross-sections of the entire Project. Proposed developments shall be marked on the plans. Such developments will include new structures, station buildings, diversion of road / carriageway, widening of RoW, additional road signs, road furniture, safety devices, relocation of utilities, removal of trees, etc.
- (e) Also prepare a separate Land Plan of the Project showing the existing ROW (along with all the existing assets within the ROW e.g. structures, drains, trees, utilities and safety devices) and proposed land required in various stretches for improvement of geometrics, construction of new structures, provision of intersections, interchanges, project facilities, etc. The Land Plan should also show encroachments, if any. A list of such encroachments along with their brief description shall also be prepared and included in the DPR.
- (f) For land proposed to be acquired as per approved alignment of the Project, the Land Plans shall be marked on duly certified village maps showing survey / plot numbers and shall be furnished along with a report which will include detailed schedules in respect of the proposed acquisition of land holdings as per revenue records in a format that would enable the Authority to initiate land acquisition proceedings.
- (g) A set of cross-sections of the proposed Project at 100 meter intervals for each homogeneous section shall be provided by the Consultant. Additional cross-sections shall be provided for curves at the start, at the middle and at the end. These cross-sections along with proposed improvement plan and preliminary design shall form the basis of preparation of detailed estimates of the Project.

3.4.3 Technology survey

The Consultant shall examine various technologies including equipment options for Monorail/LRT/ appropriate systems and advise on the most suited technology and or equipment options for the Project. The Consultant shall provide the characteristics of each of

the technology option with suitable parameters and specifications. The Consultant shall also provide a case study of the technology, for each of the options.

3.4.4 Soil and geotechnical surveys

The activities and Deliverables forming part of the soil investigation, geotechnical investigation, geo- hydrology investigation and drainage surveys are described below:

- (a) The characteristics of the existing soil, samples from every 1000 meter of the Project or closer where change in soil type is encountered.
- (b) Investigations of the subsoil strata - one trial bore at a distance of about 1000 meters interval along proposed alignment shall be carried out. The depth of trial bore shall be :
 - Upto 30 meters in soils (were no hard rock / soft rock is encountered);
 - On encountering hard rock, core drilling to a depth of atleast 3 meters in hard rock;
 - On encountering soft rock, core drilling to a depth of atleast 6 meters in soft rock.
- (c) The samples to be collected as per code IS 1892, IS 1904 and necessary tests along with bore hole details in the prescribed format of the code shall be furnished.
- (d) A broad assessment of the drainage condition and suggest measures that shall not inhibit the flow of water.

3.5 Track alignment

The Consultant shall provide detailed drawing of the approved alignment and also map the corridor characteristics: right of way, curvature, gradients, location, of building line, utilities on the corridor. The suggested alignment options should ensure minimum land acquisition and higher ridership.

3.6 Rolling Stock

The Consultant shall provide various design parameters and technology option for the rolling stock and also provide the cost for the technology. .

Rolling stock costs for the various technologies shall be obtained directly from equipment manufactures.

3.7 Ticketing system

The Consultant shall identify the suitable technology for ticketing based on the ridership envisaged for the Project.

3.8 Traction, communication & Signaling systems

The Consultant shall provide the design parameters for ancillary Electrical & Traction systems for the Project. The Consultant shall also provide the design parameters for communication & signalling system required for the Project. The Consultant shall also ensure sufficient safety measures to be undertaken during the design.

3.9 Station Building and Parking Area

The Consultant shall investigate and propose suitable locations for the station building. It shall provide site specific layout plan for each station building and indicate the land required. The layout plan should detail out the passenger facility requirements. The layout should be able to handle the projected traffic over the Concession Period. The station location identified shall not have horizontal curves.

The Consultant shall undertake field surveys and identify suitable locations for provision of parking space for commuters along with additional space for others in the locality for proper integration of other modes of transport. As far as possible, parking spaces shall not occupy much of the floor space.

3.10 Depot

The Consultant shall undertake field surveys and identify suitable locations for provision of Depot for the Project. The Depot shall be located such a way, that there is sufficient land available.

3.11 Operation Schedule

The Operation Schedule shall include the Operation cost, maintenance frequency, operation timetable, plans to reduce mean time to restore, inventory, etc. The Consultant shall also provide detailed operating costs that are based on the ridership, and suggested operating timetable. The operating unit costs will include the following:

- Track maintenance
- Staff
- Rolling stock maintenance
- Electrical maintenance
- Signals and communications maintenance
- Energy costs (breakdown of power for traction and ancillary power such as signaling, lighting, terminal, etc.)
- Inventory Plan to reduce mean time to restore the failures in service affecting equipments

3.12 Rapid Social Impact Assessment

The Consultant shall undertake social impact assessment especially the persons affected due to the Project and requiring resettlement and rehabilitation. The rehabilitation and resettlement guidelines of the government would be kept in view while undertaking the

assessment. He shall prepare a plan for resettlement and land acquisition, which shall include the following:

- (a) Prepare in accordance with guidelines of the Government, a draft Resettlement and Land Acquisition Plan;
- (b) Prepare area specific social assessments to support development of a locally relevant approach to resettlement which provides benefits to people in the Project area.
- (c) The social assessments should include gender and local aspects;
- (d) Determine the scope and magnitude of likely resettlement and land acquisition effects, and list likely losses of households, lands, business and income opportunities, as well as affected community assets and public buildings;
- (e) In consultation with local stakeholders, government and the Authority, develop an entitlement matrix, on the basis of the consultations, socio-economic surveys, and inventories of losses that will determine the amount of compensation in accordance with the guidelines and policies of the Government;
- (f) Prepare the plans with full stakeholder participation, including the Government and the Authority. Consult with affected persons and community-based organizations to ensure that all affected persons have been fully informed of their entitlements through the consultative processes initiated by the Government and the Authority. Ensure that communities and displaced persons understand the project, its impacts, and the responsibilities of the parties; and
- (g) Analyse and confirm the following aspects that will apply to land acquisition and resettlement in the project area:
 - i. Laws and regulations, including local practices;
 - ii. Budgetary processes for resettlement and land acquisitions;
 - iii. Schedules for these activities that are coordinated with the construction schedule; and
 - iv. Administrative arrangements and requirements.

3.13 Rapid Environment Impact Assessment

- (a) The Consultant shall undertake environment impact assessment of the Project as per provisions of the Applicable Laws on environment protection and identify a package of measures to reduce/eliminate the adverse impact identified during the assessment. An environmental impact assessment report and environmental management plan shall be prepared based on such assessment. The management plan shall include project specific mitigation and monitoring measures for identified impacts as well as management and monitoring plans to address them.
- (b) The Consultant shall also assist the Authority in conducting public hearings and addressing the comments and suggestions received during the EIA process for getting environmental clearance from the competent authority.

3.14 Typical Drawings and Designs

The Consultant shall arrive at the typical designs of various components conforming to the specifications and standards set-forth in accordance with good industry practice and due diligence. The specifications applicable for each system for quality in workmanship, material, and the reliability and safety of the engineering are to be provided by the Consultant. The DPR should include the following:

- a. **Structures:** typical designs of structures viz. foundation, substructure and superstructure (recommendations of maximum load tolerance to be considered for each pile in case of pile foundation) of the permanent way, station building and depot facilities,
- b. **Electrical & Traction Systems:** the electrical power supply system shall be designed and engineered based on the equipment being continuously in operation. The proposed capacities, ratings and safety requirements for the traction power supply and auxiliary power distribution shall be designed with reference to good industry practice. The overall power factor of electrical supplies be in accordance with power supply authorities stipulations. The power supply system, including the depot requirement shall be so designed to support the system operations, as per the operation plan. The designs shall be based on performance requirements.
- c. **Signalling & Telecommunication System:** A typical signalling and train control system shall be designed comprising, automatic train protection system, automatic train supervision system and automatic train operation system. The Consultant shall indicate the design headway of the system, keeping in view the maximum designed PHPDT. The design of the telecommunication shall have the features of reliability and maintainability with not less than 99.99% of all times.
- d. **Other Systems:** All other typical systems designed (viz. rolling stock, ticketing system, etc.) shall conform to the standard practices.

The Consultants are required to submit typical design and drawings for various facilities envisaged which are implementable. It shall be responsible for the accuracy of the design specifications for the Project. The designs shall be supplemented with explanatory drawings, statements, charts, notes as necessary.

3.15 Project cost

The Consultant shall work out detailed cost estimates of various components and prepare cost estimates of the Project with a break up of cost for each component separately. To the construction cost so arrived at, the Consultant may add 25% (twenty five per cent) thereof as a lump sum provision for physical (any work-slip) and price contingencies, interest during construction and other financing costs, pre-construction expenses etc.

3.16 Financial analysis

- 3.16.1 The Consultant shall provide the estimated construction costs, rolling stock cost (initial and during operation), operation and maintenance costs, ridership forecast, fare-box revenues, advertisement revenue, revenue from property development, etc. as part of its preliminary

financial analysis and appraisal of the Project. The Consultant shall, also provide a preliminary assessment of the financial viability of the Project with a view to estimating the likely IRR over a Concession Period of 10 (ten) years, 20 (twenty) years , 30 (thirty) years and 40 (forty) years respectively. It shall also provide assistance during the Bid Process for selection of the Concessionaire.

3.16.2 While undertaking the financial analysis and projecting the IRR, the following assumptions shall be adopted:

- (a) Capital cost shall be adopted as per estimates of construction cost to which 25% (twenty five per cent) shall be added for physical (any work-slip) and price contingencies, interest during construction, other financing costs etc;
- (b) debt equity ratio may be assumed as 70:30;
- (c) O&M costs may be estimated as per norms practised internationally;
- (d) the Concession Period may be fixed with reference to the year in which the projected traffic would exceed the design capacity of the Project; and
- (e) growth rate of traffic may be assumed at 5% (five per cent) per annum.

3.16.3 The Consultant shall:

- (a) calculate the NPV and EIRR for the Project. It will undertake sensitivity analysis by identifying the most critical factors and determine their impact on the EIRR, including varying project costs and benefits, implementation period, and combinations of these factors; and
- (b) conduct a risk analysis (using the Monte Carlo method) by considering the possible values for key variables based on records, and their occurrence probability.

3.16.4 If the IRR of the Project, based on the aforesaid calculations is less than 12% (twelve per cent), an effort should be made to reduce the capital costs in consultation with the Authority. This may be done either by omitting/ modifying some of the proposed station buildings and / or other structures or by phasing them, such that the IRR reaches a minimum of 12% (twelve per cent). All such modification shall take into account the change in ridership.

3.17 Assistance during bid process

The Consultant shall provide the required assistance to the financial consultant and the legal adviser in preparation of bid documents. The Consultant shall also participate in Pre-bid Conferences and assist in preparation of answers to the Bidders' queries on technical aspects of the Project and Bid Documents.

4. DELIVERABLES

The Consultant shall deliver the following deliverables (the “**Deliverables**”) for each of the two Corridors (Corridor 1 and Corridor 2) separately during the course of this Consultancy. The Deliverables for each of the two Corridors shall be so drafted that they could be given to the prospective bidders for guidance in preparation of their bids. Twenty hard copies and two soft copies (Auto Cad Version) in CDs of all the final reports, drawings, etc. shall be submitted to the Authority. For draft reports only five hard copies and one soft copy in CD shall be submitted to the Authority. The size of drawings shall be A-3 (maximum).

A. Inception Report

On commencement of the Consultancy, the Consultant shall within the period specified in clause 6.2 of this Schedule submit an Inception Report. The Inception Report shall include the Consultant’s submissions towards understanding of the RFP, and the Work Plan. The work plan shall also include inference from secondary data analysis and propose the locations for the traffic study.

B. Traffic Report

Within the period specified in clause 6.2, the Consultant shall submit Traffic Report after undertaking the activities envisaged under Traffic Study and demand assessment as specified in clause 3.2. The Report shall have following analysis

1. Inference from secondary data analysis
2. The CVC data would be analysed to depict hourly and daily variations
3. Estimate the ridership based on the inference from the Origin Destination Survey, Modal Shift and Willingness to Pay survey.

C. Option Report

Within the period specified in clause 6.2, the Consultant shall submit draft Option Report after undertaking all the activities envisaged under Task A activities and any other activity as considered appropriate by the Consultant. The Option Report should include evaluation of various technology options under various parameters such as traffic movement, likely ridership, Project Cost, operation cost, land acquisition requirements, maximum capacity the technology can handle, special structures required, integration with existing and proposed rail based system, etc. The Consultant shall also propose indicative track alignments (any restrictions, etc.), rolling stock options and the proposed indicative locations of stations.

The Consultant shall identify various alignment options (minimum 2) and also map the corridor characteristics: Project ROW, curvature, gradients, location, of building line, utilities on the corridor. The mapping could be on the google maps. (refer para 3.3.1)

The Report must clearly spell out the broad strategy for structuring the project in a manner that would restrict the likely viability gap funding, but however assuming an IRR of 12% (twelve per cent). In making this assessment, the Consultant shall follow the assumptions specified in paragraph 3.16 above. In particular, the Consultant must make realistic assumptions about the traffic projections and the resulting revenue streams with a view to making an assessment of the capital cost that can be sustained by such revenues. For this

purpose, the Consultant shall undertake traffic survey. The project components should be so formulated as to make the project viable.

In determining its aforesaid strategy, the Consultant shall also seek the advice of the Authority. In the event that the project does not seem viable, the Consultant shall not proceed with the Consultancy and the same shall stand terminated. The Consultant shall be entitled to a payment of 25% (twenty five per cent) of the Agreement Value upon such termination.

D. Report on Final Alignment

- (a) The Consultant shall undertake topographic survey for final alignment of the Project, on approval from the Authority. The Consultant shall submit a Report on the alignment together with proposed geometric improvements. The Consultant shall finalise the alignment after taking into account the comments of the Authority on the Report on Alignment. The work of preparing cross-sections and Land Plans, etc. shall be undertaken based on the finalised alignment.
- (b) Design specifications of rolling stock, track, station building, and other project related features.
- (c) The report shall have GAD, ROBs/RUBs and grade separators

E. Final Land Plan Schedules

A plan of the Project showing the Project ROW and encroachments, if any, together with a list of such encroachments along with their brief description. The report has to provided the survey no's. /plot no's of the land that is required for the Project. The Consultant shall assist the Authority by providing the land schedules in the required format, so as to initiate land acquisition process.

F. Utility Relocation Plans

Utility- wise preliminary plans together with approximate costs for shifting/relocation shall be provided for Project.

G. Reports on Environment and Social impact assessment

The Consultant shall submit reports on social impact assessment (Refer para 3.12) and environment impact assessment (Refer para 3.13).

H. Report on Traction, Communication & Signalling Design

The Consultant shall submit report on Traction & electrical design for the Project. The Consultant shall also submit the Communication & Signalling system design. The report shall also include the Operation Schedule. (refer para 3.11)

I. Detailed Project Report

The Detailed Project Report of the Project shall include the following:

- (i) *Sets of drawings*
 - (a) An Index Plan of the Project

- (b) Plans, L-sections, and typical cross-sections showing the existing features within the ROW (e.g. carriageway, structures, drains, crash barriers, service roads, utilities, adjoining land use, intersecting roads/access roads, road side developments etc.) with the proposed improvements marked thereon (e.g. raising of embankment, widening of embankment, location of median, placement of new carriageway, geometric improvements, widening or reconstruction of structures, new subways/underpasses/grade separators, service roads, arrangements for merging/diverging, traffic circulation, relocation of utilities, etc.) (Refer para 3.4.2).

(ii) Investigation Reports

- (a) Report on Traffic study (Refer para 3.2).
- (b) Engineering surveys and investigations (Refer para 3.4).

(iii) Detailed designs

Detailed designs of the Project and Project Facilities including civil structures, traction, signalling, and the additional requirements including:

- (a) Ridership forecasting for 10 (ten), 20 (twenty), 30 (thirty) and 40 (forty) years.
- (b) Track design
- (c) Vertical and Horizontal Alignment
- (d) Integration design with existing and proposed railway system.

(iv) Detailed costing

- (a) BOQ.
- (b) Cost Estimate for construction of Project.
- (c) Total Project Cost (Refer paras 3.15 and 3.16).

(v) Implementation schedule

- (a) Construction period.
- (b) Likely delays, if any, on account of land acquisition.
- (c) Power requirements (traction, terminal lighting, air conditioning of terminal, etc.)
- (d) O&M expenses

J. Schedules of Concession Agreement

The Consultant shall separately provide Technical Schedules of the Concession Agreement for the Project with all supporting documentation relating to these Schedules. Explanation of the specific requirements for the Project is given in para 5 below.

K. Financial analysis

A preliminary financial assessment of the Project indicating the likely IRR for a 10 (ten) year, 20 (twenty) year, 30 (thirty) year and 40 (forty) year Concession Period respectively (Refer para 3.16).

The Consultant shall, based on the assumptions specified in paragraph 3.16, indicate the likely viability gap funding for the project. In case the viability gap funding projected in the DPR exceeds the projection in the Options Report by more than 10% (ten per cent) of the capital costs, a deduction of 10% (ten per cent) of the Agreement Value shall be made from the payment due to the Consultant. Such deduction shall be deemed to be mutually agreed genuine pre-estimated compensation and damages suffered by the Authority on account of inaccurate projections leading to higher costs.

L. Assistance during bid process

The Consultant shall provide the required assistance to the financial consultant and the legal adviser¹ in preparation of bid documents. The Consultant shall also participate in Pre-bid Conferences and assist in preparation of answers to the Bidders' queries on technical aspects of the Project and Bid Documents.

¹ To be appointed by BARL

5. SPECIFIC REQUIREMENTS FOR THE PROJECT

For preparing technical Schedules of the Concession Agreement and other specific requirements, the Consultant shall:

- (a) Based on the Consultant's assessment of the time period for phasing the project and the 'triggers' therefore
- (b) Provide a list indicating locations of encroachments on the Project Site along with a brief description thereof.
- (c) Provide utility wise preliminary plans for shifting of existing utilities and construction of new utilities along or across the Project.
- (d) Provide a list of utility services which are required to be carried over structures.
- (e) Provide a list of structures for the Project including the Project Facilities.
- (f) The possibility of phasing the stations.
- (g) Specifically bring out the requirements of any special structures like cable stayed or special super structure for any particular bridge on the Project .
- (h) Provide a list of structures which would have to be built over the existing structure.
- (i) Indicate proposed location of station buildings and depot for the Project .
- (j) Provide an estimate of the number of trees to be planted as compensatory afforestation.
- (k) Provide total power requirement shall be provided.
- (l) Provide a list of sections/locations where tunnels may be required.
- (m) Provide a list of drawings that the Authority may require the Concessionaire to provide to the Independent Engineer .

6. TIME AND PAYMENT SCHEDULE

- 6.1 The total duration for preparation of the DPR and Schedules to the Concession Agreement shall be 14 (fourteen) weeks from the approval of Options Report, excluding the time taken by the Authority in providing the requisite documents or in conveying its comments on the Draft DPR. The Consultant shall deploy its Key Personnel as per the Deployment of Personnel proposed. Intermittent services will be required beyond the submission of Final DPR and until the end of 52 (fifty two) weeks from Submission of Final DPR or two months after the signing of the Concession Agreement, whichever is earlier. The man-days required for the intermittent services shall be provided by the Consultant as per the Agreement.
- 6.2 Time schedule for important Deliverables (the “Key Dates”) of the Consultancy and the payment schedule linked to the specified Deliverables is given below:

Payment Schedule for Corridor 1

Key Date No (KD)	Description of Deliverables	Weeks from the Effective Date	Payment for Corridor 1
KD1	Inception Report	4	Nil
KD2	Traffic Report	8	7.50%
KD3	Draft Option Report	15	3.75%
KD4	Option Report	18	7.50%
Key Date No	Description of Deliverables	Weeks from approval of Options Report	Payment for Corridor 1
KD5	Report on Final Alignment	4	7.50%
KD6	Report on Land Plan Schedules and Utility Relocation	6	7.50%
KD7	Report on Traction & Signalling Design, including Operation Manual	7	3.75%
KD8	Report on Environment and Social Impact Assessment	8	7.50%
KD9	Draft DPR including Schedules to the Concession Agreement	10	11.25%
KD10	Final DPR	14 ²	11.25%
KD11	Completion of Services (identification of Preferred Bidder by the Authority)	52 weeks from the submission of Final DPR	7.50%
	Total		75%

² Excludes the time taken by the Authority in providing its approval / comments on Option Report and Draft Reports

Payment Schedule for Corridor 2

Key Date No (KD)	Description of Deliverables	Weeks from the Effective Date	Payment for Corridor 2
KD1	Inception Report	4	Nil
KD2	Traffic Report	8	2.50%
KD3	Draft Option Report	15	1.25%
KD4	Option Report	18	2.50%
Key Date No	Description of Deliverables	Weeks from approval of Options Report	Payment for Corridor 2
KD5	Report on Final Alignment	4	2.50%
KD6	Report on Land Plan Schedules and Utility Relocation	6	2.50%
KD7	Report on Traction & Signalling Design, including Operation Manual	7	1.25%
KD8	Report on Environment and Social Impact Assessment	8	2.50%
KD9	Draft DPR including Schedules to the Concession Agreement	10	3.75%
KD10	Final DPR	14 ³	3.75%
KD11	Completion of Services (identification of Preferred Bidder by the Authority)	52 weeks from the submission of Final DPR	2.50%
	Total		25%

The Authority shall endeavour to express its approval for Task B activities within 8 weeks of submission of Options Report from Consultant.

The Consultant shall get four week for submission of the Final DPR after comments of the Authority are provided.

- 6.3 The TOR for the Consultant envisages assistance in the process of public hearings, etc. in respect of the Environment Impact Assessment (EIA) of the Project specified in para 3.13. In the event that the process cannot be completed within the period specified herein for completion of Final DPR, the EIA Report may be completed and submitted to the Authority within an extended period of 6 (six) weeks after submission of the DPR. A sum equal to 5% (five per cent) of the total payment due shall be withheld and paid to the Consultant upon submission of the EIA Report and environment management plan.
- 6.4 Mobilization Advance upto 10% (ten per cent) of the total Agreement Value shall be paid on request against Bank Guarantee of a Scheduled Bank. This shall attract 10% (ten per cent) simple interest per annum and shall be adjusted against the first four bills in four equal installments and the accrued interest shall be recovered from the fifth bill.

³ Excludes the time taken by the Authority in providing its approval / comments on Option Report and Draft Reports

- 6.5 10% (ten per cent) of the Agreement Value (aggregate of payments due for Milestones KD 11 for each Corridor) has been earmarked as final payment (“Final Payment”) to be made to the Consultant upon execution of the Concession Agreement.. In an event the Concession Agreement does not get executed within 52 weeks from the date of submission of Final DPR, the Final Payment shall not become due to the Consultant, save and except the costs incurred for meeting its reimbursable expenses during the period after submission of Final DPR, including travel costs and personnel costs, at the agreed rates. However, the reimbursable expense shall not be greater than Final Payment.

7. MEETINGS

The Authority may review with the Consultant, any or all of the documents and advice forming part of the Consultancy, in meetings and conferences which will be held in Bangalore at the Authority's office. Further, the Consultant may be required to attend meetings and conferences with pre-qualified Bidders or the Selected Bidder. The expenses towards attending such meetings during the period of Consultancy, including travel costs and *per diem*, shall be reimbursed in accordance with the Financial Proposal contained in Form-2 of Appendix-II of the RFP. The days required to be spent in Bangalore shall be computed at the rate of 8 man hours a day in case of an outstation Consultant. For a Consultant having its office within the Karnataka, the time spent during meetings shall be calculated as per actuals. No travel time shall be payable except in case of an expatriate Consultant who will be entitled to claim actual travel time, subject to a maximum of 10 (ten) man hours for a return journey.

8. CONSULTANCY TEAM

8.1 The Consultant shall form a multi-disciplinary team (the “**Consultancy Team**”) for undertaking this assignment. The following Key Personnel whose experience and responsibilities are briefly described herein would be considered for evaluation of the Technical Proposal. Other expertise such as that required for financial analysis, pavement design, material investigation characterisation, quantity survey, social impact assessment etc. for the Project shall be included in the Team either through the Key Personnel specified below or through other Professional Personnel, as necessary.

(a) Team Leader

Educational Qualifications	Graduate in Engineering
Essential Experience	20 years in planning, project preparation and design of projects.
Job responsibilities	He will lead, coordinate and supervise the multi-disciplinary team. It will be his responsibility to guide the team in arriving at solutions within the constraints specified in the TOR.
Minimum time required on site	Task A: 15 days and Task B: 40 days

(b) Civil Engineer

Educational Qualifications	Masters in Structural Engineering
Essential Experience	14 years in analysis of condition of existing bridges and design of railway bridges, flyovers, road over bridges
Job responsibilities	He will be responsible for preparation of overall design of the Monorail/LRT system and design of all the structures and other Project Facilities.

(c) Traction and Electrical Engineer

Educational Qualifications	Graduate in Electrical Engineering
Essential Experience	14 years experience in designing systems for Railways.
Job responsibilities	He will be responsible for the design of the traction system and design of the electrical system both in station and along the track.

(d) Telecommunication Engineer

Educational Qualifications	Graduate in Telecommunication / Electronics / Electrical Engineering
Essential Experience	14 years experience in surveying on projects.
Job responsibilities	He will be responsible for the design of the signaling & telecommunication for the Project.

(e) Traffic-cum-Safety Expert

Educational Qualifications	Post Graduate in Traffic and/or Transportation Engineering or Planning
Essential Experience	14 years in traffic surveys and studies, traffic safety facilities, etc. on projects.
Job responsibilities	He will be responsible for assessment of ridership forecast on the project and suggesting broad layout of intersections, interchanges, grade separators and safety devices.
Minimum time required on site	Task A: 15 days

(f) Rolling Stock Expert

Educational Qualifications	Graduate in Mechanical Engineering.
Essential Experience	14 years in planning /procuring and design of Rolling Stock.
Job responsibilities	He will be responsible for design and technology of the Rolling Stock.

(g) Environmental Expert

Educational Qualifications	Masters/Bachelor in Environmental Science or equivalent
Essential Experience	7 years in environmental studies
Job responsibilities	He will conduct the Environmental Impact Assessment of the Project
Minimum time required on site	Task B: 25 days

8.2 The Consultant shall establish a Project Office at a suitable location in Bangalore for efficient and coordinated performance of its Services. All the Key Personnel shall be deployed at this office during the minimum time required on site mentioned in clause 8.1 as specified in the Manning Schedule forming part of the Agreement. The authorised officials of the Authority may visit the Consultant’s Project Office any time during office hours for inspection and interaction with the Consultant’s Personnel. It is not expected of the Consultant to carry out the operations from the Head/Home Office. However, he may do so for the remaining consultancy services beyond the minimum time required on site mentioned in clause 8.1.

8.3 The Consultant shall mobilise and demobilise its Professional Personnel and Support Personnel with the concurrence of the Authority and shall maintain the time sheet/ attendance sheet of the working of all Personnel in the Project Office. These time sheets/ attendance sheets shall be made available to the Authority as and when asked for and a copy of such record shall be submitted to the Authority at the end of each calendar month.

9. REPORTING

- 9.1 The Consultant will work closely with the Authority. The Authority will be establishing a Working Group (the “WG”) to enable conduct this assignment. A designated Project Director of the Authority will be responsible for the overall coordination and project development. He will play a coordinating role in dissemination of the Consultant’s outputs, facilitating discussions, and ensuring required reactions and responses to the Consultant.
- 9.2 The Consultant may prepare Issue Papers highlighting issues that could become critical for the timely completion of the Project and that require attention from the Authority.
- 9.3 The Consultant will make a presentation on the inception report and Option Report for discussion with the WG. This will be a working document. The Consultant is required to prepare and submit a monthly report that includes and describes, *inter alia*, general progress to date; data and reports obtained and reviewed, conclusions to date, if any; concerns about availability of, or access to, data, analyses, reports; questions regarding the TOR or any other matters regarding work scope and related issues; and so on. The Consultants’ work on the TOR tasks should continue while the report is under consideration and is being discussed.
- 9.4 Regular communication with the WG and the Project Director is required in addition to all key communications. This may take the form of telephone/ teleconferencing, emails, faxes, and occasional meetings.
- 9.5 The Deliverables will be submitted as per schedule provided in this RFP.

10. COMPLETION OF SERVICES

- 10.1 All the study outputs including primary data shall be compiled, classified and submitted by the Consultant to the Authority in soft form apart from the reports indicated in the Deliverables (para 4). The study outputs shall remain the property of the Authority and shall not be used for any purpose other than that intended under these Terms of Reference without the permission of the Authority. The Consultancy shall stand completed on acceptance by the Authority of all the Deliverables of the Consultant and execution of the Concession Agreement or 52 (fifty two) weeks from the submission of Final DPR, whichever is earlier. The Authority shall issue a certificate to that effect. The Consultancy shall in any case be deemed to be completed upon expiry of 1 (one) year from the submission of Final DPR, unless extended by mutual consent of the Authority and the Consultant.
- 10.2 10% (ten per cent) of the Agreement Value has been earmarked as lump sum payment to be made to the Consultant upon execution of the Concession Agreement (the “**Lump Sum Payment**”). In consideration of the Lump Sum Payment, the Consultant shall provide such services as may be required by the Authority for concluding the Bid Process and execution of the Concession Agreement. In the event the concession agreement is not signed within one year of the submission of Final DPR, the Consultancy shall stand completed as specified in Clause 10.1 above, but no Lump Sum Payment shall be due to the Consultant, save and except the costs incurred for meeting its expenses during the period after submission of Final DPR, including travel costs and personnel costs, at the agreed rates specified in Annex-3 of the Agreement, which shall be reimbursed to the Consultant as per actuals. For the avoidance of doubt, it is agreed that reimbursement of such costs on travel and personnel shall be due to the Consultant as aforesaid, even if the Preferred Bidder is not identified.

Attachment A to the TOR

Topographic Survey

The field surveys would be sufficiently detailed to meet the following objectives:

- (i) Finalising the alignment and diversion of road (carriageway) including location of new bridges and other grade separated structures.
- (ii) Preparation of Land Plans for acquisition of land where necessary.
- (iii) Plans for shifting and relocation of utilities.

The field surveys shall be carried out using high precision instruments, i.e. total stations.

The width of survey corridor shall be as under:

- (i) the survey shall extend to a minimum of 100 meter on either side of the Track centre line and shall be for sufficient width to allow improvements, including Project Facilities, diversion of road

The important features of the survey conducted and the reference points taken in consideration like GPS bench mark, temporary and permanent bench marks, etc. shall be listed in appropriate formats.