

## PROJECT NOTE

### 1.1 INTRODUCTION

The Ministry of Road Transport and Highways (MORTH), Government of India has proposed "Bharat Mala Pariyojana" an Umbrella scheme of road development project through National Highways Authority of India (NHAI), National Highway and Industrial Development Corporation (NHIDC) and state Public Works Departments (PWD) at an estimated cost of INR 5,35,000crores. This is the second largest highways construction project in the country after NHDP, in that almost 50,000 km of roads targeted across the country. This project aim to improve connectivity particularly on economic corridors, border areas and to remote areas with an aim of rapid and safe movement of cargo to boost exports. International trade considered as a key aspect in this scheme and northeastern states have given special focus. The project cleared by the Union Cabinet on October 25, 2017.

The ambitious project expected to create nearly 100million man days of jobs during the construction and subsequently to about 22million jobs of the increased economic activity across the country. The construction will be carried out through many means including debt funds, budgetary allocation, private investment, toll operator transfer etc. The total length of around 34,800km considered in phase 1 including

- Economic corridors of around 9,000km,
- Inter-corridor and feeder routes of around 6,000km,
- National Corridors Efficiency Program of about 5,000 km roads
- Border and international connectivity roads of around 2,000 km,
- Coastal and port connectivity roads of around 2,000 km,
- Expressways of around 800 km
- NHDP roads of 10,000km

In pursuance of the above program, NHAI appointed M/s Louis Berger Consulting Private Limited, New Delhi as Consultants to carry out the Consultancy Services for preparation of DPR for development of Economic Corridors, Inner corridors, feeder Routes and Costal Roads to improve the efficiency of fright movement in India - Lot 3/Andhra Pradesh, Karnataka, Goa & Kerala, / Package 1. The project consists the following stretches of roads finalized as per final Inception Report.

1. Aurad – Bidar road
2. Mydukur – Badvel road
3. Belagavi (Belgaum) – Sanquelim with a proper Connectivity to NH4A and NH 17 through existing SH
4. Chittoor – Thatchur Greenfield alignment
5. Balance Portion of Satellite Ring Road of Bangalore (West Side) including connection to Hosur town to ensure ring road connectivity for Bangalore.

The carriageway width of this section is predominantly of intermediate lane standard (5.5m to 6m) with earthen shoulders (0.9m to 1.5m) on both sides. The existing geometric of the road is fair however; deficiencies in horizontal and vertical geometry noted and propose for improvement as far as possible in the available right of way. The traffic intensity on this section is low.

The existing Right of Way details as obtained from Executive Engineer, PWP &IWTD Division Bidar, Karnataka indicates @22.5m on both sides from the existing centerline of road. The proposed project road comprises of 54-at grade junctions. There is no railway level crossing, ROB/RUB in this section. There is one Minor Bridge and six minor bridges exist in this section. In addition, four vented causeways also exist in this stretch. There are forty-six numbers of culverts exist in this section of the road (Hume pipe 34no, Box type 5no and slab type 7no).

### 1.3 Socio Economic Profile

Social indicators are a set of indicators that measure the project influence area towards the policy objectives. Demographic Indicators are a scientific measure of human population dynamics. Economic indicators allow analysis of past economic performance and predictions of future performance. A list of Socio – Economic Indicators considered in the preparation of the Socio – Economic Profile are, population, male / female ratio, health, Household, literacy, poverty, employment, gross domestic product (GDP), net state domestic product (NSDP), per capita income, agriculture & irrigation , industry , and transportation

### 1.4 TRAFFIC SURVEYS, ANALYSES AND FORECAST

#### 1.4.1 Traffic Surveys and Analyses

Various traffic surveys and analysis have been carried out for addressing the objectives and issues pertaining to widening and strengthening of the project road. The surveys conducted include 7- day Volume Count, Turning Movement Survey, Origin & Destination Survey, Speed & Delay Survey, etc. The study aims at obtaining the existing traffic and travel characteristics on the project road and forecasting the same for the project horizon year considering various principal streams and various scenarios. The results of this analysis will form inputs for developing capacity augmentation proposals, designing the pavement, design of intersections, decisions regarding grade separators, pedestrian facilities, and carrying out economic and financial analysis.

Considering the traffic generation/diversion point, the project stretch divided into one homogeneous section for the purpose of analysis and presentation of traffic and travel characteristics. **Table 1.1** depicts the details of homogeneous traffic section.

**Table 0.1: Homogeneous Traffic Section**

S No	HS No.	Start Chainage/Place	End Chainage/Place	State/Highway
1	11	Aurad (0km)	Bidar(44.878km)	NH 161A

The average daily traffic (ADT) has been converted to average annual daily traffic (AADT) using seasonal correction factors. The AADT is the input for various analyses like traffic forecast, capacity augmentation, pavement design, economic and financial analysis etc. Table below gives the ADT plying on the project road.

**Table 0.2: Summary of ADT & AADT at count locations**

S No	Homogenous section	Location (km)	ADT		AADT	
			No	PCU	No	PCU
1	HS 11	30	3991	4095	4160	4224

#### 1.4.2 Traffic Forecast

Traffic demand plays the most important factor in deciding the type of infrastructure facility to be provided. This in turn determines likely costs to develop and benefits arising out of the improvement. The highway project require significant investment and thus prediction of traffic demand becomes an important task and need to be carried out accurately. For the design of pavement, plan for future maintenance program as well as capacity augmentation and for economic & financial evaluation, it is necessary to have realistic estimation of the size of traffic to the concession period.

Traffic forecasting is made by determining the past trend of traffic flow and by the use of economic models developed to co-relate past vehicle registration data with economic indices such as per capital income (PCI), net state domestic product (NSDP) and gross domestic product (GDP). By using the elasticity values obtained from the economic models and the likely rate of growth of indicators, the mode wise growth rates are obtained. Applying these growth rates, future traffic volume is estimated. The traffic forecast are given in the Table below.

**Table 0.3: Projected sectional AADT in PCU**

Sections	2017	2020	2025	2030	2035	2040	2045
HS1	4224	5589	10629	17222	27904	45007	72019

#### 1.4.3 Capacity analysis

**Table 0.4: Section wise Capacity requirement**

Year	2 Lane		4 Lane		6 Lane
	Earthen	Paved	Earthen	Paved	Paved
	2020	2020	2028	2030	2037

Based on options and as per economic parameter indicators and as discussed with NHAI four lanes proposals for the project submitted. However, considering the current economic scenario, cost of construction & land acquisition cost and as decided upon in the PATSC, it is revised to consider the two lanes option without any fresh land acquisition to Koutha realignment and to encompass the same existing alignment. This was conveyed through PIU /Gulbarga.

## 1.5 SURVEY AND INVESTIGATIONS

### 1.5.1 Topographic Survey

The broad outlines of the scope of services are:

- i) Fixing of control frame work comprising of the following activities:
  - a) Establishment of Main Control by DGPS
  - b) Establishment of Subsidiary Control Points by Total Station.
  - c) Establishment of Height Control by Digital Level
- ii) Detailed Topographical Survey using LiDAR based survey.
- iii) Additional survey as required for geometric improvements like designing of junctions, ROB, bridge site, hydrological requirements and bypass/realignment.

The detailed topographical survey for the road corridor is completed. However additional surveys required are yet to be complete in realignment portion.

### 1.5.2 Soil, Material and Pavement Investigation

#### *Field & Laboratory Investigation on Existing Subgrade Soil (Main Carriageway)*

##### **Field Tests**

In field investigation for existing subgrade, test pits of size 0.60m x 0.60m were excavated up to the subgrade level at the interface of the earthen shoulder and the carriageway. The general observations noted during the field investigation at each test pit are reported below.

- Details of the pavement composition
- Visual identification of subgrade soil
- Field dry density of the sub-grade with Core cutter method
- Field moisture content by oven dry method
- DCP test on sub-grade extending up to about 80 cm depth

##### **Dynamic Cone Penetration (DCP) Test**

DCP test was carried out as recommended by TRRL (U.K.) vide Road Note No. 31.

##### **Laboratory Tests on Existing Subgrade (Main Carriageway)**

Following laboratory tests carried out on the disturbed soil samples of test pits.

- Particle size analysis
- Liquid Limit and Plasticity Index
- Modified Proctor Compaction test

CBR test in 4 days (96 hours) soaked conditions at three energy levels corresponding to 10, 35 & 65 blows of heavy compaction rammer. The CBR at 97% of MDD for the collected samples varies from 3.15% to 13.65%.

### Existing Pavement Composition

Test pits dug at regular interval to obtain pavement composition details such as pavement course, material type, and thickness. Total thickness of flexible section of the pavement of the main carriageway varies from 310mm to 750mm except in one location it is noted as 250mm. The thickness of the bituminous surfacing varies from 55mm to 135mm.

### 1.5.3 Survey and Investigation of Borrow Materials for Construction

#### Borrow Area Soil

Extensive survey was conducted to locate the potential source of borrow area soil required for the construction of embankment and subgrade. Four locations of borrow areas are identified along the project road at distance of 0.1km to 5km. Generally, soil samples were collected from 1.5m to 2.0 m depth of the pit dug at the center of the borrow area. The tests indicate that the borrow area soil sample CBR are in the range of 12.08% to 13.91%.

#### Stone Metal

Two stone quarries were identified as the potential source of coarse aggregates required for road construction in the vicinity along the project road. It can be concluded that material from all the quarries fulfils the requirement of MORTH specifications.

#### Sand

One source identified as potential source for sand from Manjra River. The samples collected from all sources are within the permissible limit for use in construction works.

#### Water

Water samples were collected from available sources (hand pump and river) located within the project influence area and tests were conducted to evaluate its suitability for use in construction work. The test results water samples reveal that the water is safe for all construction purposes.

#### Fly ash

The nearest Coal-based Power Plant is located about 250km away from the project road.

## 1.6 DESIGN STANDARDS AND SPECIFICATIONS

Manual of Specifications and Standards for two lanes of Highways with Paved Shoulder' IRC: SP: 73-2018 adopted

#### Design proposals

Two lanes with paved shoulder configuration for the entire project is proposed. The horizontal and vertical geometry will be improved as possible within the available right of way including in Koutha realignment where the horizontal geometry are substandard.

## 1.7 PAVEMENT DESIGN

Pavement performance ensured to support the projected traffic loading throughout the design period. Its cost represents a major proportion of the total construction cost. The project road has one homogeneous section based on the traffic, CBR and existing Pavement composition. During the Feasibility study three different types of pavement options considered (Flexible type/Cement Treated Base and Granular Sub-base/ Rigid Pavement) considering merits and demerits and its life cycle costs Flexible pavement option is recommended. The composition of the paved shoulder will be same as that of main carriageway.

**Table 0.5: Pavement Composition – Granular Base and Granular Sub-base**

Bituminous Concrete (BC) :PMB40 (IRC:SP:53)	40 mm
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Scenario 2: Base Costs Plus 15% and Base Benefits	12.7	173.36
Scenario 3: Base Costs and Base Benefits Minus 15%	14.3	663.17
Scenario 4: Base Costs Plus 15% and Base Benefits Minus 15%	11.9	(40.92)

EIRR for current project proposal give a higher value as compared with the cut-off rate (12%). Also, the sensitivity analysis also shows that for current project proposal, considering the worst case, EIRR remains at cut-off rate. It is, therefore concluded that the project is economically viable for current project.

#### 1.10 FINANCIAL ANALYSIS

The financial analysis for the project is carried out as per requirement. It concluded that the project is not viable on commercial format. The traffic on the project stretch is considerably low. At **40% grant component**, the Project IRR and Equity IRR are coming at **6.9% and 6.8%**.

#### 1.11 RECOMMENDATIONS

- The existing Intermediate/2 lane road is proposed to upgrade to 4lanes with paved shoulder configuration.
- All widening proposals will be accommodated within the existing right of way of 45m including in Koutha
- Flexible pavement is recommended considering life cycle cost
- The total civil construction cost is INR 276.25crores and the cost per km comes out to be INR 5.42 crores.
- The project is economically viable and The Project IRR and Equity IRR are coming at 6.9% and 6.8% at 40% grant component. Thus, not viable for BOT/HAM mode of bidding.

The project section is part of proposed feeder corridor under Bharatmala scheme and so due to expand network of roads, this corridor has potential of traffic generation. This road also forms vital connectivity part to Hyderabad and further south. Thus, it is proposed to take for upgradation consideration.

  
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