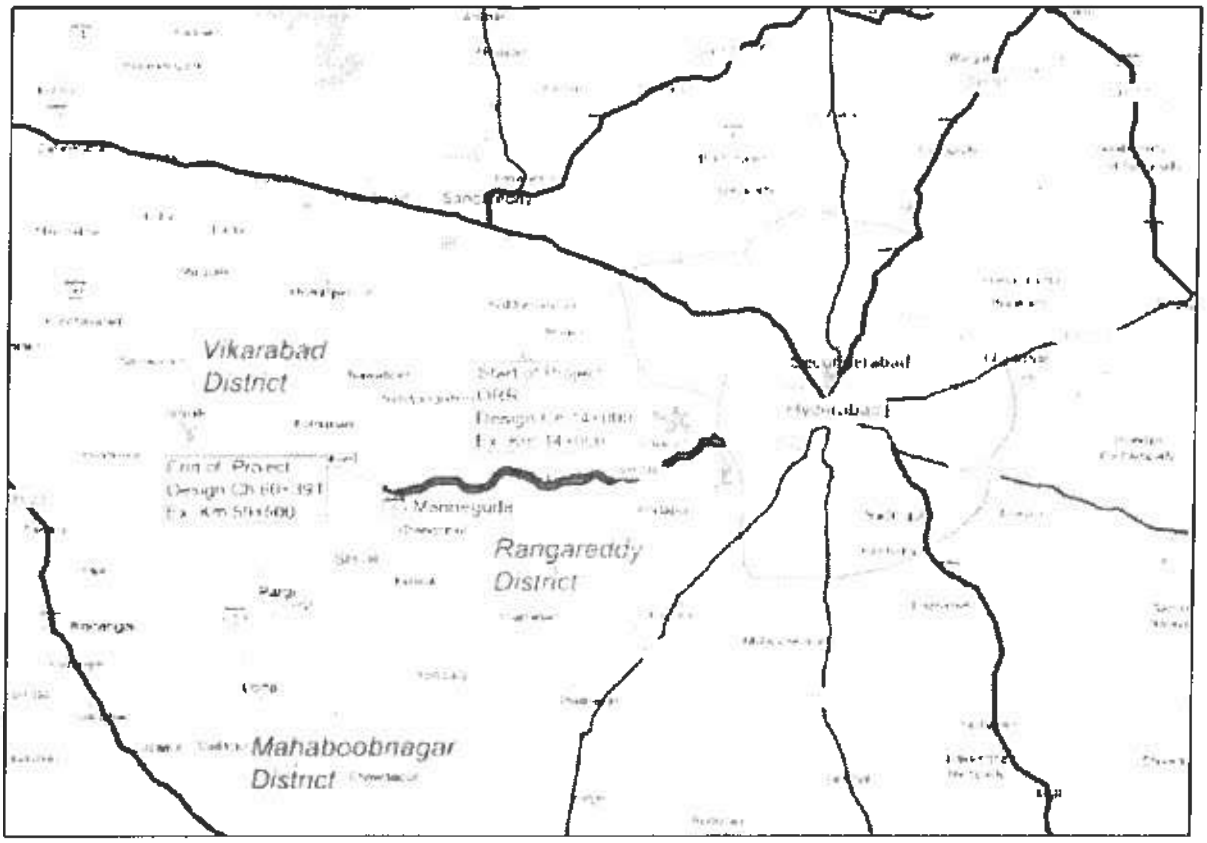
NATIONAL HIGHWAYS AUTHORITY OF INDIA
(Ministry of Road Transport and Highways)
G-5 & 6, Sector-10, Dwarka, New Delhi - 110075

# Techno-Economic Feasibility Study and Transaction Advisory Services for 7 State Roads in the State of Telangana




# FINAL FEASIBILITY REPORT

## Hyderabad - Manneguda Road
## (From Existing Ch: 14/000 to Existing Ch: 59/500)

## Main Report

## September 2018

FEEDBACK INFRA
Making Infrastructure Happen

Feedback Infra Private Limited
No: 14, Langford Garden, 1st Floor, Langford Avenue
Lalbagh Road (near Richmond Circle),Bangalore-560025

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# CHAPTER 0 – EXECUTIVE SUMMARY

## Hyderabad - Manneguda Road

# CHAPTER 0 EXECUTIVE SUMMARY

## 0.1 INTRODUCTION

### GENERAL

The Project Road is section of SH-4(declared as NH-163), which starts at Existing Ch: 14/000 (design CH 14+000) Hyderabad (from ORR- Appa Junction) and ends at Existing Ch: 59/500 (Design Ch: 60+391) near Manneguda. The design length of the project stretch is 46.391 km. The project stretch passes through Rangareddy and Vikarabad Districts and mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra reddy nagar. This chapter will give a general description of the project, existing features and design proposals to upgrade the facility to Four lane divided highway.

## 0.2 PROJECT BACKGROUND

The State Government accorded Administrative Sanction for 38 road projects to take up consultancy services for Techno-Economic Feasibility and Transaction Advisory Services by engaging experienced consultants. Out of which, seven State roads are taken up by the State of Telangana.

As per the GoT's strategic vision for the provision, operation and maintenance of infrastructure in the State, it has identified the need to upgrade and operate the high traffic roads in the State through public private partnership arrangements. The Client has the onus of procurement of concessionaires to Design, Finance, Construct, Maintain, operate and Transfer the roads by tapping into central government financing if required.

**The 7 roads being considered for Techno-Economic feasibility are as below:**

| Sl. No | Name of the Road | Awarded Length in km as per original contract Agreement | Modified Length in km as per | Additional Length in km |
|---|---|---|---|---|
| 1 | Sanga Reddy – Narsapur – Toopran – Gajwel – Bhongir – Chityal Road ( Km 0/0 on SH-17 to MDR km 43/8) | 164 | 164 | - |
| 2 | Mahaboobnagar – Nalgonda Road (Km 0/0 to km 163/2). | 163.2 | 163.2 | - |
| 3 | Hyderabad – Narsapur – Medak Road (Km 16/0 to Km 78/0) | 28 | 62 | 34 |
| 4 | Jangaon – Cheryal – Duddeda road (Km 0/0 to Km 46/4) | 46.4 | 46.4 | - |
| 5 | Jangaon – Suryapet Road (Km 0/0 to Km 84/4) | 84.4 | 84.4 | - |
| 6 | Suryapet – Mothey – Khammam Road (Km 0/0 to Km 58/3) | 58.3 | 58.3 | - |
| **7** | **Hyderabad – Bijapur Road (Hyderabad – Mannegudda – Pargi –** | **36.4** | **108.7** | **81.9** |

| Sl. No | Name of the Road | Awarded Length in km as per original contract Agreement | Modified Length in km as per | Additional Length in km |
|---|---|---|---|---|
| | Kodangal – Karnataka Border) (Km 14/0 to Km 132/300) | | | |
| | Total | 580.7 | 696.6 | 115.9 |

Roads and Buildings Department PPP wing, Government of Telangana has appointed M/s. Feedback Infra Pvt. Ltd. for providing the required consultancy services for PPP Techno-Economic Feasibility Study and Transaction Advisory Services for 7 State Roads in the State of Telangana.

The project road (SH-4) Hyderabad-Moinabad-Chevella-Mannegudda is declared as National Highway and named as NH-163. The project is transferred to National Highway Authority of India through tripartite-supplementary agreement dated 28th April 2017 between National Authority of India and Roads & Building Department of Telangana and Feedback Infra Pvt. Ltd.

The present Technical Feasibility Report is pertaining to Hyderabad-Moinabad-Chevella-Mannegudda Road.

## 0.3 SCOPE OF THE PROJECT

The original scope of work for the Transaction Advisor is divided into these two phases:

**Phase-1: Techno-Economic Feasibility study and Preliminary Engineering Design:** The main objective is to establish the Technical, Economical, and Financial viability of the selected roads and prepare preliminary engineering designs and preliminary project reports for the identified roads. The viability of the project designed as a partially access controlled facility shall be established taking in to account the requirement with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, underpasses / flyovers / ROB's rehabilitation and widening of existing and / or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates vis-à-vis the investment and financial return through toll and other revenues.

The scope of the project is to establish the Technical, economical and financial viability of the project and prepare Techno-Economic Feasibility Study and Preliminary Engineering Design Report for rehabilitation and upgrading of the existing 7 State roads to 2-lane with paved shoulders/ 4-lane with central median/ divided carriage way configuration in a sound technical and most economical manner, taking into consideration the environment and social aspects of the area.

The transaction advisory services role will be for procurement of construction agency. This must enable the GOT to determine:

- **Full road life costs;**
- **Affordability limits;**
- **Risks and their costs and**

- **Optimal value-for-money methods of delivery.**

**Phase 2: Procurement:** On the basis of the feasibility study, a solution is decided on, and if the Client requires it, the Transaction advisor will be required to provide the necessary Technical, Legal and financial advisory support for the procurement of private parties. This must be in compliance with all relevant National and State regulation policies, and will include training of staff of the Client on contract administration / management.

- To prepare bid documents for tendering purposes suitable to meet requirements of international standards;
- Preparation of Bid documents on the viability of the project to suit for various types of construction and
- Advisory services in finalization of contract and providing services in sanction of VGF from Government of India etc.

Further as per revised scope conveyed vide letter no. NHAI/Tech/Hyd-man/TS/2017/96557 dated 15.03.2017. The following documents are required to be prepared as per rearrangement of payment schedules within contact price:

| | |
|---|---|
| *Stage I&II* | *Signing of Agreement and Mobilization of Techno Economic Feasibility Report.* |
| *Stage III* | *Preparation of revised Technical Feasibility Report as per prevailing NHAI Guidelines.* |
| *Stage IV* | *Preparation of Technical Schedules and Bid Documents.* |
| *Stage V* | *Preparation of Land Plan Schedules* |
| | *Preparation of 3(a) and 3 (A) notifications* |
| | *Preparation of 3 (D) notifications including FBMs and Sub-Division plan etc. along with any other LA documents as per requirements of NHAI/CALA, peg marking at site and Utility Relocation.* |

The present report forms a part of Phase – III (Revised Technical Feasibility Report).

## 0.4 PROJECT DESCRIPTION

The Project stretch starts at Existing km 14.000 Hyderabad (Outer Ring Road) and ends at Existing km 59/500 before Manneguda town. The total existing Length of the project stretch is 45.500 km. The project stretch passes through Rangareddy and Vikarabad Districts and mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra reddy nagar. Many Schools, Religious Structures are situated along the project road.

The existing project road is a predominantly 2-lane carriageway with average width of 7m and 4-Lane exists from existing km 14/000 to km 25/470, and km 40/100 to km 43/100 with median width of 0.5m. The existing pavement is predominantly flexible pavement throughout the stretch. The existing pavement for the entire project stretch is flexible pavement. The condition of the pavement varies from Good to Poor. Earthen Shoulder is existing throughout the stretch varies from 1.0 to 2.0m. Pavement condition of the earthen shoulders is fair to poor. Many substandard horizontal curves and vertical curves exist along the alignment. Among these, some curves are observed to have insufficient sight distance. Heavy vehicular traffic movement is leading to traffic congestion and mishaps. Due to the narrow roads the congestion will hinder free flow of vehicular traffic. To overcome these

problems, it is essential to have bypass at Moinabad town and Chevella town. Mrugavani National Park exists on right side of the project road from Km 15/000 to Km 17/000. Project road traverses through Reserve Forest locations and the total existing length of forest area along the project road is about 6.730 Km.

## 0.5 SOCIO-ECONOMIC PROFILE

Social indicators are a set of indicators that measure progress of 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 is given below:

- Population
- Male / Female Ratio
- Health
- Household
- Literacy
- Poverty
- Employment
- Gross Domestic Product (GDP)
- Net State Domestic Product (NSDP)
- Per Capita Income
- Agriculture & Irrigation
- Industry
- Transportation

## 0.6 TRAFFIC SURVEYS, ANALYSES AND FORECAST

### 0.6.1 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 stretch. The surveys conducted include 7-day volume count, Turning movement survey, origin & destination survey, speed and delay survey, pedestrian count survey, willingness to pay survey etc. The study aims at obtaining the existing traffic and travel characteristics on the project corridor and forecasting the same for the project horizon year considering various constituent 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, designing the toll plaza, wayside amenities, planning the tolling strategy and carrying out economic and financial analysis.

The project stretch, which is having a length of 45.500 km, is divided into three homogeneous road sections on the basis of traffic generation and dispersal nodes located along the project road. The important dispersal / generation location identified along the project road include:

- Outer ring road at km 14.000 is the starting point of project stretch.
- Moinabad at km 23.600 is a major settlement and having four lane from ORR.

- Chevella at km 41.400 is the minor settlement, diversion point for Farooq Nagar.
- Manneguda at km 60.000 is the major settlement, diversion point for Vikarabad and end point of project stretch.

Considering the above mentioned traffic generation/diversion point, the project stretch is divided into three homogeneous section for the purpose of analysis and presentation of traffic and travel characteristics. **Table 0-1** gives the details of the homogeneous section defined for the study.

**Table 0-1: Homogeneous traffic section**

| Section No. | Starting | | Ending | | Length |
|---|---|---|---|---|---|
| | Existing km | Place | Existing km | Place | |
| I | Km 14.000 | ORR | Km 23.600 | Moinabad | 9.600 |
| II | km 23.600 | Near Moinabad | km 41.400 | Chevella | 17.800 |
| III | km 41.400 | Chevella | km 59.500 | Manneguda | 18.100 |

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 0-2** below gives the ADT and AADT plying on the project road.

**Table 0-2: Summary of ADT & AADT at count locations**

| Sl. No. | Location | ADT | | AADT | |
|---|---|---|---|---|---|
| | | Nos. | PCUs | Nos. | PCUs |
| 1 | km 32.000 | 8053 | 10352 | 8053 | 10352 |
| 2 | km 57.300 | 10282 | 14811 | 10282 | 14811 |

### 0.6.2 Traffic Forecast

Traffic demand plays the most important factor in deciding the type of facility (infrastructure) to be provided. This in turn determines likely costs to develop and benefits arising out of the improvement. A highway project of this nature calls for significant investment. Prediction of traffic demand becomes an important task and has to be carried out accurately. For the design of pavement, plan for future maintenance programme as well as capacity augmentation and for economic & financial evaluation, it is necessary to have realistic estimation of the size of traffic in the Concession period of 20 years.

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 estimated for future years are given in the **Table 0-3** below.

**Table 0-3: Projected sectional traffic (AADT) in PCUs**

| Section | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| I | 10355 | 14470 | 19212 | 24238 | 29058 | 34895 | 41969 |
| II | 10355 | 14470 | 19212 | 24238 | 29058 | 34895 | 41969 |
| III | 14811 | 20361 | 26691 | 33349 | 39715 | 47391 | 56662 |

Projected sectional AADT was compared with design service volume. The design service volume for project road is considered at the end of LOS B and LOS C and capacity augmentation is suggested for road section, which carry traffic volume more than design service volume.

It is reminded that the lane adequacies shown are based on present and future traffic and guidelines proposed in codes mentioned in Section 2.3. The IRC SP: 84 – 2014 and IRC SP: 73 – 2015 proposes 2-lane with paved shoulder for roads where traffic is less than 10000 PCUs (at the time of bidding) and 2-lane with paved shoulder where traffic exceeds 18000 PCUs. If traffic is between 10000 and 40000 PCUs, the Government may take decision whether to go for stage construction.

**Table 0-4** below shows the year up to which LoS B and LoS C will serve and when the facility is falling to next LOS, for most likely scenario.

**Table 0-4: Years to which LoS B and LoS C will serve**

| LoS | LoS B | | | LoS C | | |
|---|---|---|---|---|---|---|
| Section | I | II | III | I | II | III |
| IL | - | - | - | - | - | - |
| 2L + ES | 2020 | 2020 | 2015 | 2026 | 2026 | 2020 |
| 2L + PS | 2023 | 2023 | 2018 | 2031 | 2031 | 2023 |
| 4L + ES | 2040 | 2040 | 2031 | Beyond 2045 | Beyond 2045 | 2042 |
| 4L + PS | 2043 | 2043 | 2035 | | | Beyond 2045 |
| 6 Lane | Beyond 2045 | Beyond 2045 | Beyond 2045 | | | |

In the table, the last year up to which the facilities of Intermediate lane, 2-lane and 4-lane will continue to be in LoS B is shown. For example, consider homogeneous section III. The existing 2 lane facility will serve in LoS B till 2015. The 4-lane facility should be ready by end of 2015, for the road section to continue in same LoS. The four lane facility will serve in LoS B up to 2035 and it will fall in LoS C after 2035 onwards. That indicates, for the facility to continue in LoS B, its capacity should be augmented (6 laning) by end of 2035.

## 0.7 DESIGN STANDARDS AND SPECIFICATIONS

The design standards adopted are in conformity to IRC SP 84-2014 Standards for National/State Highways, 4 lane configuration, both with respect to highway works , Bridges, other cross drainage works, etc.

## 0.8 DESIGN PROPOSALS

**Proposed Alignment**

After carrying out the field investigation, reconnaissance survey of the existing alignment, consultant has made the proposal of the Project alignment.

The existing 2/4 lane highway will be widened to 4/6 lane with 12m median and paved shoulder configuration Widening proposal has been prepared based on availability of additional land / existing ROW, Horizontal geometrics, study of existing bridges and considering Road Safety parameters.

**Pavement Design**

Pavement design shall be carried out in accordance with Section 5 of the Manual.

Flexible pavement for main carriageway shall be designed for minimum design traffic of 19 MSA for a minimum design period of 15 years with design CBR of 10%. However, minimum thickness of Subgrade, Granular Sub-Base, Wet-Mix Macadam, DBM and BC in flexible pavement shall be 500 mm, 200 mm, 250 mm, 80 mm and 40 mm respectively.

Flexible pavement for slip roads and service roads shall be designed for minimum design traffic of 10MSA. However, minimum thickness provided for slip roads and service roads shall be 500 mm subgrade, 200 mm GSB, 250 mm WMM, 50 mm DBM and 40 mm BC.

Rigid Pavement shall be provided at Toll Plaza. However, minimum thickness of subgrade, GSB, DLC and PQC shall be 500 mm, 150 mm, 150 mm and 280mm respectively.

Paver blocks shall be considered for truck lay byes. However, minimum thickness of subgrade, GSB, WBM/WMM Base, Sand Bed and Paver Blocks shall be 500 mm, 200 mm, 250 mm, 40 mm and 100 mm respectively. The composition of the flexible pavement for Bus-Bays shall be same as that of main carriageway.

Overlay for the section of D.Ch. 14+000 to D.Ch. 18+500 in the Mrugavani National Park area for a minimum design traffic of 12MSA, and the minimum thickness provided in the section as DBM, and BC shall be 50mm, and 40mm respectively.

ii) **Type of pavement**

Flexible Pavement shall be provided for the entire project highway including bypasses, realignments, slip roads and service roads except at Toll Plaza Location where rigid pavement shall be provided.

(iii) **Design Requirements** shall be specified in the manual.

(iv) **Reconstruction of the stretches:** Total project stretch of the existing road shall be reconstructed, except at Mrugavani National Park Design Ch. 14+000 to Design Ch. 18+500.

**Bridges and Structures**

There are 117 Culverts, 10 Vehicular under pass (VUP), 8 LVUP and 2 Minor Bridges proposed in the project road.

There are 117 culverts in the project road, out of 117 culverts, 21 culverts are in poor condition that has been proposed as reconstruction, 56 new culverts are proposed due to bypass/realignment 36 new pipe culverts proposed at minor junction & 4 new pipe culverts are proposed at major junctions.

**Cross Section Type along the Project Corridor**

The Project Highway shall be constructed to four/six lane configuration for the Project length. Typical cross sections required to be developed in different segments of the project highway are given below.

| Sl. No. | Design Chainage in Km | | Length in m | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 14+000 | 18+500 | 4500 | Fig. 2.4A | |
| 2 | 18+500 | 19+600 | 1100 | Fig. 2.6B | |
| 3 | 19+600 | 20+145 | 545 | Fig. 2.6A | Approach |
| 4 | 20+145 | 20+170 | 25 | Fig. 7.8 | VUP |

| Sl. No. | Design Chainage in Km | | Length in m | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 5 | 20+170 | 20+500 | 330 | Fig. 2.6A | Approach |
| 6 | 20+500 | 21+770 | 1270 | Fig. 2.6B | |
| 7 | 21+770 | 22+320 | 550 | Fig. 2.6A | Approach |
| 8 | 22+320 | 22+345 | 25 | Fig. 7.8 | VUP |
| 9 | 22+345 | 22+670 | 325 | Fig. 2.6A | Approach |
| 10 | 22+670 | 24+400 | 1730 | Fig. 2.3A | |
| 11 | 24+400 | 25+044 | 644 | Fig. 2.6A | Approach |
| 12 | 25+044 | 25+059 | 15 | Fig. 7.8 | VUP |
| 13 | 25+059 | 26+070 | 1012 | Fig. 2.6A | Approach |
| 14 | 26+070 | 26+095 | 25 | Fig. 7.8 | VUP |
| 15 | 26+095 | 26+420 | 325 | Fig. 2.6A | Approach |
| 16 | 26+420 | 27+580 | 1160 | Fig. 2.2C | |
| 17 | 27+580 | 28+018 | 438 | Fig. 2.6A | Approach |
| 18 | 28+018 | 28+033 | 15 | Fig. 7.8 | VUP |
| 19 | 28+033 | 28+380 | 347 | Fig. 2.6A | Approach |
| 20 | 28+380 | 28+610 | 230 | Fig. 2.2C | |
| 21 | 28+610 | 28+970 | 360 | Fig. 2.2A | |
| 22 | 28+970 | 29+570 | 600 | Fig. 2.2C | |
| 23 | 29+570 | 30+330 | 760 | Fig. 2.2B | |
| 24 | 30+330 | 30+824 | 494 | Fig. 2.6A | Approach |
| 25 | 30+824 | 30+836 | 12 | Fig. 7.8 | LVUP |
| 26 | 30+836 | 31+230 | 394 | Fig. 2.6A | Approach |
| 27 | 31+230 | 31+600 | 370 | Fig. 2.2B | |
| 28 | 31+600 | 32+186 | 586 | Fig. 2.6A | Approach |
| 29 | 32+186 | 32+198 | 12 | Fig. 7.8 | LVUP |
| 30 | 32+198 | 32+800 | 602 | Fig. 2.6A | Approach |
| 31 | 32+800 | 33+393 | 593 | Fig. 2.3B | Approach |
| 32 | 33+393 | 33+408 | 15 | Fig. 7.8 | VUP |
| 33 | 33+408 | 34+150 | 742 | Fig. 2.3B | Approach |
| 34 | 34+150 | 36+100 | 1950 | Fig. 2.2B | |
| 35 | 36+100 | 36+614 | 514 | Fig. 2.6A | Approach |
| 36 | 36+614 | 36+626 | 12 | Fig. 7.8 | LVUP |
| 37 | 36+626 | 37+100 | 474 | Fig. 2.6A | Approach |
| 38 | 37+100 | 38+200 | 1100 | Fig. 2.2B | |
| 39 | 38+200 | 39+120 | 920 | Fig. 2.3B | Approach |
| 40 | 39+120 | 39+145 | 25 | Fig. 7.8 | VUP |
| 41 | 39+145 | 39+700 | 555 | Fig. 2.3B | Approach |
| 42 | 39+700 | 40+670 | 970 | Fig. 2.3A | |
| 43 | 40+670 | 41+120 | 450 | Fig. 2.3B | Approach |
| 44 | 41+120 | 41+145 | 25 | Fig. 7.8 | VUP |
| 45 | 41+145 | 41+800 | 655 | Fig. 2.3B | Approach |

| Sl. No. | Design Chainage in Km | | Length in m | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 46 | 41+800 | 42+300 | 500 | Fig. 2.3A | |
| 47 | 42+300 | 42+340 | 40 | Fig. 7.3 | MNB at 42+320 |
| 48 | 42+340 | 42+895 | 555 | Fig. 2.3A | |
| 49 | 42+895 | 42+905 | 10 | Fig. 7.3 | MNB at 42+900 |
| 50 | 42+905 | 44+480 | 1575 | Fig. 2.6A | Approach |
| 51 | 44+480 | 44+505 | 25 | Fig. 7.8 | VUP |
| 52 | 44+505 | 45+050 | 545 | Fig. 2.6A | Approach |
| 53 | 45+050 | 45+620 | 570 | Fig. 2.2B | |
| 54 | 45+620 | 46+630 | 1010 | Fig. 2.6A | Approach |
| 55 | 46+630 | 46+645 | 15 | Fig. 7.8 | VUP |
| 56 | 46+645 | 47+300 | 655 | Fig. 2.6A | Approach |
| 57 | 47+300 | 47+730 | 430 | Fig. 2.2C | |
| 58 | 47+730 | 47+930 | 200 | Fig. 2.2A | |
| 59 | 47+930 | 48+280 | 350 | Fig. 2.2B | |
| 60 | 48+280 | 48+430 | 150 | Fig. 2.2D | |
| 61 | 48+430 | 49+030 | 600 | Fig. 2.2B | |
| 62 | 49+030 | 49+550 | 520 | Fig. 2.2A | |
| 63 | 49+550 | 49+963 | 413 | Fig. 2.3B | Approach |
| 64 | 49+963 | 49+975 | 12 | Fig. 7.8 | LVUP |
| 65 | 49+975 | 50+350 | 375 | Fig. 2.3B | Approach |
| 66 | 50+350 | 52+080 | 1730 | Fig. 2.2B | |
| 67 | 52+080 | 52+480 | 400 | Fig. 2.2D | |
| 68 | 52+480 | 52+650 | 170 | Fig. 2.2B | |
| 69 | 52+650 | 53+292 | 642 | Fig. 2.3B | Approach |
| 70 | 53+292 | 53+304 | 12 | Fig. 7.8 | LVUP |
| 71 | 53+304 | 53+600 | 296 | Fig. 2.3B | Approach |
| 72 | 53+600 | 53+830 | 230 | Fig. 2.2A | |
| 73 | 53+830 | 55+180 | 1350 | Fig. 2.2B | |
| 74 | 55+180 | 55+733 | 553 | Fig. 2.3B | Approach |
| 75 | 55+733 | 55+745 | 12 | Fig. 7.8 | LVUP |
| 76 | 55+745 | 56+130 | 385 | Fig. 2.3B | Approach |
| 77 | 56+130 | 57+350 | 1220 | Fig. 2.2B | |
| 78 | 57+350 | 57+908 | 558 | Fig. 2.3B | Approach |
| 79 | 57+908 | 57+920 | 12 | Fig. 7.8 | LVUP |
| 80 | 57+920 | 58+290 | 370 | Fig. 2.3B | Approach |
| 81 | 58+290 | 59+400 | 1110 | Fig. 2.2B | |
| 82 | 59+400 | 59+749 | 349 | Fig. 2.6A | Approach |
| 83 | 59+749 | 59+761 | 12 | Fig. 7.8 | LVUP |
| 84 | 59+761 | 60+100 | 339 | Fig. 2.6A | Approach |
| 85 | 60+100 | 60+391 | 291 | Fig. 2.2D | |
| **Total Length (m)** | | | **46391.036** | | |

**Realignments / Curve Improvements:**

The Following are the Curve Improvements and realignment proposed for the project road:

| Sl. No | Existing Chainage (km) | | Design Chainage (km) | | Design Length (m) | Remarks |
|---|---|---|---|---|---|---|
| | From | To | From | To | | |
| 1 | 19.490 | 20.300 | 19+500 | 20+225 | 725 | Realignment |
| 2 | 27.850 | 28.275 | 28+000 | 28+400 | 400 | curve improvement |
| 3 | 28.500 | 28.865 | 28+615 | 29+000 | 385 | |
| 4 | 30.875 | 31.300 | 31+025 | 31+460 | 435 | |
| 5 | 31.700 | 33.050 | 31+860 | 33+175 | 1315 | |
| 6 | 45.550 | 45.800 | 46+430 | 46+680 | 250 | |
| 7 | 48.210 | 48.780 | 49+110 | 49+660 | 550 | |
| 8 | 52.635 | 53.000 | 53+540 | 53+850 | 310 | |
| 9 | 57.230 | 57.370 | 58+090 | 58+240 | 150 | |

**Bypasses:** The project stretch passes through heavy built-up areas of Moinabad and Chevella. Therefore bypasses are proposed for Moinabad and Chevella town.

| Sl. No. | Name of Bypass | Existing Chainage (Km) | | Design Chainage (Km) | | Design Length (km) |
|---|---|---|---|---|---|---|
| | | From | To | From | To | |
| 1 | Moinabad Bypass | 22.000 | 26.120 | 21+950 | 26+300 | 4.35 |
| 2 | Chevella Bypass | 38.650 | 44.120 | 38+700 | 45+060 | 6.36 |

**Protected Areas:**

Mrugavani National Park (MNP), a notified protected area [Dt. July, 21 1998 under section 35(4) of Wildlife (P) Act, 1972] is located adjacent to the road on right hand side. As per the recommendation of sub-committee on Guidelines for roads in protected areas [In pursuance to the decision taken by Standing Committee of National Board for wildlife in its 28th meeting held on 20th March 2013], *NO WIDENING IS PROPOSED*.

**Forest Locations:**

The project road traverses through the existing lengths of 4.760 km and 1.970 km through Mudimiyal RF and Kandlapally RF respectively.

**At grade intersections:**

(A) **Major Intersections:** There are 4 major junctions proposed along the project road.

| Sl. No. | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | |
| 1 | 22+333 | - | 3-legged | City road | - | Moinabad | Junction improvement at under pass locations |
| 2 | 26+083 | - | 3-legged | City road | - | Moinabad | |
| 3 | 39+133 | - | 3-legged | City road | - | Chevella | |
| 4 | 44+491 | - | 3-legged | City road | - | Chevella | |

(B) Minor Intersections: There are 31 minor junctions proposed along the project road.

| Sl. No. | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | |
| 1 | 14+210 | 14.21 | 3-legged | ORR service road | _ | Narsing to | |
| 2 | 14+580 | 14.58 | 3-legged | ORR service road | | Appa Service | |
| 3 | 15+200 | 15.20 | 3-legged | City road | Aziz nagar | _ | |
| 4 | 17+290 | 17.275 | 3-legged | City road | Aziz nagar | Gandhipet | |
| 5 | 18+500 | 18.525 | 3-legged | City road | Bakar ram | _ | |
| 6 | 20+180 | 20.215 | 3-legged | City road | _ | Himayath | VUP |
| 7 | 25+051 | - | 4-legged | City road | Surangal | Moinabad | VUP |
| 8 | 27+260 | 27.145 | 3-legged | Village Road | Kanaka | _ | |
| 9 | 27+580 | 27.5 | 4-legged | Village Road | Kanaka | Pedda | |
| 10 | 28+033 | 27.89 | 3-legged | Village Road | Kanaka | _ | VUP |
| 11 | 29+020 | 28.850 | 3-legged | Village Road | | Village Road | |
| 12 | 30+120 | 29.98 | 4-legged | Village Road | Kanaka | Appareddy | |
| 13 | 30+837 | 30.67 | 3-legged | Village Road | Sanjanpally | _ | LVUP |
| 14 | 31+380 | 31.225 | 3-legged | Village Road | _ | Appareddy | |
| 15 | 32+192 | 32.04 | 3-legged | Village Road | Toilkatta | _ | LVUP |
| 16 | 33+400 | 33.275 | 3-legged | Village Road | _ | Mudimyal | VUP |
| 17 | 36+624 | 36.5 | 3-legged | Village Road | Palgutta | - | LVUP |
| 18 | 37+850 | 37.76 | 3-legged | Village Road | - | Malkapur | |
| 19 | 39+185 | - | 3-legged | Village Road | - | kesharam | |
| 20 | 41+150 | - | 4-legged | Village Road | Shabad road | Chevalla | VUP |
| 21 | 42+140 | - | 3-legged | Village Road | - | Dharma | |
| 22 | 46+550 | 45.665 | 3-legged | Village Road | _ | SJHN college | |
| 23 | 46+639 | 45.77 | 3-legged | Village Road | Dameriguda | _ | VUP |
| 24 | 49+950 | 49.1 | 3-legged | Village Road | Bastepur | - | |
| 25 | 49+987 | 49.115 | 3-legged | Village Road | - | Mirjaguda | LVUP |
| 26 | 52+220 | 51.35 | 3-legged | Village Road | Khanapur | _ | |
| 27 | 52+240 | 52.335 | 3-legged | Village Road | Khanapur | - | |
| 28 | 53+298 | 53.455 | 3-legged | Village Road | - | Kisthapur | LVUP |
| 29 | 55+741 | 54.900 | 4-legged | Village Road | Angadi | Antharam | LVUP |
| 30 | 57+911 | 57.095 | 3-legged | Village Road | Kandlapally | _ | LVUP |
| 31 | 59+755 | 58.945 | 3-legged | Village Road | _ | Gangupalle | LVUP |

**Toll Plaza:**

Toll Plaza shall be provided at the following location:

| Location | Location of Toll Plaza (Km) | | Minimum Number of Toll Lanes | |
|---|---|---|---|---|
| | Existing Chainage | Design Chainage | Entry | Exit |
| Near Angadichittimpalle | Km 53.600 | Km 54+450 | 8 | 8 |

**Rest Areas (Wayside Amenities):**
Wayside Amenities shall be provided at locations as given below:

| Sl. no | Existing Chainage (Km) | Design Chainage (Km) | Side | Location Name |
|---|---|---|---|---|
| 1 | 44.620 | 45+560 | LHS | Near Appa reddy guda |

**Truck lay-bye:**
The truck lay-bye shall be provided at below given location.

| Sl. No. | Existing Chainage | Design Chainage | Side |
|---|---|---|---|
| 1 | - | 23+250 | Both (In Moinabad bypass) |

**Bus bays and Passenger Shelters:**
Bus bays and Passenger shelters shall be provided in accordance with section 12.5 of Manual.
There are 4 no's of bus bays and 28 no's of Passenger shelters has been proposed along the project road. The bus bays and Passenger shelters are proposed at the following locations:

| Sl. No. | Design Chainage (LHS) (Km) | Design Chainage (RHS) (Km) | Facility |
|---|---|---|---|
| 1 | 15+800 | 15+900 | Passenger Shelter |
| 2 | 17+200 | 17+400 | Passenger Shelter |
| 3 | 18+500 | 18+600 | Passenger Shelter |
| 4 | 19+800 | 19+900 | Bus Bays - Passenger Shelter |
| 5 | 26+700 | 26+800 | Passenger Shelter |
| 6 | 30+700 | 30+800 | Passenger Shelter |
| 7 | 32+200 | 32+400 | Passenger Shelter |
| 8 | 33+300 | 33+500 | Passenger Shelter |
| 9 | 36+550 | 36+700 | Passenger Shelter |
| 10 | 37+800 | 38+000 | Passenger Shelter |
| 11 | 41+800 | 41+900 | Bus Bays - Passenger Shelter |
| 12 | 50+960 | 51+060 | Passenger Shelter |
| 13 | 52+410 | 52+510 | Passenger Shelter |
| 14 | 53+230 | 53+330 | Passenger Shelter |
| 15 | 55+600 | 55+760 | Passenger Shelter |
| 16 | 57+750 | 57+900 | Passenger Shelter |

## 0.9 PRELIMINARY COST ESTIMATES

The consultants have framed the indicative project cost for 4 lane with paved shoulder configuration including cost of roads, structures, environmental and social safeguards proposed based on MoRT&H standard data book and schedule of rates (2018-2019) evolved for Telangana State together with market rate for the inputs.
The indicative estimated cost of project road comprises of

(a) Total Civil cost excluding GST: Rs. 795.08 crores.

(b) Total Civil cost including 12% GST: Rs. 890.49 crores.
(c) Total Project Cost: Rs. 1015.15 crores.
(d) Total Capital Cost: Rs. 1165.48 crores.

## 0.10 FINANCIAL ANALYSIS

Financial Analysis was carried for the project in Hybrid Annuity Mode, and the details as given below.

| Description | BOT (Hybrid Annuity) |
|---|---|
| Concession Period | 17.5 years |
| Operation Period | 15 years |
| Toll Collection Rights | Authority |
| Grant/Annuity/Construction support, annuity & O&M | Construction Support – 521.74 Cr |
| | Annuity – 471.12 Cr |
| | Interest – 954.84 Cr |
| | O&M Payments – 1038.57 Cr |
| Equity IRR | 23.42% |
| Project IRR | 5.10% |
| Authority Capital requirement during the Construction | 521.74 Cr as construction support |
| Approx. Capital requirement by authority for each year post construction | 2464.53 Cr. (Annuity, Interest & O & M) |

# *CHAPTER 1 – PROJECT DESCRIPTION AND ENGINEERING ALTERNATIVES*

***Hyderabad - Manneguda Road***

# CHAPTER 1 PROJECT DESCRIPTION & ENGINEERING ALTERNATIVES

## 1.1 GENERAL

The Project Road is section of SH-4 (declared as NH-163), which starts at Existing Ch: 14/000 (design CH 14+000) Hyderabad (from ORR-Appa Junction) and ends at Existing Ch: 59/500 (Design Ch: 60+391) near Manneguda. The design length of the project stretch is 46.391 km. The project stretch passes through Rangareddy and Vikarabad Districts and mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra reddy nagar. This chapter will give a general description of the project, existing features and design proposals to upgrade the facility to four lane divided highway.

## 1.2 PROJECT BACKGROUND

The State Government accorded Administrative Sanction for 38 road projects to take up consultancy services for Techno-Economic Feasibility and Transaction Advisory Services by engaging experienced consultants. Out of which, seven State roads are taken up by the State of Telangana.

As per the GoT's strategic vision for the provision, operation and maintenance of infrastructure in the State, it has identified the need to upgrade and operate the high traffic roads in the State through public private partnership arrangements. The Client has the onus of procurement of concessionaires to Design, Finance, Construct, Maintain, operate and Transfer the roads by tapping into central government financing if required. The 7 roads being considered for Techno-Economic feasibility are as below:

| Sl. No | Name of the Road | Awarded Length in km as per original contract Agreement | Modified Length in km as per | Additional Length in km |
|---|---|---|---|---|
| 1 | Sanga Reddy – Narsapur – Toopran – Gajwel – Bhongir – Chityal Road ( Km 0/0 on SH-17 to MDR km 43/8) | 164 | 164 | - |
| 2 | Mahaboobnagar – Nalgonda Road (Km 0/0 to km 163/2). | 163.2 | 163.2 | - |
| 3 | Hyderabad – Narsapur – Medak Road (Km 16/0 to Km 78/0) | 28 | 62 | 34 |
| 4 | Jangaon – Cheryal – Duddeda road (Km 0/0 to Km 46/4) | 46.4 | 46.4 | - |
| 5 | Jangaon – Suryapet Road (Km 0/0 to Km 84/4) | 84.4 | 84.4 | - |
| 6 | Suryapet – Mothey – Khammam Road (Km 0/0 to Km 58/3) | 58.3 | 58.3 | - |
| **7** | **Hyderabad – Bijapur Road (Hyderabad – Mannegudda – Pargi – Kodangal – Karnataka Border) (Km 14/0 to Km 132/300)** | **36.4** | **108.7** | **81.9** |
| | **Total** | **580.7** | **696.6** | **115.9** |

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Roads and Buildings Department PPP wing, Government of Telangana has appointed M/s. Feedback Infra Pvt. Ltd. for providing the required consultancy services for PPP Techno-Economic Feasibility Study and Transaction Advisory Services for 7 State Roads in the State of Telangana.

The project road (SH-4) Hyderabad-Moinabad-Chevella-Mannegudda is declared as National Highway and named as NH-163. The project is transferred to National Highway Authority of India through tripartite-supplementary agreement dated 28th April 2017 between National Authority of India and Roads & Building Department of Telengana and Feedback Infra Pvt. Ltd.

The present Technical Feasibility Report is pertaining to Hyderabad-Moinabad-Chevella-Mannegudda Road.

## 1.3 SCOPE OF THE PROJECT

The scope of work for the Transaction Advisor is divided into these two phases:
**Phase-1: Techno-Economic Feasibility study and Preliminary Engineering Design**. The main objective is to establish the Technical, Economical, and Financial viability of the selected roads and prepare preliminary engineering designs and preliminary project reports for the identified roads. The viability of the project designed as a partially access controlled facility shall be established taking in to account the requirement with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, underpasses / flyovers / ROB's rehabilitation and widening of existing and / or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates vis-à-vis the investment and financial return through toll and other revenues.

The scope of the project is to establish the Technical, economical and financial viability of the project and prepare Techno-Economic Feasibility Study and Preliminary Engineering Design Report for rehabilitation and upgrading of the existing 7 State roads to 2-lane with paved shoulders/ 4-lane with central median/ divided carriage way configuration in a sound technical and most economical manner, taking into consideration the environment and social aspects of the area.

The transaction advisory services role will be for procurement of construction agency. This must enable the GOT to determine:

- Full road life costs
- Affordability limits
- Risks and their costs
- Optimal value-for-money methods of delivery.

**Phase 2: Procurement.** On the basis of the feasibility study, a solution is decided on, and if the Client requires it, the Transaction advisor will be required to provide the necessary Technical, Legal and Financial advisory support for the procurement of private parties. This must be in compliance with all relevant National and State regulation policies, and will include training of staff of the Client on contract administration / management.

- To prepare bid documents for tendering purposes suitable to meet requirements of international standards.
- Preparation of Bid documents on the viability of the project to suit for various types of construction.
- Advisory services in finalization of contract and providing services in sanction of VGF from Government of India etc.

- Further as per the letter no. NHAI/Tech/Sur-Kham/2016/94693 dated 03.02.2017 of National Authority of India. The following documents are required to be prepared as per rearrangement of payment schedules within contact price:
- Stage I&II Signing of Agreement and Mobilization of Techno Economic
- Feasibility Report.
- Stage III Preparation of revised Technical Feasibility Report as per
- prevailing NHAI Guidelines.
- Stage IV Preparation of Technical Schedules and Bid Documents.
- Stage V Preparation of Land Plan Schedules
- Preparation of 3(a) and 3 (A) notifications
- Preparation of 3 (D) notifications including FBMs and Sub-Division plan etc., along with any other LA documents as per requirements of NHAI/CALA, peg marking at site and Utility Relocation.

The present report forms a part of Phase – III (Revised Technical Feasibility Report).

## 1.4 STRUCTURE OF THIS REPORT

The Modified Technical Feasibility Report for the entire length from km 14+000 to km 60+391is made as a single package.

The Modified Technical Feasibility Report comprises of four Volumes as per Appendix -B of Contract Agreement. These Volumes are:

***CHAPTER 0*** - ***EXECUTIVE SUMMARY***

This contains all relevant extracts of the report.

***CHAPTER 1*** - ***PROJECT DESCRIPTION AND ENGINEERING ALTERNATIVES***

The above Provides the background, objective and scope of consultancy and structure of this report and relevant aspects for the project road sections which describes the start and end points of the project road sections, ribbon development with salient cross sectional parameters such as RoW, carriageway & shoulder widths, important intersections & junctions, prevalent drainage patterns, utilities and wayside amenities. Development of design criteria, standards and improvement proposals, bypass requirements, intersection improvements, traffic facilities, drainage, bridges, over & under passes, cross drainage structures, landscaping and arboriculture have been covered in this chapter.

***CHAPTER 2*** - **METHODOLOGY**

Provides the guidelines for conducting surveys and completing the different stages in the preparation of the feasibility report, as per TOR.

***CHAPTER 3*** - ***SOCIO - ECONOMIC PROFILES***

The socio economic profile of Andhra Pradesh and the relative status of Project Influence Area, distribution of economic activities and the perspective growth of the state are contained in this chapter.

***CHAPTER 4 - INDICATIVE* DESIGN STANDARDS**

This chapter deals with the details of all the parameters that are to be adopted for the project as per the various standards published by IRC and guidelines issued by NHAI and MORT&H.

***CHAPTER 5 - TRAFFIC SURVEYS AND ANALYSIS***

Discussion of various traffic surveys and analysis related to Classified Volume Counts, Origin Destination, Willingness to Pay, Turning Movement Survey and Speed and Delay Surveys are included. Assessment of growth rates, projects traffic for the project horizon period and traffic assignment on selected route is also covered in this chapter.

***CHAPTER 6 - ENVIRONMENTAL SCREENING AND PRELIMINARY ASSESMENT***

Base line environmental scenario, screening & scoping, critical environmental issues and preliminary budget have been covered in this chapter.

***CHAPTER 7 - INITIAL SOCIAL ASSESMENT AND PRELIMINARY RESETTLEMENT PLAN***

General overview on socio economic profile, important settlements, RoW constraints, affected villages, probable adverse impacts & associated land requirements and resettlement plan have been dealt in this chapter.

***CHAPTER 8 - PRELIMINARY COST ESTIMATE***

This chapter contains the preliminary cost estimate for the project road.

***CHAPTER 9 - ECONOMIC ANALYSIS***

This chapter provides a summary of economic costs and analysis providing the Economic Internal Rate of Return (EIRR) and sensitivity analysis.

***CHAPTER 10 - FINANCIAL ANALYSIS***

This chapter provides deals with the assessment of Financial Internal Rate of Return (FIRR). Assessment of commercial viability based on project costs, operation and maintenance costs, toll revenue under different financing options.

**Volume-II Appendix to Main Report.**

**Volume-III Drawings.**

## 1.5 DESCRIPTION OF PROJECT ROAD

The Project stretch passes through Rangareddy and Vikarabad Districts in the State of Telangana. A brief description about each District is presented below.

**VIKARABAD DISTRICT**

Vikarabad district is carved out of erstwhile Rangareddy district. The district shares boundaries with Sangareddy, Rangareddy, Mahabubnager and the state of Karnataka. The district comprises 18

mandals and 2 revenue divisions – Vikarabad and Tandur. The district headquarters is located at Vikarabad town. The district is spread over an area of 3,386.00 square kilometres (1,307.34 sq mi).

**RANGAREDDY DISTRICT**

The district was formed in 1978 when it was split from Hyderabad district. Originally named Hyderabad (Rural) district, it was renamed after Konda Venkata Ranga Reddy, a freedom fighter who fought for the independence of Telangana from the Nizams and who went on to become the deputy chief minister of Andhra Pradesh. In 2016, it was carved out during the districts re-organisation to create new Vikarabad district and Medchal–Malkajgiri district.

A fresh water reservoir, called Osman Sagar, Himayath Sagar, on the river Musi at Gandipet is the prime drinking water source to the capital city of Hyderabad/Secunderabad.

- Medium-scale industries and Cement Corporation of India (CCI)'s cement factories are established at Tandur.
- Another major company is Hyderabad Chemicals and Fertilizers, established at Moula-Ali in 1942.

In 2006 the Indian government named Ranga Reddy one of the country's 250 most backward districts (out of a total of 640). It is one of the nine districts in Telangana currently receiving funds from the Backward Regions Grant Fund Programme (BRGF).

## 1.6 EXISTING FEATURES

**Existing Road Alignment**

The Project Road Starts at Hyderabad ORR-Appa Junction (Km 14.000) on NH-163 and ends before Manneguda (Km 59.500). The total length of the project stretch is about 45.500 km. It passes through Ranga Reddy and Vikarabad districts. It connects major district roads and village roads. The alignment comprises of few substandard horizontal and vertical curves which would require geometric corrections. The project highway passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra Reddy Nagar. Many Schools, Religious Structures are situated along the project road. The location map of the project road is presented in. The location map of the project road is presented in **Figure 1-1**.

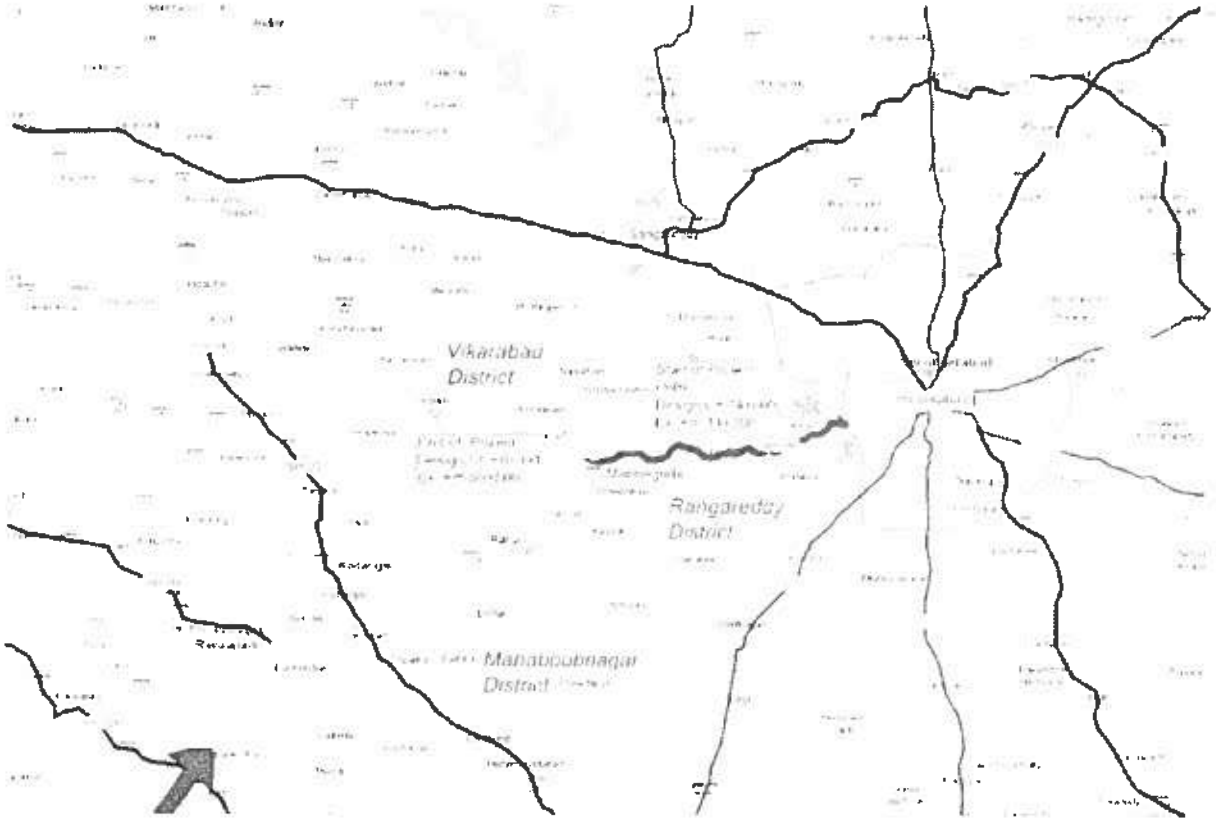


**Figure 1-1: Location Map**

The existing Project stretch has 2-lane undivided carriageway and 4-lane at few Built up locations. The horizontal geometry is fairly even throughout the stretch, however sharp curves are observed at few locations. The existing camber was found to be satisfactory. The increased numbers of points with deficient sight distance reduces the travel speed substantially. The setback distances of buildings / compound walls at curves also reduce sight distance.

The project highway is in Rangareddy and Vikarabad Districts, it passes through the towns / villages mentioned in **Table 1-1**.

**Table 1-1: List of Villages and Towns**

| S. No. | Existing Chainage | | Length (km) | Name of Village/Town |
|---|---|---|---|---|
| | From | To | | |
| 1 | 24.000 | 25.800 | 1800 | Moinabad |
| 2 | 32.000 | 33.200 | 1200 | tholkatha |
| 3 | 40.800 | 42.600 | 1800 | Chevella |
| 4 | 51.200 | 51.600 | 400 | Indra Reddy Nagar |

Congestion of traffic at urban and semi-urban places along project road is causing reduction in travel speeds. This impediment to traffic flows could be mitigated by segregating local traffic with through traffic, eviction of encroachments, Hawkers etc. and with better traffic management plan viz. providing median, service roads, zebra crossing etc.

**Terrain and land use**

The terrain along the project stretch is predominantly plain with small stretch falling under Rolling. The land use pattern along the project road comprises of Built up, Industrial and Agricultural in which predominant land use pattern is Agricultural. Land use along the Project stretch is shown below.

**Table1-2: Land use along the project stretches**

| S. No. | Land use pattern | % of Land use |
|---|---|---|
| 1 | Mrugavani National Park | 6.64% |
| 2 | Agriculture | 56.55% |
| 3 | Built up | 11.44% |
| 4 | Industrial | 10.56% |
| 5 | Forest land | 14.81% |

**Traffic Movement**

The project road (SH-4), starts near Moinabad and ends at Manneguda intersection. This road is called as Hyderabad – Bijapur road. The development proposals should cover estimate of future traffic along the corridor, which in turn is driven by existing traffic flow and travel pattern along the corridor and growth potential of the project influence area. To assess these parameters, extensive traffic surveys are proposed at strategically selected points along the corridors after initial reconnaissance.

Considering the above mentioned traffic generation/diversion point, the project stretch is divided into Three homogeneous section for the purpose of analysis and presentation of traffic and travel characteristics. **Table 1-3** gives the details of the homogeneous section defined for the study.

**Table 1-3: Homogeneous traffic section**

| Section No. | Starting | | Ending | | Length(Km) |
|---|---|---|---|---|---|
| | Existing km | Place | Existing km | Place | |
| I | Km 14.000 | ORR | Km 23.600 | Moinabad | 9.600 |
| II | km 23.600 | Near Moinabad | km 41.400 | Chevella | 17.800 |
| III | km 41.400 | Chevella | km 59.500 | Manneguda | 18.100 |

**Intersections**

There are 44 minor Intersections along the project stretch. The major Intersections are given in **Table 1-4.**

**Table 1-4: Details of Major Intersections**

| Sl. No. | Existing Km | Type | Leads to | | Remarks |
|---|---|---|---|---|---|
| | | | LHS | RHS | |
| NIL | | | | | |

**Table 1-5: Details of Minor Intersections**

| Sl. No | Existing Km | Type of Junction | Leads to | |
|---|---|---|---|---|
| | | | LHS | RHS |
| 1 | 14.212 | T | _ | Narsing to appa service road |
| 2 | 14.580 | T | | Appa Service road |
| 3 | 15.200 | T | Aziz nagar | _ |

| Sl. No | Existing Km | Type of Junction | Leads to | |
|---|---|---|---|---|
| | | | LHS | RHS |
| 4 | 17.275 | Y | Aziz nagar | Gandhipet |
| 5 | 18.525 | Y | Bakar ram | _ |
| 6 | 19.970 | Y | Enkepally | _ |
| 7 | 20.215 | Y | _ | Himayath nagar |
| 8 | 22.000 | Y | Murthuzaguda | _ |
| 9 | 24.675 | T | Moinabad village | Moinabad village |
| 10 | 24.975 | X | Sriram nagar | Pedda mangalaram |
| 11 | 27.145 | Y | Kanaka mamidi road | _ |
| 12 | 27.890 | Y | Kanaka mamidi road | _ |
| 13 | 27.500 | + | Kanaka mamidi road | Pedda mangalram |
| 14 | 28.850 | T | | Village |
| 15 | 30.670 | Y | Anjanpally | _ |
| 16 | 31.225 | T | _ | Appa reddy guda |
| 17 | 32.040 | T | Tollkatta | _ |
| 18 | 33.275 | Y | _ | Mudimyal |
| 19 | 36.500 | T | Palgutta | _ |
| 20 | 37.760 | T | _ | Malkapur |
| 21 | 39.185 | T | _ | Kesaram |
| 22 | 40.775 | T | Allawada | |
| 23 | 41.212 | T | Chevalla village cross road | _ |
| 24 | 41.245 | T | _ | Chevalla village cross road |
| 25 | 41.557 | T | Chevalla village cross road | _ |
| 26 | 41.664 | T | Chevalla village cross road | _ |
| 27 | 41.910 | T | _ | Malkapur |
| 28 | 41.925 | T | Chevalla village cross road | _ |
| 29 | 42.060 | + | Chavalla village | Chavalla village |
| 30 | 42.140 | T | _ | Dharma sagar |
| 31 | 42.275 | T | _ | Chevalla village cross road |
| 32 | 42.375 | T | _ | Chevalla village cross road |
| 33 | 43.458 | T | _ | Ibrahampalle |
| 34 | 43.750 | T | _ | Ibrahampalle |
| 35 | 45.665 | T | _ | Sjhn college of engineering |
| 36 | 45.770 | Y | Dameriguda | _ |
| 37 | 49.135 | X | Bastepur | Mirjaguda |
| 38 | 51.385 | Y | Khanapur | _ |
| 39 | 51.560 | T | Cross road | _ |
| 40 | 52.400 | Y | Khanapur | _ |
| 41 | 52.455 | T | _ | Kisthapur |
| 42 | 54.900 | + | Angadi chitampally | Antharam |

| Sl. No | Existing Km | Type of Junction | Leads to | |
|---|---|---|---|---|
| | | | LHS | RHS |
| 43 | 57.095 | T | Kandlapally | _ |
| 44 | 58.945 | T | _ | Gangupalle |

**Railway crossings / ROB/RUB**

The site includes No Railway over Bridge as listed below:

| Sl. No. | Existing Chainage (Km) | Type of structure | No. of span's | Length of span (m) | Total Length (m) | Remarks |
|---|---|---|---|---|---|---|
| NIL | | | | | | |

**Pavement and shoulders**

The existing pavement in the project stretch is flexible pavement; the visual riding quality of the pavement varies from good to fair. Cracks observed namely, longitudinal and alligator type. There are very few potholes and patched areas. The edge breaking of carriageway was observed at high embankment locations. Earthen shoulders are provided on both sides with width varying up to 2m. Increased width of formation was observed at village and town locations

**Cross – Drainage structures**

The existing project stretch consists of 30 culverts.

Out of the 30 existing structures, most of the existing culverts have been proposed for reconstruction due to poor condition and inadequacy of vent size.

**Right of Way (ROW)**

The existing right of way along the project stretch is varying from 16m to 30m.

**Road furniture and markings**

Road signs are present along the entire stretch. Kilometre stones are present for most part of the highway, but in certain locations they are missing. Hectometre stones, Guard stones on embankment stretches and boundary pillars are present along the entire length except at few locations.

**Trees**

There are trees on both sides of the highway at few locations. Some of these trees may require to be cut to accommodate the widening of the existing carriageway.

**Other environmental features**

A detailed environmental impact assessment study will be carried out as part of the assignment(after alignment approval), which will bring out in detailed particular environmental characteristic or feature which may be disturbed due to the widening of the highway.

The environmental management plan to be prepared as part of the study, will bring out details and mitigation measures to be adopted for issues such as tree cutting and plantation, noise or air pollution during construction, soil or water contamination, safety and health hazards during construction.

## 1.7 PROPOSED DESIGN FEATURES

**Proposed Alignment**

As per traffic projections, the existing road requires to be widened to 4-lane divided carriageway. The widening options are:

- Eccentric widening
- Concentric widening

The options are dictated by the following considerations:

- Limit of ROW width
- Utilities
- Nallahs /parallel flows
- Location of water bodies

After carrying out the field investigation and reconnaissance survey of the existing alignment, consultants have made the following proposal for the Project alignment. The alignment proposed is feasible, economical and technically sound. The alignment avoids major acquisition in major built up.

Areas, industrial area, religious structures, public utilities like school, Government offices etc. Detailed widening scheme has been given in **Table 1-6.**

**Table 1-6: Proposed Widening Scheme**

| Sl. No. | Design Chainage in Km | | Length in Km | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 14+000 | 18+500 | 4500 | Fig. 2.4A | |
| 2 | 18+500 | 19+600 | 1100 | Fig. 2.6B | |
| 3 | 19+600 | 20+145 | 545 | Fig. 2.6A | Approach |
| 4 | 20+145 | 20+170 | 25 | Fig. 7.8 | VUP |
| 5 | 20+170 | 20+500 | 330 | Fig. 2.6A | Approach |
| 6 | 20+500 | 21+770 | 1270 | Fig. 2.6B | |
| 7 | 21+770 | 22+320 | 550 | Fig. 2.6A | Approach |
| 8 | 22+320 | 22+345 | 25 | Fig. 7.8 | VUP |
| 9 | 22+345 | 22+670 | 325 | Fig. 2.6A | Approach |
| 10 | 22+670 | 24+400 | 1730 | Fig. 2.3A | |
| 11 | 24+400 | 25+044 | 644 | Fig. 2.6A | Approach |
| 12 | 25+044 | 25+059 | 15 | Fig. 7.8 | VUP |
| 13 | 25+059 | 26+070 | 1012 | Fig. 2.6A | Approach |
| 14 | 26+070 | 26+095 | 25 | Fig. 7.8 | VUP |
| 15 | 26+095 | 26+420 | 325 | Fig. 2.6A | Approach |
| 16 | 26+420 | 27+580 | 1160 | Fig. 2.2C | |
| 17 | 27+580 | 28+018 | 438 | Fig. 2.6A | Approach |
| 18 | 28+018 | 28+033 | 15 | Fig. 7.8 | VUP |
| 19 | 28+033 | 28+380 | 347 | Fig. 2.6A | Approach |
| 20 | 28+380 | 28+610 | 230 | Fig. 2.2C | |

| Sl. No. | Design Chainage in Km | | Length in Km | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 21 | 28+610 | 28+970 | 360 | Fig. 2.2A | |
| 22 | 28+970 | 29+570 | 600 | Fig. 2.2C | |
| 23 | 29+570 | 30+330 | 760 | Fig. 2.2B | |
| 24 | 30+330 | 30+824 | 494 | Fig. 2.6A | Approach |
| 25 | 30+824 | 30+836 | 12 | Fig. 7.8 | LVUP |
| 26 | 30+836 | 31+230 | 394 | Fig. 2.6A | Approach |
| 27 | 31+230 | 31+600 | 370 | Fig. 2.2B | |
| 28 | 31+600 | 32+186 | 586 | Fig. 2.6A | Approach |
| 29 | 32+186 | 32+198 | 12 | Fig. 7.8 | LVUP |
| 30 | 32+198 | 32+800 | 602 | Fig. 2.6A | Approach |
| 31 | 32+800 | 33+393 | 593 | Fig. 2.3B | Approach |
| 32 | 33+393 | 33+408 | 15 | Fig. 7.8 | VUP |
| 33 | 33+408 | 34+150 | 742 | Fig. 2.3B | Approach |
| 34 | 34+150 | 36+100 | 1950 | Fig. 2.2B | |
| 35 | 36+100 | 36+614 | 514 | Fig. 2.6A | Approach |
| 36 | 36+614 | 36+626 | 12 | Fig. 7.8 | LVUP |
| 37 | 36+626 | 37+100 | 474 | Fig. 2.6A | Approach |
| 38 | 37+100 | 38+200 | 1100 | Fig. 2.2B | |
| 39 | 38+200 | 39+120 | 920 | Fig. 2.3B | Approach |
| 40 | 39+120 | 39+145 | 25 | Fig. 7.8 | VUP |
| 41 | 39+145 | 39+700 | 555 | Fig. 2.3B | Approach |
| 42 | 39+700 | 40+670 | 970 | Fig. 2.3A | |
| 43 | 40+670 | 41+120 | 450 | Fig. 2.3B | Approach |
| 44 | 41+120 | 41+145 | 25 | Fig. 7.8 | VUP |
| 45 | 41+145 | 41+800 | 655 | Fig. 2.3B | Approach |
| 46 | 41+800 | 42+300 | 500 | Fig. 2.3A | |
| 47 | 42+300 | 42+340 | 40 | Fig. 7.3 | MNB at 42+320 |
| 48 | 42+340 | 42+895 | 555 | Fig. 2.3A | |
| 49 | 42+895 | 42+905 | 10 | **Fig. 7.3** | **MNB at 42+900** |
| 50 | 42+905 | 44+480 | 1575 | Fig. 2.6A | Approach |
| 51 | 44+480 | 44+505 | 25 | Fig. 7.8 | VUP |
| 52 | 44+505 | 45+050 | 545 | Fig. 2.6A | Approach |
| 53 | 45+050 | 45+620 | 570 | Fig. 2.2B | |
| 54 | 45+620 | 46+630 | 1010 | Fig. 2.6A | Approach |
| 55 | 46+630 | 46+645 | 15 | Fig. 7.8 | VUP |
| 56 | 46+645 | 47+300 | 655 | Fig. 2.6A | Approach |
| 57 | 47+300 | 47+730 | 430 | Fig. 2.2C | |
| 58 | 47+730 | 47+930 | 200 | Fig. 2.2A | |
| 59 | 47+930 | 48+280 | 350 | Fig. 2.2B | |
| 60 | 48+280 | 48+430 | 150 | Fig. 2.2D | |

| Sl. No. | Design Chainage in Km | | Length in Km | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 61 | 48+430 | 49+030 | 600 | Fig. 2.2B | |
| 62 | 49+030 | 49+550 | 520 | Fig. 2.2A | |
| 63 | 49+550 | 49+963 | 413 | Fig. 2.3B | Approach |
| 64 | 49+963 | 49+975 | 12 | Fig. 7.8 | LVUP |
| 65 | 49+975 | 50+350 | 375 | Fig. 2.3B | Approach |
| 66 | 50+350 | 52+080 | 1730 | Fig. 2.2B | |
| 67 | 52+080 | 52+480 | 400 | Fig. 2.2D | |
| 68 | 52+480 | 52+650 | 170 | Fig. 2.2B | |
| 69 | 52+650 | 53+292 | 642 | Fig. 2.3B | Approach |
| 70 | 53+292 | 53+304 | 12 | Fig. 7.8 | LVUP |
| 71 | 53+304 | 53+600 | 296 | Fig. 2.3B | Approach |
| 72 | 53+600 | 53+830 | 230 | Fig. 2.2A | |
| 73 | 53+830 | 55+180 | 1350 | Fig. 2.2B | |
| 74 | 55+180 | 55+733 | 553 | Fig. 2.3B | Approach |
| 75 | 55+733 | 55+745 | 12 | Fig. 7.8 | LVUP |
| 76 | 55+745 | 56+130 | 385 | Fig. 2.3B | Approach |
| 77 | 56+130 | 57+350 | 1220 | Fig. 2.2B | |
| 78 | 57+350 | 57+908 | 558 | Fig. 2.3B | Approach |
| 79 | 57+908 | 57+920 | 12 | Fig. 7.8 | LVUP |
| 80 | 57+920 | 58+290 | 370 | Fig. 2.3B | Approach |
| 81 | 58+290 | 59+400 | 1110 | Fig. 2.2B | |
| 82 | 59+400 | 59+749 | 349 | Fig. 2.6A | Approach |
| 83 | 59+749 | 59+761 | 12 | Fig. 7.8 | LVUP |
| 84 | 59+761 | 60+100 | 339 | Fig. 2.6A | Approach |
| 85 | 60+100 | 60+391 | 291 | Fig. 2.2D | |
| Total Length (Km) | | | 46391.036 | | |

**Proposed Bypass:**

The project stretch passes through heavy built-up areas of Moinabad and Chevella. Therefore bypasses are proposed for Moinabad and Chevella town.

**Table 1-7: Proposed Bypasses**

| Sr. No. | Name of Bypass | Existing Chainage (Km) | | Design Chainage (Km) | | Length (km) |
|---|---|---|---|---|---|---|
| | | From | To | From | To | |
| 1 | Moinabad Bypass | 22.000 | 26.120 | 21+950 | 26+300 | 4.35 |
| 2 | Chevella Bypass | 38.650 | 44.120 | 38+700 | 45+060 | 6.36 |

**Proposed Typical Cross Sections**

Based on traffic considerations, geometric standards and existing site condition, the following typical cross sections have been proposed for different stretches of the project road. The main components are as given in Table 1-6 Error! Reference source not found.. Typical Cross sections are presented shown in Drawing Volume

## Details of Proposed Typical Cross Sections

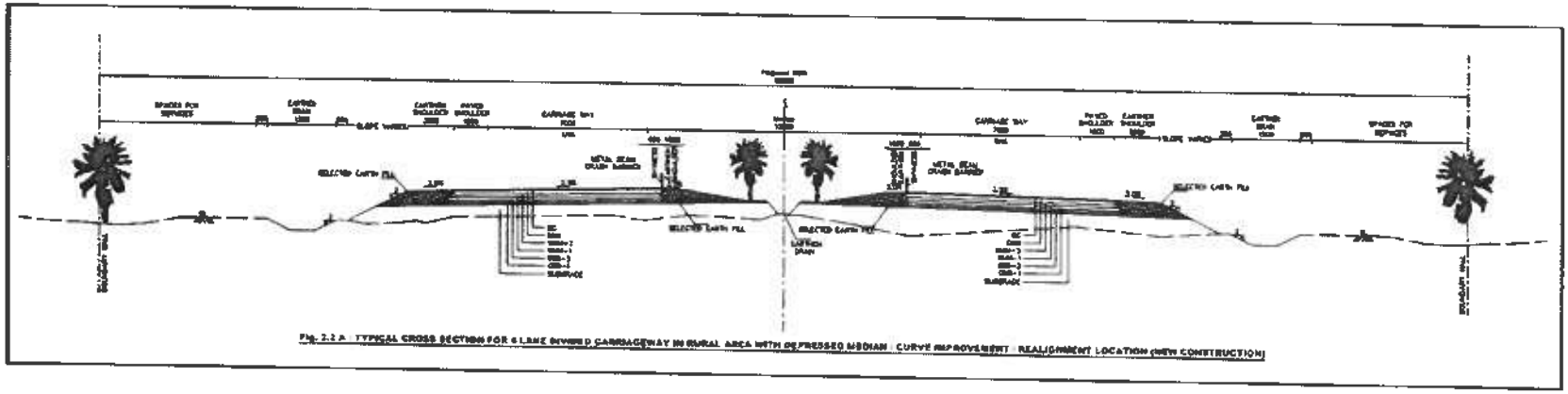

Fig. 2.2 A : TYPICAL CROSS SECTION FOR 4 LANE DIVIDED CARRIAGEWAY IN RURAL AREA WITH DEPRESSED MEDIAN : CURVE IMPROVEMENT : REALIGNMENT LOCATION (NEW CONSTRUCTION)

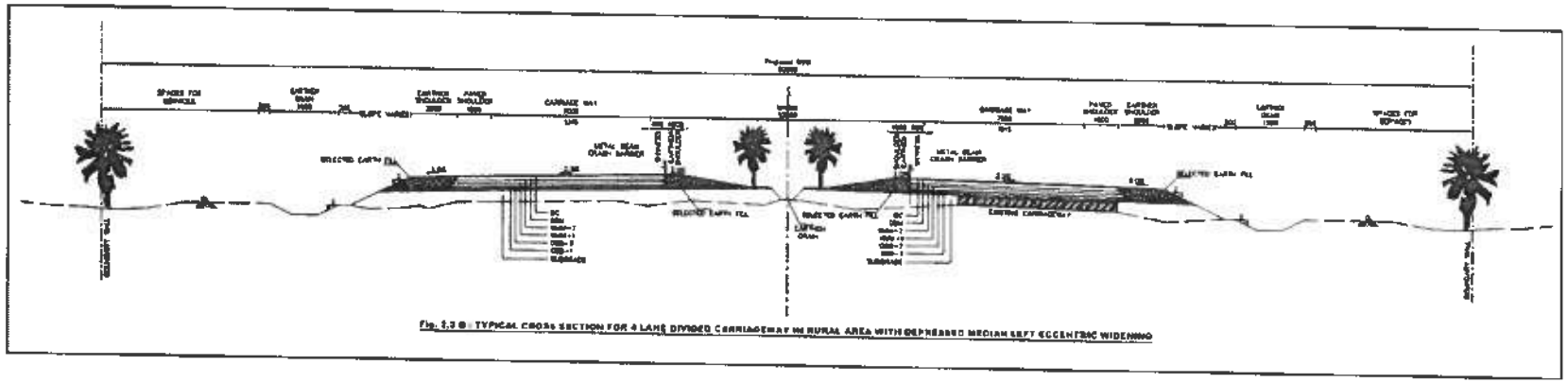

Fig. 2.3 B : TYPICAL CROSS SECTION FOR 4 LANE DIVIDED CARRIAGEWAY IN RURAL AREA WITH DEPRESSED MEDIAN LEFT ECCENTRIC WIDENING

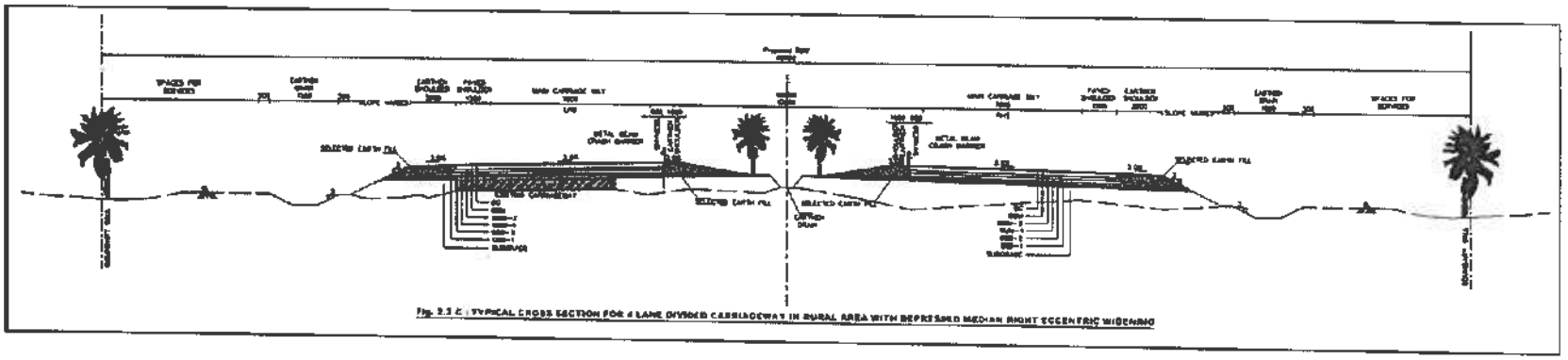

Fig. 2.3 C : TYPICAL CROSS SECTION FOR 4 LANE DIVIDED CARRIAGEWAY IN RURAL AREA WITH DEPRESSED MEDIAN RIGHT ECCENTRIC WIDENING

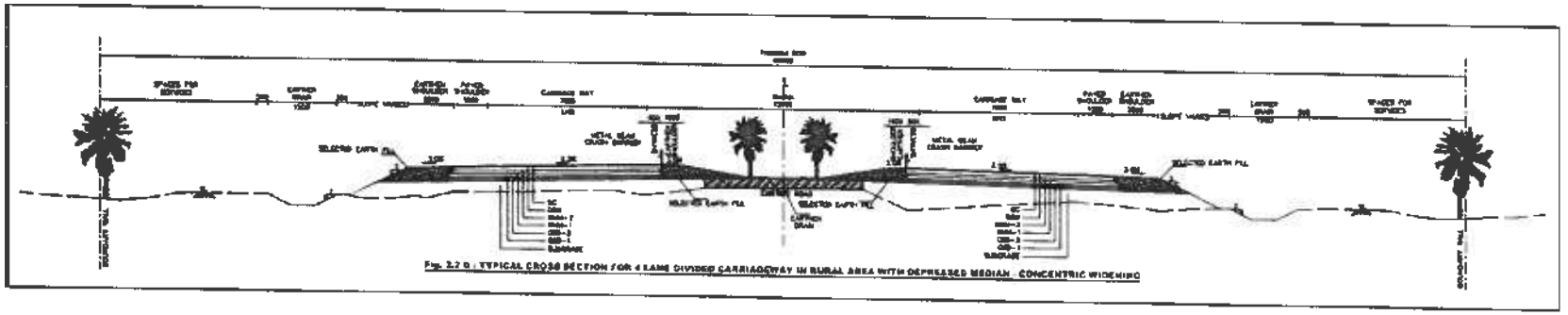

Fig. 2.2 B : TYPICAL CROSS SECTION FOR 4 LANE DIVIDED CARRIAGEWAY IN RURAL AREA WITH DEPRESSED MEDIAN CONCENTRIC WIDENING

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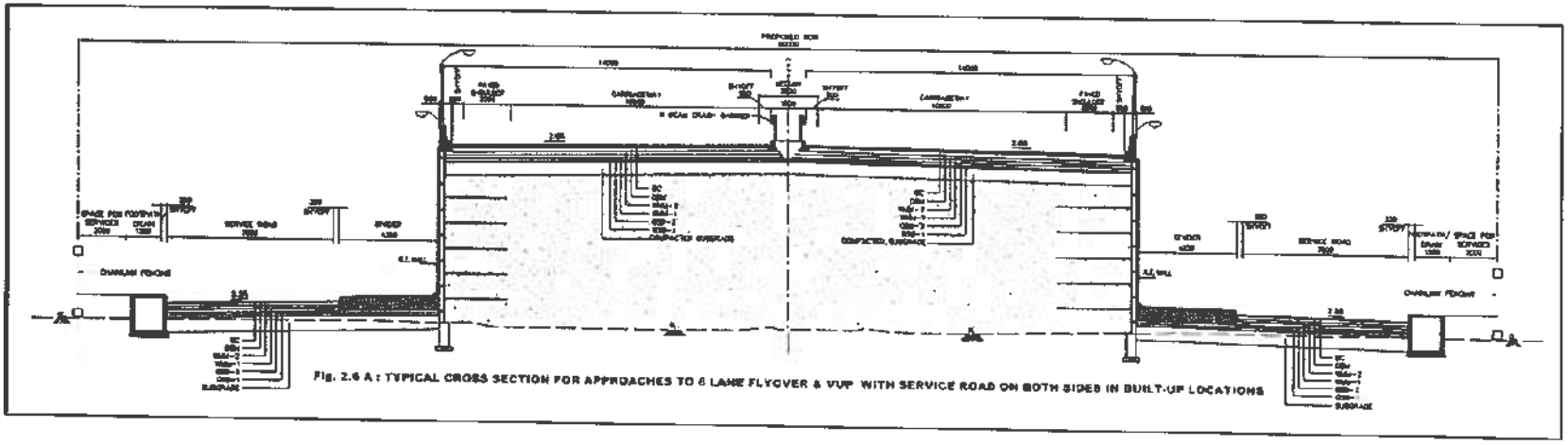

Fig. 2.6 A : TYPICAL CROSS SECTION FOR APPROACHES TO 6 LANE FLYOVER & VUP WITH SERVICE ROAD ON BOTH SIDES IN BUILT-UP LOCATIONS

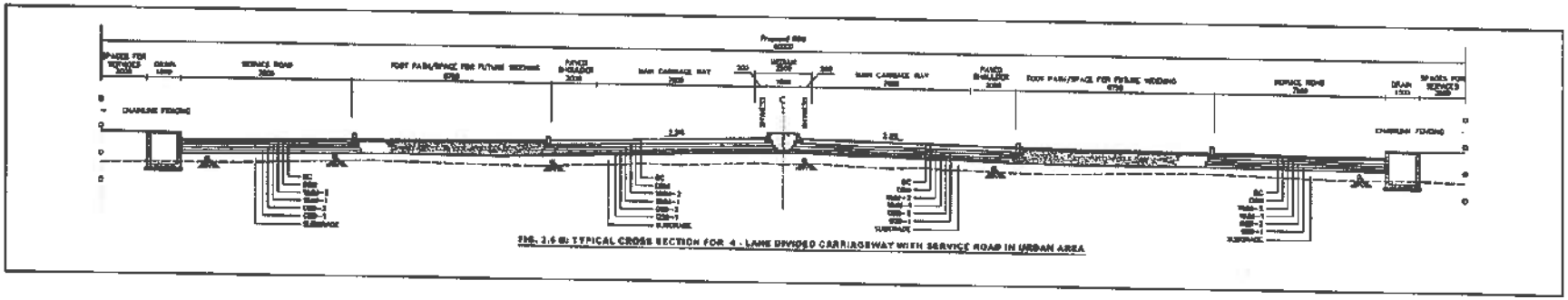

FIG. 2.6 B: TYPICAL CROSS SECTION FOR 4 - LANE DIVIDED CARRIAGEWAY WITH SERVICE ROAD IN URBAN AREA

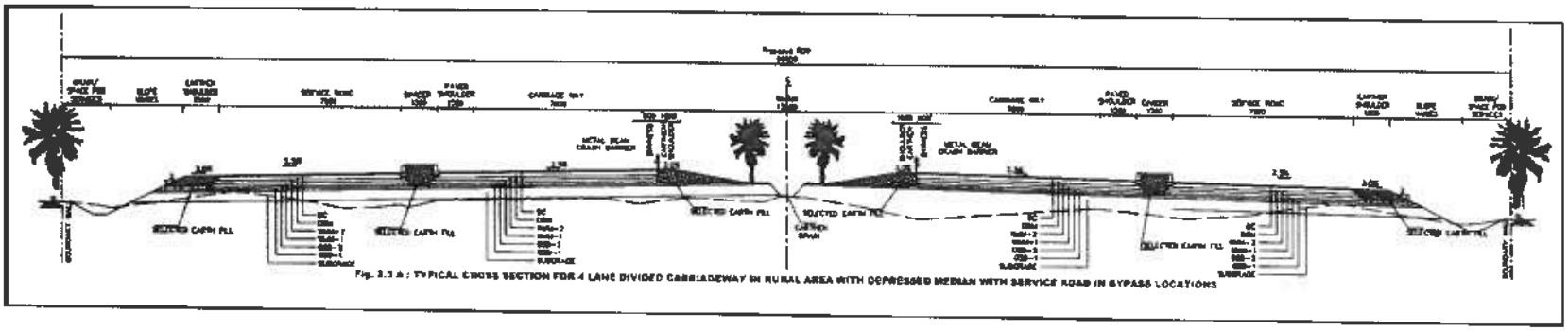

Fig. 2.3 a : TYPICAL CROSS SECTION FOR 4 LANE DIVIDED CARRIAGEWAY IN RURAL AREA WITH DEPRESSED MEDIAN WITH SERVICE ROAD IN BYPASS LOCATIONS

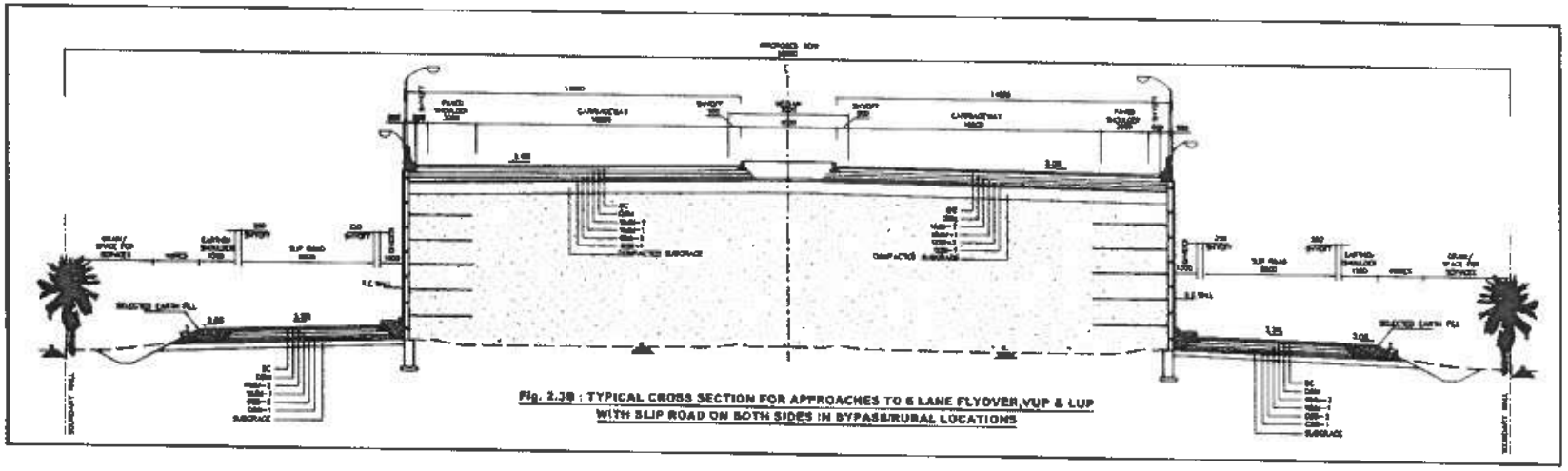

Fig. 2.39 : TYPICAL CROSS SECTION FOR APPROACHES TO 6 LANE FLYOVER,VUP & LUP WITH SLIP ROAD ON BOTH SIDES IN BYPASS/RURAL LOCATIONS

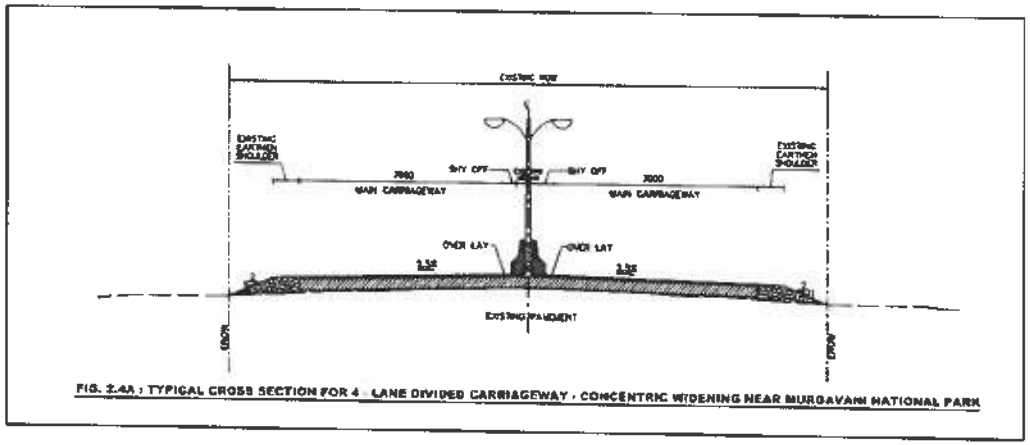


FIG. 2.4A : TYPICAL CROSS SECTION FOR 4 - LANE DIVIDED CARRIAGEWAY - CONCENTRIC WIDENING NEAR MURGAVANI NATIONAL PARK

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**Pavement Design**

**i) Pavement design shall be carried out in accordance with Section 5 of the Manual.**

Flexible pavement for main carriageway shall be designed for minimum design traffic of 19 MSA for a minimum design period of 15 years with Design CBR of 10%. However, minimum thickness of Subgrade, Granular Sub-Base, Wet-Mix Macadam, DBM and BC in flexible pavement shall be 500 mm, 200 mm, 250 mm, 80 mm and 40 mm respectively.

Flexible pavement for slip roads and service roads shall be designed for minimum design traffic of 10MSA. However, minimum thickness provided for slip roads and service roads shall be 500 mm subgrade, 200 mm GSB, 250 mm WMM, 50 mm DBM and 40 mm BC.

Rigid Pavement shall be provided at Toll Plaza. However, minimum thickness of subgrade, GSB, DLC and PQC shall be 500 mm, 150 mm, 150 mm and 280mm respectively.

Paver blocks shall be considered for truck lay byes. However, minimum thickness of subgrade, GSB, WBM/WMM Base, Sand Bed and Paver Blocks shall be 500 mm, 200 mm, 250 mm, 40 mm and 100 mm respectively. The composition of the flexible pavement for Bus-Bays shall be same as that of main carriageway.

Overlay for the section of D.Ch. 14+000 to D.Ch. 18+500 in the Mrugavani National Park area for a minimum design traffic of 12MSA, and the minimum thickness provided in the section as DBM, and BC shall be 50mm, and 40mm respectively.

**ii) Type of pavement**

Flexible Pavement shall be provided for the entire project highway including bypasses, realignments, slip roads and service roads except at Toll Plaza Location where rigid pavement shall be provided.

**(iii) Design Requirements shall be specified in the manual.**

**(iv) Reconstruction of the stretches:** Total project stretch of the existing road shall be reconstructed, except at Mrugavani National Park D.Ch. 14+000 to D. Ch. 18+500.

**Major Junctions**

There are four major junctions, which needs to be improved as per IRC guidelines The proposed Major Junctions are given in.

**Table 1-8: List of Major Junctions Proposed**

| Sl. No | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | |
| 1 | 22+333 | - | 3-legged | City road | - | Moinabad | Junction improvement at under pass location |
| 2 | 26+083 | - | 3-legged | City road | - | Moinabad | |
| 3 | 39+133 | - | 3-legged | City road | - | Chevella | |
| 4 | 44+491 | - | 3-legged | City road | - | Chevella | |

Minor Junctions

There are 31 nos minor junctions, which need to be improved as per IRC guidelines, all minor junctions are to be improved as at-grade junctions.

Table 1-9: List of Major Junctions Proposed

| Sl. No. | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | |
| 1 | 14+210 | 14.21 | 3-legged | ORR service road | _ | Narsing to appa service road | |
| 2 | 14.580 | 14.58 | 3-legged | ORR service road | | Appa Service road | |
| 3 | 15+200 | 15.20 | 3-legged | City road | Aziz nagar | _ | |
| 4 | 17+290 | 17.275 | 3-legged | City road | Aziz nagar | Gandhipet | |
| 5 | 18+500 | 18.525 | 3-legged | City road | Bakar ram | _ | |
| 6 | 20+180 | 20.215 | 3-legged | City road | _ | Himayath nagar | VUP |
| 7 | 25+051 | - | 4-legged | City road | Surangal | Moinabad | VUP |
| 8 | 27+260 | 27.145 | 3-legged | Village Road | Kanaka mamidi road | _ | |
| 9 | 27+580 | 27.5 | 4-legged | Village Road | Kanaka mamidi road | Pedda mangalram | |
| 10 | 28+033 | 27.89 | 3-legged | Village Road | Kanaka mamidi road | _ | VUP |
| 11 | 29+020 | 28.850 | 3-legged | Village Road | | Village Road | |
| 12 | 30+120 | 29.98 | 4-legged | Village Road | Kanaka mamidi road | Appareddy guda | |
| 13 | 30+837 | 30.67 | 3-legged | Village Road | Sanjanpally | _ | LVUP |
| 14 | 31+380 | 31.225 | 3-legged | Village Road | _ | Appareddy guda | |
| 15 | 32+192 | 32.04 | 3-legged | Village Road | Tollkatta | _ | LVUP |
| 16 | 33+400 | 33.275 | 3-legged | Village Road | _ | Mudimyal | VUP |
| 17 | 36+624 | 36.5 | 3-legged | Village Road | Palgutta | - | LVUP |
| 18 | 37+850 | 37.76 | 3-legged | Village Road | - | Malkapur | |
| 19 | 39+185 | - | 3-legged | Village Road | - | kesharam | |
| 20 | 41+150 | - | 4-legged | Village Road | Shabad road | Chevalla | VUP |
| 21 | 42+140 | - | 3-legged | Village Road | - | Dharma sagar | |
| 22 | 46+550 | 45.665 | 3-legged | Village Road | _ | SJHN college of engineering | |
| 23 | 46+639 | 45.77 | 3-legged | Village Road | Damerigud a | _ | VUP |
| 24 | 49+950 | 49.1 | 3-legged | Village Road | Bastepur | - | |
| 25 | 49+987 | 49.115 | 3-legged | Village Road | - | Mirjaguda | LVUP |

| Sl. No. | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | |
| 26 | 52+220 | 51.35 | 3-legged | Village Road | Khanapur | _ | |
| 27 | 52+240 | 52.335 | 3-legged | Village Road | Khanapur | - | |
| 28 | 53+298 | 53.455 | 3-legged | Village Road | - | Kisthapur | LVUP |
| 29 | 55+741 | 54.900 | 4-legged | Village Road | Angadi chitampally | Antharam | LVUP |
| 30 | 57+911 | 57.095 | 3-legged | Village Road | Kandlapally | _ | LVUP |
| 31 | 59+755 | 58.945 | 3-legged | Village Road | _ | Gangupalle | LVUP |

## 1.8 STRUCTURES

There are 117 Culverts, 10 Vehicular under pass (VUP), 8 LVUP and 2 Minor Bridges proposed in the project road. There are 117 culverts in the project road, out of 117 culverts, 21 culverts are in poor condition that has been proposed as reconstruction, 56 new culverts are proposed due to bypass/realignment 36 new pipe culverts proposed at minor junction & 4 new pipe culverts are proposed at major junctions.

**Table 1-10: Summary of Structures**

| Structure Proposal Summary | | | |
|---|---|---|---|
| Sl. No. | Category | Proposal | No. of structures |
| *CULVERTS (117 nos.)* | | | |
| 1 | Culverts- New Construction | New culverts are to be constructed due to realignment and bypass. | 56 |
| | | New culverts at Major & Minor Junctions | 40 |
| | Culverts - Reconstruction | Culverts Reconstructed due to inadequate size and condition of existing structure | 21 |
| | Culverts - Widening | Culverts Widened due to inadequate width. | - |
| *TOTAL NO OF MINOR BRIDGES (2 nos.)* | | | |
| 2 | Minor bridges –New construction | New construction due to bypass / Realignment | 2 |
| | Minor bridges-Reconstruction | Minor bridges Reconstruction to 6-Lane | - |
| | Minor bridges-Reconstruction + New Construction | Minor bridges Reconstruction + New construction to 6-Lane | - |
| | Minor bridges- Widening + New Construction | Minor bridges widening + New construction to 6-Lane | - |
| | Minor bridges-Retained | Minor bridges Retained & New construction to 6-Lane | - |
| *MAJOR BRIDGES (0 nos.)* | | | |
| 3 | Major Bridge – New construction | New construction due to Bypass | - |
| | Major Bridge- | Major Bridge (Reconstruction and New | - |

| Structure Proposal Summary | | | |
|---|---|---|---|
| **Sl.** | **Category** | **Proposal** | **No. of** |
| | Reconstruction | Construction) | |
| | Major Bridge – Widening/Retained | Major bridges widening(Existing Retained + Parallel New bridge proposed on RHS & LHS) | - |
| | | ***VUP (10 nos.)*** | |
| 4 | VUP | New construction due to bypass / Realignment | 10 |
| | | ***Flyovers (0 nos.)*** | |
| 5 | Flyover | New Construction due to Bypass at major junction | - |
| | | ***Viaducts (0 nos.)*** | |
| 6 | Viaduct | New construction due to dense habitation on both side of Road | - |
| | | ***LVUP (8 nos.)*** | |
| 7 | LVUP | New construction of LVUP due to bypass / Realignment | *8* |
| | | ***PUP (0 no.)*** | |
| 8 | PUP | New construction of PUP | - |
| | | ***CUP (0 nos.)*** | |
| 9 | CUP | New Construction of CUP | *0* |

## MAJOR BRIDGES

Table 1-11: Proposals for New Major Bridges

| Sl. No. | Chainage (Km) | | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Width (m) | |
| -NIL- | | | | | | | | | | | | | |

Table 1-12: Proposals for Reconstruction of Major Bridges

| Sl. No. | Chainage (Km) | | Structure No | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Width (m) |
| -NIL- | | | | | | | | | | | | | |

Table 1-13: Major Bridge to be Retained with R&R

| Sl. No. | Chainage (Km) | | Structure No. | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Width (m) |
| -NIL- | | | | | | | | | | | | | |

## MINOR BRIDGES AND CAUSEWAYS

Table 1-14: Proposal of New Minor Bridges.

| Sl. No. | Chainage (Km) | | Type of Structure | Name of River & Type of Crossing | Proposal | Proposed Bridge Details | | Width (m) | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road | |
| 1 | Chevella Bypass | 42+320 | MNB | Nala | New Construction | 2 x 20.0 | RCC T-Girder | 2 x 16.0 | - | Skew Bridge |
| 2 | Chevella Bypass | 42+900 | MNB | Nala | New Construction | 1 x 10.0 | RCC Box | 2 x 16.0 | - | - |

Table 1-15: Proposal for Widening of Minor Bridges.

| Sl. No. | Chainage (Km) | | Structure No | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | Width (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road |
| -NIL- | | | | | | | | | | | | | | |

Table 1-16: Proposal for Reconstruction of Minor Bridges.

| Sl. No. | Chainage (Km) | | Structure No | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | Width (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road |
| -NIL- | | | | | | | | | | | | | | |

Table 1-17: Minor Bridge to be Retained with R&R.

| Sl. No. | Chainage | | Structure No | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | | Span Arrangement | Super Structure | Sub Structure | Width (m) | | Span Arrangement | Super Structure | Width (m) |
| -NIL- | | | | | | | | | | | | | |

**VUP and LVUP**

Along the stretch of the road 10 new VUP and 8 new LVUP have been proposed. Details of the same are given in **Table 1-18** to **Table 1-19**.

Table 1-18: Proposal for New VUP.

| Sl. No. | Chainage (Km) | | Type of Structure | Proposal | Proposed Bridge Details | | Width (m) | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road | |
| 1 | 20.243 | 20+180 | VUP | New construction | 1 x 25 x 5.5 | PSC Girder | 2 x 14.5 | - | Chilkur Balaji Road |
| 2 | Moinabad Bypass | 22+333 | VUP | New construction | 1 x 25 x 5.5 | PSC Girder | 2 x 14.5 | - | Start of Bypass, Joginapally Engg. College Road |
| 3 | Moinabad Bypass | 25+051 | VUP | New construction | 1 x 15 x 5.5 | RCC Girder | 2 x 14.5 | - | Peddamangalaram to Surangal Road |
| 4 | Moinabad Bypass | 26+083 | VUP | New construction | 1 x 25 x 5.5 | PSC Girder | 2 x 14.5 | - | End of Moinabad Bypass |
| 5 | 27.896 | 28+033 | VUP | New construction | 1 x 15 x 5.5 | RCC Girder | 2 x 14.5 | - | Appaketiguda & Kanakamamidi Village Road |
| 6 | 33.275 | 33+400 | VUP | New construction | 1 x 15 x 5.5 | RCC Girder | 2 x 14.5 | - | Yunis Sultan Engineering College, Mudimyal Road |

| Sl. No. | Chainage (Km) | | Type of Structure | Proposal | Proposed Bridge Details | | Width (m) | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement | Super Structure | Main Carriageway | Service Road | |
| 7 | Chevella Bypass | 39+133 | VUP | New construction | 1 x 25 x 5.5 | PSC Girder | 2 x 14.5 | - | Start of Chevella Bypass |
| 8 | Chevella Bypass | 41+150 | VUP | New construction | 1 x 25 x 5.5 | PSC Girder | 2 x 14.5 | - | Shabad Road Connecting to NH -7 at Farookh Nagar |
| 9 | Chevella Bypass | 44+491 | VUP | New construction | 1 x 25 x 5.5 | PSC Girder | 2 x 14.5 | - | End of Chevella Bypass |
| 10 | 45.775 | 46+639 | VUP | New construction | 1 x 15 x 5.5 | RCC Girder | 2 x 14.5 | - | Alhabeed College and Dameriguda |

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Table 1-19: Proposal for New LVUP

| Sl. No. | Chainage (Km) | | Type of Strucutre | Proposal | Proposed Bridge Details | | Width (m) | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road | |
| 1 | 30.683 | 30+837 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Kethireedy Pally Village Road |
| 2 | 32.043 | 32+192 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Tholkatta Village Road |
| 3 | 36.504 | 36+624 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Palgutta Road |
| 4 | 49.150 | 49+987 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Bastepur - Mirjaguda Road |
| 5 | 52.465 | 53+298 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Angadi - Antharam Road |
| 6 | 54.925 | 55+741 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Allur Road |
| 7 | 57.097 | 57+911 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | - |
| 8 | 58.946 | 59+755 | LVUP | New construction | 1 x 12 x 4.0 | RCC Box | 2 x 14.5 | - | Gangupalle Road |

**FLYOVER and VIADUCTS**

Table 1-20: Proposal for New Flyovers

| Sl. No. | Chainage (Km) | | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | Width (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road |
| -NIL- | | | | | | | | | | | | | |

Table 1-21: Proposal for New Viaduct

| Sl. No. | Chainage (Km) | | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | Width (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road |
| -NIL- | | | | | | | | | | | | | |

**PUP**

Table 1-22: Proposal for PUP

| Sl. No. | Chainage (Km) | | Type of Structure | Name of River & Type of Crossing | Existing Bridge Details | | | | Proposal | Proposed Bridge Details | | Width (m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | | Span Arrangement (m) | Super Structure | Sub Structure | Width (m) | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road |
| -NIL- | | | | | | | | | | | | | |

### CUP

Table 1-23: Proposal for CUP

| Sl. No. | Chainage (Km) | | Type of Structure | Existing Bridge Details | | | Proposal | Proposed Bridge Details | | Width (m) | | TCS | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | | Span Arrangement (m) | Super Structure | Width (m) | | Span Arrangement (m) | Super Structure | Main Carriageway | Service Road | | |
| -NIL- | | | | | | | | | | | | | |

### Box and Pipe Culverts

There are 117 culverts in the project road, out of 117 culverts, 21 culverts are in poor condition that has been proposed as reconstruction, 56 new culverts are proposed due to bypass/realignment 36 new pipe culverts proposed at minor junction & 4 new pipe culverts are proposed at major junctions.

Table 1-24: Proposal for New Box Culverts.

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| 1 | Minor Realignment | 19+749 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.6A |
| 2 | Minor Realignment | 19+976 | - | - | - | New Construction | Box Culvert | 1 x 3 x 1.5 | 2.6A |
| 3 | Moinabad Bypass | 22+387 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.6A |
| 4 | Moinabad Bypass | 22+887 | - | - | - | New Construction | Box Culvert | 1 x 3 x 1.5 | 2.3A |
| 5 | Moinabad Bypass | 23+067 | - | - | - | New Construction | Box Culvert | 1 x 2 x 2 | 2.3A |
| 6 | Moinabad Bypass | 23+167 | - | - | - | New Construction | Box Culvert | 1 x 3 x 3 | 2.3A |
| 7 | Moinabad Bypass | 23+687 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.3A |
| 8 | Moinabad Bypass | 23+930 | - | - | - | New Construction | Box Culvert | 1 x 3 x 3 | 2.3A |

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| 9 | Moinabad Bypass | 24+149 | - | - | - | New Construction | Box Culvert | 1 x 2 x 2 | 2.3A |
| 10 | Moinabad Bypass | 24+700 | - | - | - | New Construction | Box Culvert | 1 x 2 x 2 | 2.6A |
| 11 | Moinabad Bypass | 25+453 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.6A |
| 12 | Moinabad Bypass | 25+527 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 13 | Moinabad Bypass | 25+814 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 14 | 27+350 | 27+487 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2C |
| 15 | 28+225 | 28+333 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 16 | Minor Realignment | 28+783 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2A |
| 17 | 28+825 | 28+945 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2A |
| 18 | 32+300 | 32+423 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 19 | 32+387 | 32+523 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 20 | 33+807 | 33+923 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.3B |
| 21 | 34+300 | 34+414 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.2B |
| 22 | 34+345 | 34+452 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.2B |
| 23 | 34+850 | 34+959 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.2B |
| 24 | 37+416 | 37+528 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.2B |
| 25 | Chevella Bypass | 39+622 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3B |
| 26 | Chevella Bypass | 39+723 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.3A |
| 27 | Chevella Bypass | 39+843 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3A |
| 28 | Chevella Bypass | 40+113 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3A |
| 29 | Chevella Bypass | 40+343 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3A |
| 30 | Chevella Bypass | 40+533 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.3A |
| 31 | Chevella Bypass | 41+477 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.3B |
| 32 | Chevella Bypass | 41+943 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3A |
| 33 | Chevella Bypass | 42+064 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.3A |
| 34 | Chevella Bypass | 42+200 | - | - | - | New Construction | Box Culvert | 1 x 2 x 2 | 2.3A |
| 35 | Chevella Bypass | 42+647 | - | - | - | New Construction | Box Culvert | 1 x 2 x 2 | 2.3A |

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| 36 | Chevella Bypass | 42+845 | - | - | - | New Construction | Box Culvert | 1 x 3 x 3 | 2.3A |
| 37 | Chevella Bypass | 42+984 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.6A |
| 38 | Chevella Bypass | 43+338 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.6A |
| 39 | Chevella Bypass | 43+600 | - | - | - | New Construction | Box Culvert | 1 x 2 x 2 | 2.6A |
| 40 | Chevella Bypass | 43+971 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 41 | 44+189 | 45+071 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2B |
| 42 | 44+600 | 45+483 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2B |
| 43 | 44+800 | 45+690 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 44 | 44+985 | 45+921 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 45 | 45+415 | 46+291 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 46 | 45+506 | 46+389 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 47 | 45+515 | 46+406 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2C |
| 48 | 46+665 | 47+521 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2A |
| 49 | 46+975 | 47+846 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2A |
| 50 | Curve Improvement | 47+906 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2D |
| 51 | 47+550 | 48+406 | - | - | - | New Construction | Box Culvert | 1 x 2 x 1.5 | 2.2A |
| 52 | Minor Realignment | 49+196 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2A |
| 53 | Curve Improvement | 53+641 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2A |
| 54 | Curve Improvement | 53+719 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.2B |
| 55 | 54+075 | 54+952 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3B |
| 56 | 54+500 | 55+371 | - | - | - | New Construction | Box Culvert | 1 x 2.0 x 1.5 | 2.3B |

Table 1-25: Proposal for New Pipe Culverts.

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| -NIL- | | | | | | | | | |

Table 1-26: Proposal for Reconstruction of Slab Culverts to Box Culverts

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| 1 | 28+990 | 29+138 | Slab Culvert | 1 x 2.0 | 11.8 | Reconstruction | Box Culvert | 1 x 2 x 1.5 | 2.2C |
| 2 | 29+600 | 29+789 | Slab Culvert | 1 x 3.0 | 11.0 | Reconstruction | Box Culvert | 1 x 3 x 2.8 | 2.2B |
| 3 | 36+100 | 36+212 | Slab Culvert | 1 x 2.0 | 11.7 | Reconstruction | Box Culvert | 1 x 2 x 1.5 | 2.6A |
| 4 | 48+700 | 49+647 | Slab Culvert | 1 x 4.0 | 12.0 | Reconstruction | Box Culvert | 1 x 4.5 x 2.0 | 2.3B |
| 5 | 48+900 | 49+772 | Slab Culvert | 1 x 1.0 | 12.0 | Reconstruction | Box Culvert | 1 x 2 x 1.5 | 2.3B |
| 6 | 55+550 | 56+430 | Slab Culvert | 1 x 3.0 | 12.0 | Reconstruction | Box Culvert | 1 x 3 x 1.5 | 2.2B |
| 7 | 56+440 | 57+321 | Slab+Stone Arch | 1 x 2.4 | 12.0 | Reconstruction | Box Culvert | 1 x 3 x 2.5 | 2.2B |
| 8 | 58+990 | 59+847 | Slab Culvert | 1 x 2.3 | 12.0 | Reconstruction | Box Culvert | 1 x 3 x 2.5 | 2.6A |

Table 1-27: Proposal for Reconstruction of Pipe Culverts to Box Culverts.

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| 1 | 17+500 | 17+553 | Pipe Culvert | 1 x 0.6 | 20.4 | Reconstruction | Box Culvert | 1 x 2.0 x 1.5 | 2.4A |
| 1 | 19+300 | 19+328 | Pipe Culvert | 1 x 0.6 | 22.5 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.6B |
| 2 | 21+300 | 21+318 | Pipe Culvert | 1 x 0.6 | 21.8 | Reconstruction | Box Culvert | 1 x 2.0 x 1.5 | 2.6B |

| Sl. No. | Chainage (Km) | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (m) | Width (m) | | Type of Culvert | Span Arrangement (m) | TCS |
| 3 | 27+890 | 28+069 | Pipe Culvert | 2 x 0.9 | 22.1 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.6A |
| 4 | 31+500 | 31+719 | Pipe Culvert | 1 x 0.9 | 12.8 | Reconstruction | Box Culvert | 1 x 2.0 x 1.5 | 2.6A |
| 5 | 38+300 | 38+410 | Pipe Culvert | 1 x 0.45 | 12.7 | Reconstruction | Box Culvert | 1 x 2.0 x 1.5 | 2.3B |
| 6 | 46+700 | 47+681 | Pipe Culvert | 2 x 0.45 | 12.4 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.2C |
| 7 | 47+390 | 48+319 | Pipe Culvert | 2 x 0.45 | 12.6 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.2D |
| 8 | 50+358 | 51+206 | Pipe Culvert | 2 x 0.45 | 12.0 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.2B |
| 9 | 53+050 | 53+907 | Pipe Culvert | 2 x 0.45 | 12.0 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.2B |
| 10 | 56+850 | 57+703 | Pipe Culvert | 2 x 0.9 | 12.5 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.3B |
| 11 | 57+250 | 58+095 | Pipe Culvert | 1 x 0.6 | 12.0 | Reconstruction | Box Culvert | 1 x 2.0 x 1.5 | 2.3B |
| 12 | 59+300 | 60+146 | Pipe Culvert | 2 x 1.0 | 13.2 | Reconstruction | Box Culvert | 2 x 2.0 x 1.5 | 2.2D |

Table 1-28: Proposal for Widening of Pipe Culvert.

| Sl. No. | Chainage | | Existing Culvert Details | | | Proposal | Proposed Culvert Details | | |
|---|---|---|---|---|---|---|---|---|---|
| | Existing | Design | Type of Culvert | Span Arrangement (No. x Vent) | Width (m) | | Type of Culvert | Span Arrangement (Nox Vent) | TCS |
| -NIL- | | | | | | | | | |

New Pipe Culverts Proposed at Major Junctions

Table 1-29: Proposal for New Construction of Pipe Culvert at Major Junction.

| Sl. No. | Design Chainage (Km) | Location | Type of Junction | Total Length of Culvert (m) | No of Vents |
|---|---|---|---|---|---|
| 1 | 22.333 | Moinabad Start | 3-legged | 1 x 1.2 | 1 |
| 2 | 26.083 | Moinabad End | 3-legged | 1 x 1.2 | 1 |
| 3 | 39.133 | Chevella Start | 3-legged | 1 x 1.2 | 1 |
| 4 | 44.491 | Chevella End | 3-legged | 1 x 1.2 | 1 |

## New Hume Pipe Culverts at Minor Junction

Table 1-30: Proposal for New Construction of Pipe Culvert at Minor Junction.

| Sl. No. | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Total Length of Culvert (m) | No of Vents |
|---|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | | |
| 1 | 14+210 | 14.210 | 3-legged | ORR service road | – | Narsing to appa service road | 1 x 1.2 | 1 |
| 2 | 14+580 | 14.580 | 3-legged | ORR service road | | Appa Service road | 1 x 1.2 | 1 |
| 3 | 15+200 | 15.200 | 3-legged | City road | Aziz nagar | – | 1 x 1.2 | 1 |
| 4 | 17+290 | 17.275 | 3-legged | City road | Aziz nagar | Gandhipet | 1 x 1.2 | 1 |
| 5 | 18+500 | 18.525 | 3-legged | City road | Bakar ram | – | 1 x 1.2 | 1 |
| 6 | 20+180 | 20.215 | 3-legged | City road | – | Himayath nagar | 1 x 1.2 | 1 |
| 7 | 25+051 | - | 4-legged | City road | Surangal | Moinabad | 1 x 1.2 | 2 |
| 8 | 27+260 | 27.145 | 3-legged | Village Road | Kanaka mamidi road | – | 1 x 1.2 | 1 |
| 9 | 27+580 | 27.500 | 4-legged | Village Road | Kanaka mamidi road | Pedda mangalram | 1 x 1.2 | 2 |
| 10 | 28+033 | 27.890 | 3-legged | Village Road | Kanaka mamidi road | – | 1 x 1.2 | 1 |
| 11 | 29+020 | 28.850 | 3-legged | Village Road | | Village Road | 1 x 1.2 | 1 |
| 12 | 30+120 | 29.980 | 4-legged | Village Road | Kanaka mamidi road | Appareddy guda | 1 x 1.2 | 2 |
| 13 | 30+837 | 30.670 | 3-legged | Village Road | Sanjanpally | – | 1 x 1.2 | 1 |
| 14 | 31+380 | 31.225 | 3-legged | Village Road | – | Appareddy guda | 1 x 1.2 | 1 |
| 15 | 32+192 | 32.040 | 3-legged | Village Road | Tollkatta | – | 1 x 1.2 | 1 |
| 16 | 33+400 | 33.275 | 3-legged | Village Road | – | Mudimyal | 1 x 1.2 | 1 |
| 17 | 36+624 | 36.500 | 3-legged | Village Road | Palgutta | - | 1 x 1.2 | 1 |
| 18 | 37+850 | 37.760 | 3-legged | Village Road | - | Malkapur | 1 x 1.2 | 1 |
| 19 | 39+185 | - | 3-legged | Village Road | - | kesharam | 1 x 1.2 | 1 |
| 20 | 41+150 | - | 4-legged | Village Road | Shabad road | Chevalla | 1 x 1.2 | 2 |

| Sl. No. | Design Chainage in Km | Existing Chainage in Km | Type of Junction | Category of Road | Leads To | | Total Length of Culvert (m) | No of Vents |
|---|---|---|---|---|---|---|---|---|
| | | | | | LHS | RHS | | |
| 21 | 42+140 | - | 3-legged | Village Road | - | Dharma sagar | 1 x 1.2 | 1 |
| 22 | 46+550 | 45.665 | 3-legged | Village Road | _ | SJHN college of engineering | 1 x 1.2 | 1 |
| 23 | 46+639 | 45.770 | 3-legged | Village Road | Dameriguda | _ | 1 x 1.2 | 1 |
| 24 | 49+950 | 49.100 | 3-legged | Village Road | Bastepur | - | 1 x 1.2 | 1 |
| 25 | 49+987 | 49.115 | 3-legged | Village Road | - | Mirjaguda | 1 x 1.2 | 1 |
| 26 | 52+220 | 51.350 | 3-legged | Village Road | Khanapur | _ | 1 x 1.2 | 1 |
| 27 | 52+240 | 52.335 | 3-legged | Village Road | Khanapur | - | 1 x 1.2 | 1 |
| 28 | 53+298 | 53.455 | 3-legged | Village Road | - | Kisthapur | 1 x 1.2 | 1 |
| 29 | 55+741 | 54.900 | 4-legged | Village Road | Angadi chitampally | Antharam | 1 x 1.2 | 2 |
| 30 | 57+911 | 57.095 | 3-legged | Village Road | Kandlapally | _ | 1 x 1.2 | 1 |
| 31 | 59+755 | 58.945 | 3-legged | Village Road | _ | Gangupalle | 1 x 1.2 | 1 |

## 1.9 ROAD FURNITURE AND PAVEMENT MARKINGS

The road furniture, traffic safety features and other facilities included in the design are:

- Bus Bays
- Truck Lay byes
- Road Markings
- Cautionary, Mandatory and Information Signs.
- Kilometre Stones
- Hectometre Stones and Boundary Stones
- Delineators and Object Markers
- Guard Post
- Crash Barrier
- Toll Plaza
- Land Acquisition

**Bus-bays and passenger shelters**

Bus Bays are proposed as per the recommendations of IRC: 84-2014. Typical bus bay layouts are included in the drawing volume. The locations of bus lay byes are presented in Error! Reference source not found..

**Table 1-31: Proposed Bus Byes/Bus Shelters locations**

| Sl. No. | Design Chainage (LHS) (Km) | Design Chainage (RHS) (Km) | Facility |
|---|---|---|---|
| 1 | 15+800 | 15+900 | Passenger Shelter |
| 2 | 17+200 | 17+400 | Passenger Shelter |
| 3 | 18+500 | 18+600 | Passenger Shelter |
| 4 | 19+800 | 19+900 | Bus Bays - Passenger Shelter |
| 5 | 26+700 | 26+800 | Passenger Shelter |
| 6 | 30+700 | 30+800 | Passenger Shelter |
| 7 | 32+200 | 32+400 | Passenger Shelter |
| 8 | 33+300 | 33+500 | Passenger Shelter |
| 9 | 36+550 | 36+700 | Passenger Shelter |
| 10 | 37+800 | 38+000 | Passenger Shelter |
| 11 | 41+800 | 41+900 | Bus Bays - Passenger Shelter |
| 12 | 50+960 | 51+060 | Passenger Shelter |
| 13 | 52+410 | 52+510 | Passenger Shelter |
| 14 | 53+230 | 53+330 | Passenger Shelter |
| 15 | 55+600 | 55+760 | Passenger Shelter |
| 16 | 57+750 | 57+900 | Passenger Shelter |

**Truck Lay byes**

Local consultations were done to determine the location of frequent stoppages, shops, restaurants/dhabas etc. and subjective opinion of the drivers regarding necessity of truck lay bye was gathered. The proposed location of the truck lay bye is presented in **Table 1.32.**

**Table 1-32: Proposed truck Lay byes locations**

| Sl. No. | Existing km | Design Chainage Km | Side | Location Name |
|---|---|---|---|---|
| 1 | - | 23+250 | Both | Moinabad Bypass |

**Rest Areas (Wayside Amenities):** Rest Area shall be provided in accordance with relevant sections of the Manual of specifications and standards (IRC: SP: 84-2014) at the following proposed locations:

| Sl. No. | Existing Chainage (Km) | Design Chainage (Km) | Side | Location Name |
|---|---|---|---|---|
| 1 | 44.620 | 45+560 | LHS | Near Appareddy guda |

**Road Markings**

Road markings perform an important function of guiding and controlling traffic on a highway. These markings serve as psychological barriers and signify the delineation of traffic paths and their lateral clearance from traffic hazards for safe movement of traffic. Road markings are therefore essential to ensure smooth and orderly flow of traffic and road safety. The Code of Practice for Road Markings, IRC: 35-1997, has been used in the study.

The location and type of marking lines, material and colour is followed as per IRC: 35-1997 – "Code of Practice for Road Markings".

The road markings were carefully planned for carriageways, intersections, toll plazas and bridge locations.

**Cautionary, Mandatory and Information Signs**

Cautionary, mandatory and information signs have been provided depending on the situation and function they perform in accordance with the IRC: 67-2011 guidelines for Road Signs.

**Kilometre Stone Details**

The details of kilometre stones are in accordance with IRC: 8-1980 guidelines. Kilometre stones should be provided on the left hand side in the travelling direction of the road i.e., independently for each direction of travel. Kilometre stones shall be fixed at right angles to the centre line of the carriageway.

**Hectometre Stones and Boundary Stones**

The details of Hectometre stones and boundary stones conform to IRC: 26-1967 and IRC: 25-1967. Hectometre stones are located on the same side of the road as the kilometre stones. The inscription on the stones shall be in numerals 2, 4, 6 and 8 marked in an ascending order in the direction of increasing chainage away from the starting station. The numerals shall be 80mm high. The colour of the numerals shall be black on a white background. Boundary stones shall be located on either side of the road opposite every 200m stone and kilometre stone. In addition these shall be fixed at all angular points of the boundary. Where the boundary is on a curve or the land is of significant value and likely to be encroached upon, the boundary stones, as required, shall be installed at closer intervals.

**Delineators and Object Markers**

Roadway delineators are intended to mark the edges of the roadway so as to guide drivers on the alignment ahead. Object markers are used to indicate hazards and obstructions within the vehicle flow path, for example, channelling islands close to the intersections.

Delineators and object markers are provided as per the details given in the drawings and are provided in accordance with the provisions of IRC: 79-1989. They are basically driving aids and should not be regarded as substitutes for warning signs, road markings or barriers. Delineators are provided for all curves of radius less than 600m. They are not provided at locations where Chevron sign boards are provided.

**Guard Post**

Guard posts are proposed on embankments of height more than 1.0m, bridge approaches and horizontal curves of radius greater than 170m. The spacing of guard post shall be 2.0m c/c in these areas. Typical Guard post consists of precast (M20) post of size 200mm x 200mm and a height of 600mm above ground level. They are encased in M15 cement concrete for a depth of 450mm below ground level. Guard posts are painted with alternate black and white reflective paint of 150mm wide bands.

**Crash Barrier**

Metal Beam Crash Barrier is proposed at locations where the embankment height is more than 3.0m, at horizontal curves of radius less than 170m and also at major bridge approaches. Metal beam rail shall be of W-profile corrugated steel sheet beams complying with the following mechanical properties.

i) Tensile strength, Min = 483 MPA
ii) Elongation in 2 inches, Min = 12%
iii) Yield, Min = 345 MPA

The beam elements shall have nominal width of 483mm. Post consists of formed C-channel of size 150 x 75 x 5, 785mm long and spacers consists of formed C-channel of size 150 x 75 x 5, 330 mm long. All members of the system should be hot dipped galvanised to have a minimum coating of 550g/sqm on each face in compliance to relevant MORT&H Specification (Cl. 810). The spacing of posts should be 2.0m c/c. Crash barrier system absorbs impact of vehicle and laterally restrains a vehicle from veering off. This ensures minimum damage to the vehicle and passengers.

**Toll Plazas**

Toll plaza shall be constructed at prescribed location on the highway. Toll plazas, will include additional right-of-way, service lanes, toll booths, lighting and toll booth equipment and these would add 5% to 10% to the cost of the highway.

In the Indian context, the collection system aims to capture the maximum traffic given the condition of the open system.

**Proposed Toll Plaza Location**

One Toll Plaza has been proposed and location is mentioned in below

Table 1-33.

**Table 1-33: Proposed Toll plaza location:**

| Sl. No. | Location | Existing Chainage (Km) | Design Chainage (Km) | Number of Toll Lanes | |
|---|---|---|---|---|---|
| | | | | Entry | Exit |
| 01 | Near Angadichittimpalle | 53+600 | 54+450 | 8 | 8 |

# CHAPTER 2 – PROPOSED STUDY METHODOLOGY

## Hyderabad - Manneguda Road

# CHAPTER 2. PROPOSED STUDY METHODOLOGY

## 2.1 GENERAL

The Technical Feasibility Study is aimed at evaluating the existing deficiencies of the project road in respect to functional, structural, efficiency and safety requirements for meeting the needs of projected traffic for the design period of 30 years. This is carried out based on the findings from various surveys and investigations carried out, observations made and experiences gained from similar projects. The scope includes broadly identifying the improvement needs matching with requirements; determining the associated costs and benefits and assessing the economic and financial viability of upgrading the project to 4/6-lane divided carriageway of NH standards.

The feasibility study, in general, consists of:

- Traffic surveys
- Engineering Surveys and Investigations
- Environmental and Social Screening
- Outline of Design proposal
- Preliminary cost estimates
- Economic viability
- Financial viability

The methodology adopted in carrying out various tasks for the feasibility study is discussed briefly in the following paragraphs. Outline of various proposals based on the results obtained from analysis surveys & investigations data, planning; designs for improvement of project road are separately dealt-with in relevant chapters.

## 2.2 BASIS

The broad methodology, prepared on the basis of the Terms of Reference (TOR), has been generally developed keeping IRC guidelines/standard practices.

## 2.3 COLLECTION OF AVAILABLE DATA

Secondary data especially with regard to socio-economic profile, past traffic trends, other relevant data have been collected from various Government Departments and other bodies and reviewed and used to the extent relevant and necessary. The historical data on traffic and hydrology, to some extent, have been collected from local R&B offices. The hydrology data has been analyzed for determining the flood discharges of various rivers / streams.

Data on accidents along the project road has been collected from the respective police stations. This data has been analyzed to identify the black spots and stretches prone to accidents so as to suggest mitigation measures.

## 2.4 SOCIO-ECONOMIC PROFILE

A thorough study of the socio-economic profile of the state and the project influence area (PIA) has been carried out. The aspects include gender, local population, industry, agriculture employment, health, education, child labour etc.

## 2.5 TRAFFIC SURVEY, ANALYSIS AND PROJECTION

Initial contacts with the R&B revealed the extent of available traffic data relating to the study corridor.

Traffic surveys along the project road include the following:

- Classified Traffic Volume Counts
- Origin- Destination and commodity Movement Surveys
- Turning Movement Surveys
- Axle Load Surveys
- Speed - Delay Surveys
- Pedestrian Crossing Surveys

Standard procedures given in IRC Codes have been followed, as described in Traffic Surveys and Analysis chapter.

On the basis of the study of the traffic characteristics, the total project road has been comprises of one homogeneous section.

Growth of traffic in project influence area and also along the project road is regarded as the most important aspect; since the whole project design, economic & financial evaluation is based on this. To establish the realistic growth rates, road transport data, population growth rates and socio-economic parameters have been studied and analyzed. The growth rates for passenger vehicles have been worked out on the basis of annual growth rate of population and per capita income while the growth rates of freight vehicles have been based on the rate of growth in agricultural, industrial and tourism sectors and historical traffic data. These growth rates have been used to arrive at the traffic projections for the design period. The condition of the road varies from good to fair. However, with the development of this corridor to four-lane divided carriageway configuration, greater amount of traffic is expected to be diverted from the peripheral road network. Appropriate traffic diversion models have been used for assessment of diverted traffic to this road. Speed and delay surveys and axle load data have been used in the calculation of Vehicle Operating Cost (VOC) and for determination of Vehicle Damage Factor. The details on traffic data and projections have been discussed in a separate Chapter of this Report.

## 2.6 ENGINEERING SURVEYS AND INVESTIGATIONS

### 2.6.1 Reconnaissance and Alignment

The consultants have made a study of the available land width (ROW), topographic survey maps of the project area and other relevant information collected.

A detailed reconnaissance survey has been conducted on the total section of the project road and an assessment of possible alignment change at places, if required, has also been made. Detailed features such as land-use, habitation, water routes, canals, intersecting roads, railway lines, utilities such as OFC Cables, electrical lines (HT / LT), etc. have also been noted down. This has enabled the Consultants to visualize the possible problems likely to be encountered in surveys and investigations, design, and execution of the project. The detailed ground reconnaissance of project influence area has been utilized for planning and programming the detailed surveys and investigations.

Identification of homogenous sections has been carried based on traffic data, pavement condition and height of embankment. For each homogenous section, the related studies / surveys have been carried out.

### 2.6.2 Road Inventory and Pavement Investigations

#### 2.6.2.1 Road Inventory Survey

Road inventory survey has been carried out at 200m intervals along the project road to collect details of all the features of the existing road and pavement. The following aspects have essentially been covered:

- Terrain
- Land use (built-up / agricultural / forest / industrial / barren)
- Village / Town
- Formation width
- Carriageway width - (type / width / condition)
- Shoulder (type / width / condition)
- Embankment height
- Submergence history, if any
- Details and configuration of major junctions.
- Details of cross roads
- Location of sharp curves
- List of important structures like temples, petrol pumps, weigh bridges, schools / colleges, passenger shelters, dhabas, major buildings, industrial areas etc.
- Location of water bodies (lakes & reservoir etc.)
- Right of way
- Culverts, bridges and other structures (type, size & span arrangement)
- Road side arboriculture
- Existing tree plantations
- Existing utility services on either side within ROW
- General drainage condition

This data has been taken into consideration for preliminary design (duly augmented by topographical survey).

#### 2.6.2.2 Pavement Investigations

- Road and Pavement Condition Surveys: Detailed field studies have been carried out to collect pavement condition, shoulder condition, embankment condition and drainage condition.

- Information regarding, ravelling, type and area of cracks, carriageway edge fretting, areas under patch repair and shoulder conditions has been collected by making visual observation at 200m intervals along the existing road. Rut depth was measured by a 3m aluminium straight edge and wedges at appropriate 50m intervals along the project road.

- Benkelman Beam Deflection (BBD) tests will be conducted as per the procedure stated in the TOR and the same is as described below:

– Main line measurements at 500 m interval

– Control line measurements – for each homogeneous section for at least 100 m per kilometer, measurements have been taken at 10 m intervals.

Characteristic deflections have been analyzed as per IRC: 81-1997.

- Pavement Roughness

Pavement roughness survey will be carried out using a 5th Wheel Bump Integrator, which gives a continuous record / observations of the unevenness of the road surface.

- Sub-grade Characteristics and Strength

Test pits have been dug for pavement investigation, and soil samples will be collected from these pits at appropriate interval for each homogenous section for field and laboratory investigations.

### 2.6.3 Bridge Inventory and Condition Survey

Inventory and Condition survey of existing bridges and culverts has been carried out to identify their number, type, condition and hydrological aspects. This exercise has enabled the Consultants to assess the requirements of the existing structures en route, like widening, repair, and replacement, as well as matching with the new ones, to be built alongside. Information related to the submergence, if any has also been collected. The format for collection of data is in line with requirements specified in IRC: SP- 19.

#### 2.6.3.1 Preliminary Hydraulic and Hydrological Survey

Subsequent to the inventory and condition survey of bridges and culverts, it is necessary to ascertain hydraulic adequacy of the structures. This data is particularly necessary to determine, if the structure has to be retained or reconstructed. The hydraulic adequacy of structures is substantiated using the data obtained from hydrological survey. This basically consists of finding out the actual discharge in a stream / river. A detailed desk study of the topo-sheets is conducted to obtain the catchment area contributing to the flow in the stream. Further, rainfall statistics in the area is studied deeply to obtain the maximum 24-hour rainfall in the catchment area. Site understanding of the catchment characteristics is carried out to obtain the flow coefficient. The above data is used in the calculation of discharge and linear water way required for the stream. Further, the scour depth and depth of maximum flow along with velocity of flow is calculated. The study results with respect to HFL and adequacy of the waterway are compared with the data obtained from the Bridge inventory survey and the hydraulic adequacy of the structure is established.

### 2.6.4 Topographic Surveys

The Topographical survey forms the basis of most of the highway and bridges design work.

For carrying out the Topographic Surveys, a quality procedures has been adopted (for data logging accuracy and independent checks), which is to be targeted at capturing only the essential ground features, as the availability of digitized terrain mapping is the most critical field activity in this project program.

Basic features of the topographical survey are detailed in sub-sections below:

#### 2.6.4.1 Level - 1

**Major Control:** A network of major control points are established at approximately 5km intervals along the project road. They are established using differential GPS equipment. These Major Control Points are connected to the existing National Grid points. A comprehensive station description will be provided in the Final Topographical Report to ensure ease of locating / reinstatement at subsequent stages.

**Minor Control:** Minor Control Points have been established to carry out the topographic survey. These are generally at 250 m intervals along the route. The Minor Control Points will be connected to the Major Control Points. Station descriptions will again be provided for relocation and identification purpose. The Minor Control Points will be established during detailed survey with Total Stations.

#### 2.6.4.2 Level - 2

**Detailed Survey**

**Roads:** Detailed ground surveys of all significant physical features have been carried out using Total Stations. In general, a survey string is observed along each feature line, and points are observed at suitable intervals. The survey conforms to the requirements of R&B, wherever relevant. The survey extends normally 30m on either side of the centre line of the existing road and about 100m along the cross road at key intersections.

At locations where the existing alignment crosses or meets with another key road the survey has been carried out up to a relevant and appropriate distance on the adjoining road(s) and across a width sufficient to allow for any necessary improvements. The data is stored on data loggers and downloaded daily for processing. All features are coded in the field to allow maximum use of standardized software packages relating to mapping techniques and highway design.

**Structures:** Topographic surveys along the alignment have also been conducted for bridges over rivers and streams.

In case of bridges, requisite cross sections / L-sections along rivers and streams has been obtained as laid down in the IRC codes.

#### 2.6.4.3 Office Processing

The field survey data has been processed in the office to provide a digital output file for the design engineers.

The data is structured so that the vertical profile of the proposed alignment can be produced automatically. The format of the resulting data readily promotes the calculations of earthworks and other quantities required for the evaluation of cost estimates.

Roadway strip plans have been produced from the survey data, which is used to identify the existing Right of Way (ROW) along the road corridors. In addition, the plans are used to identify all existing installations within the ROW that require re-location based on the new road design. Action Plans for covering the relocation of these obstructing installations and public utilities are to be prepared on a kilometer basis.

### 2.6.5 Geotechnical Investigation for Pavement and Sub-grade Design

Trial pits have been excavated at desired intervals for homogenous sections in a staggered manner to assess the pavement composition and sub-grade. Further, detailed investigations have been carried out to determine:

- in-situ density and moisture content at each test pit;
- field CBR using DCPT at each test pit;
- Characterization (grain size and atterberg limits) at each test pit;

### 2.6.6 Material Investigations

Material investigations have been carried out to explore the availability of suitable construction material and likely extent of usage in embankment and different pavement courses.

The samples have been collected as described below:

a) From quarry sites for aggregate characteristics like, A.I.V, gradation, Soundness, flakiness and elongation index, stripping value and water absorption etc.

b) From potential borrow areas for availability of suitable embankment and sub grade material, and identification of suitable borrow areas, tested in line with relevant IRC code and MORT&H Specifications.

## 2.7 ENGINEERING DESIGN

### 2.7.1 Geometric Design of Highway

The geometric deficiencies such as sharp horizontal curves and steep gradients along the project road have been identified from the topographic survey plans and improvements are proposed accordingly, keeping in view the design standards, practical feasibility and land acquisition consideration. The environmental and social considerations have also been kept in view.

It is observed that the project road, by and large, has good geometrics, but it is not commensurate with high-speed travel at some locations. Generally, a design speed of 100 kmph has been adopted. The realignments are proposed in the poor geometric sections for improvement of geometrics to be in conformity with the IRC guidelines.

### 2.7.2 Pavement Design

The pavement design includes

i) Design of pavement of the new carriageway
ii) Overlay design of the existing pavement

Benkelman Beam Deflection Test Results and Pavement Condition Survey data as well as close reconnaissance by experts have been used to determine the strength/requirement of existing pavement. The thickness of overlay has been proposed judiciously considering the provisions of IRC: 81-1997 code of practice.

Design of new pavement has been made on the basis of the cumulative number of standard axles on the pavement determined from Traffic Projections and VDF values obtained from Axle Load Survey. The recommendations of IRC: 37 (Code of practice for design of flexible pavement) have been adopted for proposing the most feasible pavement thickness.

### 2.7.3 Design of Structures

It is observed that most of the bridges in the project road are in fair to good condition which can be retained. Some bridges need reconstruction/widening etc..,
In most of the locations structure are available with sufficient width and vent size, and those structure are proposed to retain except in few locations of realignment/Geometric improvement/Bypass. Pipe culverts having diameter more than 0.9m are proposed to widen/Retain whereas pipes having diameter less than 0.9m are proposed for reconstruction.

Preliminary Hydraulic and hydrological studies have been carried out for determination of flood discharges and eventually, for working out the waterway and general span arrangement, deck level etc. The hydraulic and hydrological studies are based on the IRC: SP-13.

### 2.7.4 ROB/ Flyover

The design of ROB shall be carried out based on the guidelines put forth by the Ministry of Railways.

### 2.7.5 Drainage Design

The drainage design has been based on the hydraulic and hydrological studies, with considerations for rain water harvesting structures at suitable locations and as per IRC: SP: 42-1994 "Guidelines on Road Drainage".

## 2.8 PRELIMINARY ENVIRONMENTAL AND SOCIAL SCREENING

### 2.8.1 Environmental screening

An Environmental Impact Assessment (EIA) study was undertaken and a report was prepared which includes a Mitigation Plan that sets out feasible and cost effective measures that will reduce potentially significant adverse environmental effects, if any, to an acceptable level.
A Preliminary Environmental Desk Study focuses on the Environmental Assessment of key impacts, issues and alternatives, including information necessary for proposed development.

The following issues were identified:

- The information necessary for decision making;
- The important environmental issues and concerns;
- The significant effects, factors and alternatives to be considered; and
- The appropriate content and boundaries of an EIA study
-

The programme includes:

- Field surveys;
- Consultation exercises with official and non-official sources; identifying existing relevant baseline data;
- Identifying the scope of baseline surveys required;
- Identifying key issues to be addressed within the EIA,

- Providing a technical brief for the EIA

To identify any potential environmental conflicts arising due to the widening of the existing road, collated and plotted the information collected on to strip plans to arrive at the environmental constraints for the proposed scheme.

The main issues included local settlements and communities, traffic, agriculture, ecology landscape, land-use and soils, water, archaeology heritage, cultural and religious sites and planning issues.

This part of the study was undertaken in parallel with the economic and engineering analyses in order to determine any significant social or environmental issues, which could require further in-depth study. The approach and methodology to be adopted for environmental assessment would conform to the requirement of the Environmental Impact Assessment notification, MOEF, 1994, Environmental Guidelines for Rail / Road / Highway Project, MOEF, 1989 and relevant World Bank Operational Directives, Source Book and Hand Book.

**Secondary data collection**

Secondary data collection including relevant maps for all the corridors was collected from various government / semi-government departments / agencies, research institutions / universities and NGOs regarding:

- Physical resources
- Flora and fauna
- Critical natural habitats
- Built-up areas
- Water bodies
- Other critical environmental indicators
- Policy, legal and administrative framework etc.

The available data was used for environmental screening. The results of this screening are plotted on strip maps and presented in tabular formats.

The results of the preliminary screening lead to identification of the nature and extent of environmental issues needing more detailed examination.

### 2.8.2 Social Screening

The preliminary site visit reveals that land acquisition problem would be very crucial throughout the study stretch.

**Secondary data collection**

Available information was collected from various agencies that have worked in the state. The information includes constitutional provisions, conventions and protocols on human rights and indigenous people, status of social related legislation and policies of the Central Government and the state of Telangana, key factors in RAR planning, guidelines for entitlement framework and community, social, ethnic and economic indicators of the population.

**Social Impact Screening**

During this preliminary screening stage, the consultants made an initial visit to the site in order to develop a clear understanding of the proposed road changes that may be undertaken, and to

identify the impact on housing, business and agricultural activities expected to arise out of the changes. The social impact screening concentrated on the areas likely to impact the most on the population.

The data was analyzed and screening was done initially, through a reconnaissance survey. The various indicators considered are:

- Community Life and Economic Activities

  - Severance of community
  - Encroachment on local community facilities
  - Encroachment on local economic activities
  - Encroachment on the access to and rights of resources
  - Cultural heritage / property
  - Social structure, institution and customs
  - Cultural shock
  - Road safety
  - Public health
  - Waste
  -

- Land acquisition and resettlement

  - Expropriation of resources
  - Involuntary resettlement
  - Conflict between target population and host population
  - Indigenous or traditional population

The results of the screening have been plotted on maps and tabulated to identify any major conflicts and extent of conflicts.

## 2.9 SCHEMES FOR DEVELOPMENT AND ASSESSMENT

From the existing field data development schemes and results of surveys and investigations have been evolved. This task made use of available data, site reconnaissance desk studies and preliminary findings. The standards, codes of practice and other relevant controlling documents are listed in Chapter – 4.0, thereby establishing the procedures, design controls and general engineering practice required.

In the review of project alignment due consideration have been given to the environmental implications, land acquisition and impact on project affected people, using information obtained from the field surveys undertaken.

The terrain for the project road has been divided into two types namely, plain and rolling section. The design parameters for the different type of road sections have been used.

A preliminary assessment of the new bridges and ROBs has been carried out along with rehabilitation of existing bridges and culverts.

### 2.9.1 PRELIMINARY COST ESTIMATES

The rate of materials adopted in the preliminary cost estimate is based on the basic rates of ***SOR as per Telangana Revised Standard data for the year 2018-19,*** updated with respect to market rates for major cost items. The basis of analysis is the MORT&H Standard Data Book. For the working out of preliminary cost estimate, work items are split into the following sub-heads:

1. Site Clearance and earthworks
2. Granular Pavement Courses
3. Bituminous Courses
4. Bridges, Culverts, Retaining Walls and other structures
5. Kerbs, Drainage and other Protective works
6. Road Junctions, Service Roads, Bus Stops, Truck Lay-byes
7. Toll Plaza
8. Road Furniture and Road Safety Works
9. Traffic Management and maintenance during construction
10. Land and Structure Acquisition
11. Relocation of utilities
12. Rehabilitation and Social Costs
13. Environmental improvement (Civil works)
14. Environmental Improvement (Non Civil works)

## 2.10 ECONOMIC VIABILITY

Simultaneous to, and linked with the traffic survey, data collection has been undertaken in relation to the cargo related vehicle fleet. It has been possible to collect some of this information from the OD surveys. In addition, information has been obtained from vehicle dealers and operators to determine the types of vehicles commonly used their utilization and the cost of parts, labour, maintenance and repairs.

The Consultants recommend, given to the uncertainty inherent, in use of high, medium and low growth scenarios; it has been carried advice to have two growth periods representing the short to medium term and the long term.

Consultant made use of the HDM-IV model to conduct the economic analysis of the route. The model requires classified traffic volumes, both existing and forecast vehicle fleet data and detailed engineering data relating to the existing road and the existing and future maintenance and repair regimes, including costs. Each traffic section as indicated by the traffic studies has been modeled separately to produce an Economic Internal rate of Return (EIRR), Net Present Value (NPV) and Benefit/Cost Ratio (BCR) for the proposed and alternative rehabilitation schemes.

It is essential for the validity of the results to establish a reasonable "do minimum" situation against which each scheme is compared. A "do nothing" scenario, wherein the road is not maintained, will produce unrealistically high benefits for all other schemes, hence the base case should include a minimum reasonable level of intervention to prevent road closure.

Sensitivity tests have been carried out including low and high traffic growth scenarios, increasing and reducing existing traffic volumes by 10% and increasing construction, maintenance and rehabilitation costs by 10%. Together, these tests reveal the economic robustness of the proposed project.

## 2.11 FINANCIAL VIABILITY

The financing of a project is closely inter-linked with the cost requirement - (capital and running costs) future traffic flows and revenue potential. A financial model would be developed to project total revenues over a period of 30 years. The model would help determine the following under commercial format:

- Different user fee scenarios (toll)
- Funding options as packages for private participation
- With govt. participation in funding

Funding options as packages for private participation would cover:

- BOT
- Concession
- Leasing
- Management contract
- Performance agreement
- Servicing out or contracting out
- Corporatization

Govt. participation may be examined in the following manner:

- with Govt. subsidy
- without Govt. subsidy
- Partly financed through public funds supplementing the toll collection by other revenue sources or any other revenue augmentation method.

The Consultant would propose and finalize with MoRTH parameters, formats and scenarios in respect of commercial analysis for adopting a businesslike approach. Pricing strategy is to be well designed as to ensure cost recovery and tariff adjustment corresponding to cost increase. The Consultant would try to balance the conflicting goals in this context, namely (i) ensuring reasonable and just price from consumer angle and (ii) allowing for adequate profit margin through price cap approach.

Financial Analysis would be carried out with respect to:

- Projected income statement
- Balance sheet
- Discounted cash flow including detailed cash outflow and inflow besides amortization statements
- Sensitivity analysis under a number of probable scenarios including traffic volume, traffic rate/price-cap etc.

Financial scheme would be finalized after the financial analysis is carried as stated above.

# CHAPTER 3 - SOCIO-ECONOMIC PROFILE

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# CHAPTER 3. SOCIO-ECONOMIC PROFILE

## 3.1 INTRODUCTION

This chapter provides socio-economic profile at two levels, like, regional or state level and project influence area.

For a better understanding about how the growth of traffic and demand for transport infrastructure is dependent on the region's available resources, human and natural, social and economic distribution, gross output and growth potential, a study of socioeconomic profile is essential. For any region, a close inter-relation exists between the socio economic activity and transport infrastructure. The region's development is totally governed by these two components and how they complement each other.

The socio economic profile helps in making project implementation decisions. A survey of economic activity and demographic trends in the past can help in explaining current social status distribution among the society, the living standards, the quality of life, the general awareness, maturity levels and in turn the reflection on the growth of traffic etc.

Socio-economic and demographic data of the project area – population & density, employment, poverty levels, industry, agriculture, literacy, health, transport, tourism potential and related aspects. Socio – economic profile has been prepared to provide a quantitative framework against which qualitative socio and economic impacts of any of the development initiative can be assessed and evaluated.

The socio-economic profile is discussed in terms of a few selected indicators, which are broadly categorized in to the following and hence together are termed as socio economic indicators.

### 3.1.1 Social and Demographic Indicators

Social indicators are set of indicators that measure progress towards the policy objectives designed for promoting employment, combating poverty, improving living and working conditions, combating exclusion, developing human resources, etc.
Demographic indicators are a scientific measure of human population dynamics. It encompasses study of the size, structure and distribution of populations, and how populations change over time due to births, deaths, migration and ageing.
A list of socio and demographic indicators considered for this report is as under:

- Population
- Male/Female ratio
- Health
- Household
- Literacy
- Poverty
- Employment

### 3.1.2 Economic Indicators

An economic indicator is simply any economic statistic, which indicates how well the economy is doing and how well the economy is going to do in the future. To understand economic indicators, one has to understand the ways in which economic indicators differ. Alternatively statistics, which

indicates current economic growth rates and trends such as retail sales and employment. Economic indicators allow analysis of economic performance and predictions of future performance.

- Gross domestic product (GDP)
- Net state domestic product (NSDP)
- Per Capita Income(PCI)
- Agriculture & irrigation
- Industry
- Transportation

**Project influence area**

A project influence area is the zone that fall in the near vicinity of the project corridor, to which the project investments induce a catalytic development resulting in additional generation of traffic other than normal. The Project Road Starts at km 14.000 Hyderabad (ORR) and ends at km 59.500 before Manneguda town. The total Existing Length of the project stretch is 45.500km. The project Stretch falls in Ranga Reddy and Vikarabad Districts.

A detailed accounting of the socio-economic profile of the PIA has been prepared which traces the PIA's economic performance of the past and establishes the likely growth prospects for the future. The output of this Chapter is the economic growth prospects of the PIA with respect to certain selected economic variables and serves as the basis for arriving at a realistic traffic growth rate, for different vehicle categories.

### 3.1.3 Methodology

The socio economic characteristics of the PIA as indicated above have been examined through a preliminary socio economic survey. The base data required was collected from numerous agencies and referring the various literature available from the Directorate of Economics and Statistics and official government websites. All statistics used to study the past economic performance of the PIA are based on secondary official sources of information.

## 3.2 SOCIAL AND DEMOGRAPHIC PROFILE

### 3.2.1 General history

Telangana is a State in the Southern region of India. It has an area of 114,840 square km and is the twelfth largest State in India. Most of it was part of the princely State of Hyderabad , ruled by the Nizam of Hyderabad. In 1948, the Hyderabad from Nizam rule joined the Union of India. In 1956, the Hyderabad State was dissolved on the basis of linguistic reorganization of States. The Telugu speaking part of Hyderabad State, known as Telangana, was merged with Andhra State to form Andhra Pradesh. On 2 June 2014, Telangana was separated from Andhra Pradesh as a new 29th State of India, with the city of Hyderabad as its capital. Hyderabad will continue to serve as the joint capital city for Andhra Pradesh and Telangana for a period of not more than ten years.

Telangana is bordered by the States of Maharashtra , Odisha, Chhattisgarh to the north, Karnataka to the west, and Andhra Pradesh to the south and east.
Telangana lies between 15°48' and 19°50'N latitude and 77°30' and 81°40'E longitude.

Earlier Telangana has only 10 districts after the bifurcation of two Telugu state AP and Telangana. The Telangana government has decided to form new districts for the development of the state. First, the TS government has proposed seventeen (17) districts has been placed at Parliament meeting last

year. Many political parties opposed to this decision, but after a long struggle and Telangana CM K Chandrasekhar Rao clear explanation on the intent behind the TS New Districts the government has finally approved for the Telangana New Districts Names List 2017. Now after six hours long meeting with all the committee member, the Telangana government has finalized the list to 31 new districts.

| Sl No. | District of Telangana | Revenue Division's |
|---|---|---|
| 01 | Adilabad District | Adilabad |
| 02 | Mancherial District | Uturu, Mancherial |
| 03 | Nirmal District | Nirmal |
| 04 | komaram bheem Asifabad District | Bhainsa, Asifabad |
| 05 | Karimnagar District | Karimnagar, Huzurabad |
| 06 | Jagtial District | jagtial, Mettupalli |
| 07 | Peddapalli District | Peddapalli, Mantini |
| 08 | Rajanna Sircilla District | Sircilla |
| 09 | Nizamabad District | Nizamabad, Armoor |
| 10 | Kamareddy District | Bodhan, Kamareddy, Banswada, Yellareddy |
| 11 | Warangal Urban District | Ellareddy, Warangal |
| 12 | Warangal Rural District | Warangal (Rural), Narsampet |
| 13 | (Jayashankar) Bhupalpally District | Bhupalpally, Mulugu |
| 14 | Jangaon District | Jangaon, Station Ghanpur |
| 15 | Mahabubabad District | Mahabubabad, Thorrur |
| 16 | Khammam District | Khammam, kalluru |
| 17 | Bhadradri Kothagudem District | Kothagudem, Bhadrachalam |
| 18 | Medak District | Medak, Toopran, Narsapur |
| 19 | Sangareddy District | Sangareddy, Zahirabad, Narayankedh |
| 20 | Siddipet District | Siddipet, Gajwel |
| 21 | Mahabubnagar District | Mahabubnagar, Narayanpet |
| 22 | Wanaparthy District | Wanaparty |
| 23 | Nagarkurnool District | Nagarkurnool, Kalwakurthy, Achampet |
| 24 | Jogulamba Gajwel District | Gajwel |
| 25 | Nalgonda District | Nalgonda, Miryalaguda, Devarakonda |
| 26 | Suryapet District | Suryapet, Kodad |
| 27 | Yadadri Bhuvanagiri District | Bhuvanagiri, Choutuppal |
| 28 | Vikarabad District | Vikarabad, Tandur,— |
| 29 | Medchal District | Malkajgiri, Keesara |
| 30 | Rangareddy District | Kondukuru, Ibrahimpatnam, Rajendranagar, Chevella. |
| 31 | Hyderabad District | Hyderabad, Secunderabad |

### 3.2.2 Population

Salient demographic figures are as shown in **Table 3-1** below. It includes population, rural and urban divide, density, literacy rate, sex ratio etc.

**Table 3-1: Demographic figures of combined state Andhra Pradesh & Telangana**

| Item | Figures |
|---|---|
| Total Population | 84665533 |
| Males | 42509881 |
| Females | 42155652 |
| Rural | 56311788 |
| Urban | 28353745 |
| Density of Population (per sqkm) | 308 |
| Literacy Rate (%) | 67.66 |
| Sex Ratio (Females per 1000 Males) | 992 |
| Percentage of Urban Population | 33.49 |

*Source: Planning Commission of India, as per Census 2011

### 3.2.3 Health

The total fertility rate of the state is 1.8. The infant mortality rate is 43 and maternal mortality ratio is 134 (SRS 2011) which are lower than the National average. The sex ratio in the state is 992 (as compared to 940 for the country). Comparative figures of major health indicators are as given in **Table 3-2** below.

**Table 3-2: Health profile of combined state Andhra Pradesh & Telangana compared to National figures**

| Sl. No. | Item | AP | India |
|---|---|---|---|
| 1 | Total population (Census 2011) (in million) | 84.66 | 1210.19 |
| 2 | Decadal growth (Census 2001-2011) (%) | 11.10 | 17.64 |
| 3 | Crude birth rate (SRS 2011) | 17.5 | 21.8 |
| 4 | Crude death rate (SRS 2011) | 7.5 | 7.1 |
| 5 | Total fertility rate (SRS 2008-2010) | 1.8 | 2.51 |
| 6 | Infant mortality rate (SRS 2011) | 43 | 44 |
| 7 | Maternal mortality ratio (SRS 2011) | 134 | 212 |
| 8 | Sex ratio (Census 2011) | 992 | 940 |
| 9 | Population below poverty line (SRS 2009-2010) (%) | 21.1 | 29.8 |

*Source: Planning Commission of India, as per Census 2011

### 3.2.4 Literacy

The total literacy rate of the state has commendably improved above the national average. The total literacy rate is 75.87%, the literacy rate of males is 82.11% compared to females which 69.40%. The districts along the project road has literacy rates above the state average (refer **Table 3-3**).

Table 3-3: Project Road District wise area, population and literacy

| Sl. No | District Name | Area ( Sq Km ) | Population | | Literacy | |
|---|---|---|---|---|---|---|
| | | | Male | Female | Male | Female |
| 1 | Ranga Reddy | 7564.88 | 2701008 | 2595733 | 82.11% | 69.40% |

*Source: www.census2011.co.in

Telangana is served by more than 20 leading institutes of excellence in higher education. All major such as arts, humanities, science, engineering, law, medicine, business and veterinary science are offered, leading to first degrees as well as postgraduate awards. Advanced research is conducted in all major areas.

The state has recently made strides in setting up several institutes of high quality. *International Institute of Information Technology (IIIT)* and *Indian School of Business* (ISB) are gaining international attention for their standards. National Institute of Fashion Technology, Hyderabad (NIFT) is well reputed among those interested in fashing as career.

## 3.3 ECONOMIC PROFILE

### 3.3.1 Gross State Domestic Product

State Domestic Product (SDP) popularly known as state income and related aggregates are of very much use to meet the requirements of planning and policy making purposes. With the gradual improvement in the availability of basic data over the years, a comprehensive review of methodology for state income has constantly been undertaken with a view to updating the data base and shifting the Base Year to a more recent year. As a result, Base Year of State Domestic Product has been shifted from time to time. Estimates initially were made with the Base year 1960-61 in August 1967. The Base year of SDP was further revised from 1960-61 to 1970-71 in January 1978, from 1970-71 to 1980-81 in February 1988 and from 1980-81 to 1993-94 in March 1999.

Advance Estimates of GSDP for 2011-2012 at Constant (2004-05) prices are estimated on the basis of Second Advance Estimates of Agriculture, Index of Industrial Production, Forecast Reports provided by respective line departments and also the data provided by the CSO, Government of India on performance of Supra Regional Sectors like Railways, Communications, Banking & Insurance etc. The Advance Estimates of GSDP at Current prices are derived using the implicit price deflators and WPI of respective compilation categories.

GSDP at Constant (2004-05) prices for the year 2011-2012 is estimated at Rs. 405,048 Crores (Advance Estimates).

In the Primary sector, among sub sectors Agriculture alone has registered a negative growth, which is due to decline in production of food grains. The Live Stock sector is one of the most sustainable and dependable sectors registering a moderate growth.

Secondary sector comprising of Manufacturing (Registered and Unregistered) Electricity, Gas & Water Supply and Construction together are showing an impressive growth.

Tertiary sector comprises Trade, Hotels & Restaurants, Transport by other means & Storage, Communications, Banking & Insurance, Real Estate & Business Services and Community, Social & Personal services. .

The GSDP of Combined State Andhra Pradesh and Telangana and GDP of All India at Constant (2004-05) prices are given in Table 3-4.

**Table 3-4: GSDP of Combined State AP and TS and GDP of All India at constant (2004-2005) prices (Rs. Crores)**

| Year | Combined State Andhra Pradesh and Telangana | | All India | |
|---|---|---|---|---|
| | GSDP | % Change | GDP | % Change |
| 2001-2002 | 145,185 | 4.22 | 2472052 | 5.52 |
| 2002-2003 | 149,142 | 2.73 | 2570690 | 3.99 |
| 2003-2004 | 163,085 | 9.35 | 2777813 | 8.06 |
| 2004-2005 | 224,713 | 8.15 | 2971464 | 6.97 |
| 2005-2006 | 246,210 | 9.57 | 3253073 | 9.48 |
| 2006-2007 | 273,730 | 11.18 | 3564364 | 9.57 |
| 2007-2008 | 306,645 | 12.02 | 3896636 | 9.32 |
| 2008-2009 | 327,731 | 6.88 | 4158676 | 6.72 |
| 2009-2010(P) | 342,571 | 4.53 | 4516071 | 8.59 |
| 2010-2011(Q) | 375,664 | 9.66 | 4937006 | 9.32 |
| 2011-2012(A) | 405,048 | 7.82 | 5243582 | 6.21 |

P: Provisional, Q: Quick, A: Advanced

*Source: Directorate of Economics & Statistics, Andhra Pradesh and CSO, New Delhi.

### 3.3.2 Per Capita Income

The Per Capita Income is an indicator of the standard of living of the people. As per the Advance estimates of 2011-12, the Per Capita Income of Combined State Andhra Pradesh and Telangana at current prices increased to Rs.71,540 from Rs.62,912 in 2010-11 registering a growth of 13.7 percent. The Per Capita Income at constant (2004-05) prices, has also gone up from Rs.40,366 in 2010-11 to Rs.42,710 in 2011-12 registering a growth rate of 5.8 percent. The per capita income of Combined State AP and TS and all India at Current prices from 1999-2000 to 2011-2012 are given in Table 3-5.

**Table 3-5: Per capita income of Combined State AP and TS and all India at Current Prices (Rs)**

| Year | Combined State Andhra Pradesh and Telangana | | All India | |
|---|---|---|---|---|
| | PCI | % Change | PCI | % Change |
| 1999-2000 | 15507 | - | 15839 | - |
| 2000-2001 | 17243 | 11.19 | 16648 | 5.11 |
| 2001-2002 | 18630 | 8.04 | 17800 | 6.92 |
| 2002-2003 | 19568 | 5.03 | 18899 | 6.17 |
| 2003-2004 | 22041 | 12.64 | 20936 | 10.78 |

| Year | Combined State Andhra Pradesh and Telangana | | All India | |
|---|---|---|---|---|
| | PCI | % Change | PCI | % Change |
| 2004-2005 | 23729 | 7.66 | 22946 | 9.60 |
| 2005-2006 | 28539 | 12.7 | 27131 | 12.4 |
| 2006-2007 | 33135 | 16.1 | 31206 | 15.0 |
| 2007-2008 | 39727 | 19.9 | 35825 | 14.8 |
| 2008-2009(R) | 46345 | 16.7 | 40775 | 13.8 |
| 2009-2010(P) | 52814 | 14.0 | 46117 | 13.1 |
| 2010-2011(Q) | 62912 | 19.1 | 53331 | 15.6 |
| 2011-2012(A) | 71540 | 13.7 | 60972 | 14.3 |

R: revised, P: Provisional, Q: Quick, A: Advanced

**Source:** Directorate of Economics & Statistics, Andhra Pradesh and CSO, New Delhi.

### 3.3.3 Gross fixed capital formation

The growth of the productive capacity of the economy of a state depends on its rate of capital accumulation and it is assessed by estimating the capital formation of that state. Higher the rate of capital accumulation, higher would be the growth of the productive capacity of the economy, where as its paucity leads to low level of production with higher cost. Thus Capital Formation assumes paramount importance in the context of policy making by the State and Central Governments. It reveals the potential investment of public and private sectors and gives net addition of the assets created during the year.

Estimates of Gross Capital Formation (GCF) consist of Gross Fixed Capital Formation (GFCF) and changes in stock. GFCF is a better indicator than GCF since changes in stock is subject to more fluctuations and also non-availability of the stocks information in most of the industry groups of private sector. Hence, the estimates are confined to GFCF rather than GCF at current prices. For measurement of GFCF at State level, expenditure approach is followed as the data on imports and exports of capital goods across the state boundaries and net inflow of resources from outside the State are not available.

The GFCF by industry groups has been revised from 1999-2000 to 2004-05 as base year of State Domestic Product has been changed from 1993-94 to 1999-2000 due to availability of latest data from various surveys and Censuses conducted by State/Central Governments, to incorporate latest International standards, to capture the structural changes that have taken place in the economy of the state and to make methodological improvements. The improvements made in compilation of estimates are All India Debt and Investment Survey (AIDIS) results of 2002-03, additional coverage of Cultivated Assets, expenditure made by new industries before commencing the production, installation charges of wind energy systems, wind mills, aero generators, expenditure on Software, and results of NSSO 56th round Survey (2000-01) on unorganized manufacturing of the state for the years 1999-2000 to 2004-05.

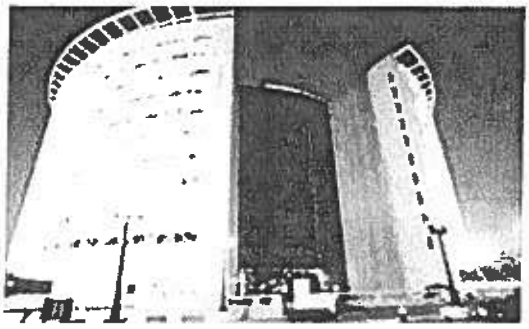
The GFCF also included from private corporate sector is based on the latest RBI studies and collection of annual accounts.

## 3.4 AGRICULTURE

Agriculture has been the chief source of income for the state's economy. Two important rivers of India, the Godavari and Krishna, flow through the state, providing irrigation. Rice, sugarcane, cotton, mirchi and tobacco are the local crops. There are many multi-state irrigation projects under development, including Godavari River Basin Irrigation Projects.

## 3.5 INFORMATION TECHNOLOGY

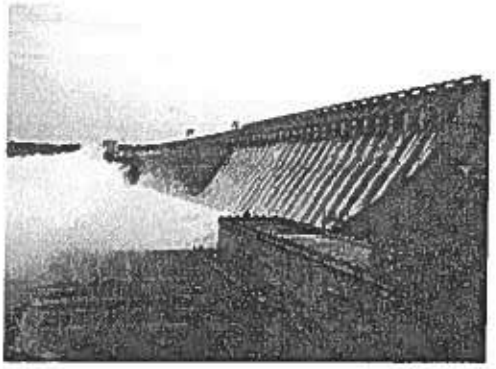
The state has also started to focus on the fields of information technology and biotechnology. In 2004 - 2005, Combined state Telangana and Andhra Pradesh was at the fifth position in the list of top IT exporting states of India before Bi-furcation of state in 2014. The IT exports from the State was Rs.1,800 million in 2004. At an increase of 52.3% every year, the IT exports reached Rs.19,000 million in 2006 - 2007 and ranked fourth in India. The service sector of the state already accounts for 43% of the GSDP and employs 20% of the work force.



**Cyber towers**

## 3.6 IRRIGATION

Nagarjuna Sagar Dam is a masonry dam built across Krishna River in Nagarjuna Sagar, Telangana, India. It is the world's tallest masonry dam, at a height of 124 metres and creates a reservoir holding up to 11,472 million cubic metres. It is one of the earliest irrigation and hydro-electric projects in India. The dam provides irrigation water to the Nalgonda, Prakasam, Khammam and Guntur Districts.



**Nagarjuna Sagar Dam**

## 3.7 MINERAL WEALTH

Combined State Andhra Pradesh and Telangana is a mineral rich state, ranking second in India in terms of mineral wealth. For example, the state has about one third of India's limestone reserves, at about 30 billion tonnes.

The Combined state ranks first nationwide in hydro electricity generation with national market share of over 11%.

Combined State Andhra Pradesh and Telangana gross state domestic product for 2005 is estimated at $62 billion in current prices. The gross state domestic product of Combined State

Andhra Pradesh and Telangana at market prices is estimated by *Ministry of Statistics and Programme Implementation* with figures in millions of Indian Rupees.

## 3.8 TRANSPORTATION

Major transportation links of Telangana

### 3.8.1 Railways

South Central Railway
South Eastern Railway

### 3.8.2 Airports

Hyderabad
Shamshabad

### 3.8.3 Road Transport

Telangana Road Transport Corporation (TSRTC) is the major public transport corporation owned by government of Telangana connecting all the cities and villages. TSRTC has also the distinction of being in the Guinness book of World records for having the largest fleet of vehicles, and the longest area covered/commuted daily (Rahil). Apart from these thousands of private operators run buses connecting major cities and towns of the state. Vehicles like autorickshaws occupy a major share of the local transport in the cities and adjoining villages.

## 3.9 TOURISM

Yadagirigutta, the abode of an avatara of Vishnu, Sri Lakshmi Narasimha. The Ramappa temple and Thousand Pillars temple in Warangal are famous for some fine temple carvings. The state has one of well-knowned Buddhist centres at Nagarjuna Konda.

Charminar, Golconda Fort, Chandragiri Fort, and Falaknuma Palace are some of the monuments attracting Tourism in the state Capital Hyderabad.

The project road passing through Vikarabad and Rangareddy district;

**VIKARABAD DISTRICT**

Vikarabad district is carved out of erstwhile Rangareddy district. The district shares boundaries with Sangareddy, Rangareddy, Mahabubnager and the state of Karnataka. The district comprises 18 mandals and 2 revenue divisions – Vikarabad and Tandur. The district headquarters is located at Vikarabad town. The district is spread over an area of 3,386.00 square kilometres (1,307.34 sq mi).

Telugu is the Local Language here. Total population of Vikarabad (CT) is 9,27,140 according to census 2011.Density of population is 274 persons per sq. Km Sex ratio (Female per 1000 Males) is 1,001. Literate rate of the district is 57.91. All the numbers are according to 2011 census.

**Climate and Rainfall**

The region experiences hot and dry summer throughout the year except during the South West Monsoon season. The year may broadly be divided into four seasons. It experiences cold season from December to Mid February, summer season from Mid February to first week of June. South

West monsoon season from June to September and retreating monsoon or the past monsoon season during October to November.

**Transport & Communication**

Umdanagar Rail Way Station , Budvel Rail Way Station are the very nearby railway stations to Shamshabad.How ever Hyderabad Decan Rail Way Station is major railway station 18 KM near to Shamshabad.

**RANGA REDDY DISTRICT**

To begin with the nomenclature of the District, the Ranga Reddy District was called as Hyderabad (Rural). It was changed as K.V. Ranga Reddy District and later on Ranga Reddy District.

The District is located in the Central Part of the Deccan Plateau and lies between $16^0$ 30` and $18^0$ 20` of North Latitude and $77^0$ 30` and $79^0$ 30` of East Longitudes. The District is bounded on the North by Medak District, East by Nalgonda District, South by Mahaboobnagar District, West by Gulbarga District & North West of Bidar District of Karnataka State. It covers an area of 7564.88 Sq. Kms. Area of Rangareddy is 7493 Sq. Km. It is 20th largest district in Andhra Pradesh and 112th largest in India in terms of total area. Note: Kutch district(45441 sq.km) of Gujarat is the largest and Mahe district(9 sq km) of Puducherry is the smallest district in India.

**Demographics**

In 2011, Rangareddy had population of 5,296,741 of which male and female were 2,701,008 and 2,595,733 respectively. In 2001 census, Rangareddy had a population of 3,575,064 of which males were 1,839,227 and remaining 1,735,837 were females. Rangareddy District population constituted 6.26 percent of total Maharashtra population. In 2001 census, this figure for Rangareddy District was at 4.69 percent of Maharashtra population.

**Climate and Rainfall**

There are no remarkable fluctuations in the temperature as the district generally tends to be dry. It gets quite warm during the summer months of April, May and June and also continues to be warm in the rest of the year except during December and January where the temperature drops slightly. The maximum and minimum temperatures have been recorded as 42.90 and 16.20 centigrade respectively. The hot weather period in the district is between March to May, followed by South-west monsoon period between June to September, Northeast monsoon period between October to December and winter period during January to February.

**Economy**

Medium-scale industries and Cement Corporation Of India (CCI)'s cement factories are established at Tandur. Another major company is Hyderabad Chemicals and Fertilizers, established at Moula-Ali in 1942. In 2006 the Indian government named Ranga Reddy one of the country's 250 most backward districts (out of a total of 640). It is one of the nine districts in Telangana currently receiving funds from the Backward Regions Grant Fund Programme (BRGF).

# CHAPTER 4 - INDICATIVE DESIGN STANDARDS

## Hyderabad - Manneguda Road

# CHAPTER 4. INDICATIVE DESIGN STANDARDS

## 4.1 GENERAL

The Project Road is section of SH-4(In principle declared as NH-163), which starts at Existing Ch: 14/000 (Design Ch 14+000) Hyderabad (from ORR-Appa Junction) and ends at Existing Ch: 59/500 (Design Ch: 60+391) near Manneguda. The Designed length of the project stretch is 46.391 km. The project stretch passes through Rangareddy and Vikarabad Districts and mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra reddy nagar. This chapter will give a general description of the project, existing features and design proposals to upgrade the facility to Four/Six-lane divided highway. This chapter will give a general description of the project, existing features and Design Proposals to upgrade the facility to 4-lane divided carriageway.

The proposed rehabilitation and up-gradation is to be carried out to make it a high-speed highway with divided carriageway configuration in all respects. The stretch passes through plain terrain predominantly. The abutting land use pattern varies from residential to agricultural. Almost throughout the length of the Project Highway, human settlements were observed, in towns and villages. There are semi built-up and completely built-up areas.

This section describes the standards and principles based on which the designs of different proposed project features will be carried out. These proposed standards are consistent with the parameters recommended in the relevant standards of the Indian Roads Congress (IRC). The aim of this chapter is to evolve design standards and material specifications for various elements primarily based on IRC publications and MORT&H circulars and relevant recommendations from the international standards.

## 4.2 TERRAIN CLASSIFICATION

It is proposed to adopt the following terrain classification as recommended in IRC-73:

| Terrain Classification | Percentage Slope of the Country |
|---|---|
| Plain | 0 – 10 |
| Rolling | > 10 – 25 |
| Mountainous | > 25 - 60 |
| Steep | > 60 |

The proposed alignment predominantly passes through plain terrain as per above classification except for the forest portion where the terrain is classified as rolling and thus geometric designs will be based on IRC: SP 73-2015 and IRC:SP 84-2014 for plain terrain.

## 4.3 GUIDING PRINCIPLES

While carrying out the geometric design, the following points will be taken into consideration:

- The designed facility shall not become obsolescent before the design period.
- Design shall be consistent and the standards followed for different elements shall be compatible with one another.
- The design shall cover all geometric aspects of the road including signs, grade separated structures, ROBs, etc.

- The design will be worked out, aiming at minimizing the vehicle operating cost, including initial cost and cost of maintenance etc.
- The design will take into consideration the Environmental, Aesthetic and Landscaping aspects of the project road.

## 4.4 TRAFFIC

### 4.4.1 General

The Indian Roads Congress (IRC) has published highway capacity standards for rural and urban highways. Capacity analysis is a fundamental aspect in planning, design, operation of roads, and provides among other things, the basis for determining the carriageway width to be provided at any point in a road network with respect to the volume and composition of traffic. Moreover it is a valuable tool for evaluation of the investments needed for future road constructions and improvements, and for working out priority between competing projects.

### 4.4.2 Definitions and Concepts

Volume (or Flow) is the number of vehicles that pass through a given point on the road during a designated time interval. Since roads have a certain width and numbers of lanes, flow is always expressed in relation to the given width (i.e., per lane or per two lane etc.). The time unit selected is an hour or a day. ADT is the volume of average Daily Traffic when the measurements are taken for a few days. AADT is the volume of the Annual Average Daily Traffic when measurements are taken for 365 days of the year and averaged out.

When vehicles are in jammed condition, the density is the maximum. It is then termed as the jamming density.

Capacity is defined as the maximum hourly volume (vehicles per hour) at which vehicles can reasonably traverse a point or uniform section of a lane or roadway during a given time period under the prevailing road way, traffic and control conditions.

Design Service Volume is defined as the maximum hourly volume at which vehicles can reasonably traverse a point or uniform section of a lane or road way during the given time period under the prevailing roadway, traffic and control conditions, while maintaining a designated level of service.

Peak Hour Factor is defined as the traffic volume during peak hour expressed as percentage of the AADT. The peak hour volume in this case is taken as the thirtieth hourly Volume (i.e., volume of traffic which is expected only during 30 hours in a year).

#### 4.4.2.1 Equivalency Factors

Equivalency Factor is a factor to convert the mixed flow of traffic in to single unit to express the capacity of road. The unit generally employed is the Passenger Car Unit (PCU).

The maximum service flow in terms of PCU's per day in rolling and hilly terrain will depend upon the extent of trucks and buses present in the traffic stream, their PCU equivalent and the grades of the alignment. Further, the passenger car equivalent factor decreases for the same grade with the increase in percentage of commercial vehicles.

Equivalency factors for conversion of different types of vehicles in to equivalent passenger car units based on their relative interference value, are given in **Table 4-1**(As per IRC: 64-1990).

**Table 4-1: PCU factor for various types of vehicles on rural roads**

| Sl. NO. | Vehicle Type | Equivalency Factors |
|---|---|---|
| | **Fast Moving Vehicles** | |
| 1 | Motor Car Scooter | 0.50 |
| 2 | Passenger Car, Pick up van or Auto rickshaw | 1.00 |
| 3 | Agricultural tractor, Light Commercial Vehicle | 1.50 |
| 4 | Truck or bus | 3.00 |
| 5 | Truck – trailer, Agricultural Tractor – trailer | 4.50 |
| | **Slow Moving Vehicles** | |
| 1 | Cycle | 0.50 |
| 2 | Cycle Rickshaw | 2.00 |
| 3 | Hand Cart | 3.00 |
| 4 | Horse drawn vehicle | 4.00 |
| 5 | Bullock Cart | 8.00 |
| 6 | Small Bullock Cars | 6.00 |

### 4.4.3 Recommended Design Service Volumes for Four Lane Roads

Recommended design service volumes for four lane roads are given below in **Table 4-2**. The values recommended are based on the assumption that the road has four lanes divided carriageway separated by a median and with good paved and earthen shoulders. The capacity figures relate to Level of Service 'B' and Level of Service 'C' as defined inIRC:SP:84-2014 is given in **Table 4-2**.

**Table 4-2: Design Service Volumes for Four lane Highways in PCU's per day**

| Sl. No. | Terrain | Level of Service 'B' | Level of Service 'C' |
|---|---|---|---|
| 1 | Plain and Rolling | 40000 | 60000 |
| 2 | Mountainous and Steep | 20000 | 30000 |

### 4.4.4 Recommended Design Service Volume for Multi-lane Road

Sufficient information about capacity of multilane roads under mixed traffic condition is not yet available. Capacity on dual carriageway roads can be affected by factors like kerb shyness, vehicle parking etc. Tentatively a volume of 35000 PCUs can be adopted for four lanes divided carriageway located in plain terrain. It is assumed that reasonable good earthen shoulders exist on outer side and a minimum of 3m central verge exists. In case well designed paved shoulders of 1.5m width are provided, the capacity of four lane dual roads can be taken up to 40000 PCUs.

The capacity values mentioned above relate to LOS B on dual carriageway. It is not desirable to adopt LOS C.

## 4.5 INDICATIVE DESIGN STANDARD FOR ROADS

The draft geometric design standards are proposed for this project based on IRC:-SP-73: 2015(Manual of Specifications and Standards for Two laning highways through Public Private Partnership) and IRC:-SP-84:2014 (Manual of Specifications and Standards for Four laning highways through Public Private Partnership).

**Table 4-3: Proposed Indicative Draft Geometric Design standards**

| S No. | DESCRIPTION | IRC STANDARDS | | |
|---|---|---|---|---|
| 1 | Design speed<br>Plain and Rolling | Max – Min | 100 - 80 km/hr | |
| 2 | Lane width | | 3.5 m | |
| 3 | Paved shoulder width | | 1.5 m in Rural & 2.0m in Built-up | |
| 4 | Shy away on median edge | | 0.5m | |
| 5 | Shy away on outer/other edges | | 0.25m | |
| 6 | Cross-slopes | Carriageway<br>Paved shoulder<br>Unpaved shoulder | 2.5 %<br>2.5 %<br>3.0 % | |
| 7 | Maximum super elevation | | 7.0%(Limited) | |
| 8 | Minimum horizontal curve radius | For 100 Km/hr<br>For 80 Km/hr | 400 m<br>250 m | |
| 9 | Radii beyond which super elevation not required | For 100 Km/hr<br>For 80 Km/hr | 2000 m<br>1200 m | |
| 10 | Super elevation runoff rate | For Plain and rolling<br>For mountainous & steep | <1 in 150<br><1 in 60 | |
| 11 | Transition curves to be used with length of spiral equal to length of super elevation runoff | | | |
| 12 | Extra widening of carriageway on curves | For curve radius<br>>300m<br>101 to 300m | Nil<br>0.6m | |
| 13 | Gradient | Ruling Gradient<br>Limiting Gradient | 2.5 %<br>3.3 % | |
| 14 | Minimum Length of Vertical Curves / Grade change not requiring vertical curve | Design Speed | min. curve length | max. grade change |
| | | 100 km/hr<br>80 km/hr | 60m<br>50m | 0.5%<br>0.6% |
| 15 | Vertical curve 'K' values<br>Crest vertical curve/Sag vertical curve | For design Speed<br>100 km/hr<br>80 km/hr | Crest<br>74<br>33 | Sag<br>42<br>26 |
| 16 | Vertical clearance | Road over road<br>Road over railway<br><br>Electrical lines<br>H.T.Electrical lines<br>Telecommunication Lines | 5.5 m<br>6.25m to 8.14m (as requirement type of line)<br>6.0m (Up to 650 V)<br>6.5m (More than 650 V)<br>5.5m (Up to 110 V) | |

**Table 4-4: Geometric Design standards (Mountainous and Steep Terrain)**

Mountainous and Steep Terrain is Not Applicable.
The complete project stretch is passing through Plain and rolling Terrain.

## 4.6 DESIGN SPEED

Design speed is the basic parameter, which determines the geometric features of the road. The proposed design speeds for different terrain categories as per IRC are as follows:

| Terrain Categories | Design Speed (km/h) | | |
|---|---|---|---|
| | Desirable | Minimum | |
| Plain | 100 | 80 | |
| Rolling | 80 | 65 | |
| Mountainous | | 50 | 40 |
| Steep | 40 | 30 | |

For road stretches passing through open areas, the speeds corresponding to plain terrain is proposed as 100 Km/hr. The minimum design speed shall be adopted in sections where the site conditions or economics do not permit the ruling design speed.

The need for warning signs shall be carefully considered whenever reduction in design speed becomes unavoidable.

## 4.7 CROSS-SECTIONAL ELEMENTS

### 4.7.1 Right of Way (ROW)

The Proposed ROW for Forest Area is 30m and in Rural /Urban areas is 45m and in Bypass is 60m.

### 4.7.2 Lane Width

The width of a basic traffic lane is taken to be 3.5 m. Thus, for 2-lane carriageway width will be 7.0 m and 0.25 m wide concrete gutter section laid along with the median kerb will provide compensation for kerb shyness.

### 4.7.3 Paved Shoulders

Full strength pavement for paved shoulders is proposed. Width of these shoulders will be 1.50 m. This will provide for better traffic operation conditions, lower maintenance and facility of directly using these as part of carriageway when the road is widened.

### 4.7.4 Earthen Shoulders

These are proposed to be 2.0m wide on either side of the main carriageway.

### 4.7.5 Median

The project road will have median and its width is proposed to be 2.0 m. For the structures the median is proposed to be 4.0 m wide. At major bridges, the median width will be kept more to accommodate the foundation for new bridge. The differential colour of the asphalt pavement and

the concrete gutter section will help better and safer traffic operation. The medians will be edged with 250 mm high un-mountable concrete kerbs.

### 4.7.6 Service Road/Slip Road

No service road proposed

### 4.7.7 Slope Protection

Embankments slopes of height less than 3m shall be turfed and those above 3m height shall be protected with stone pitching.

### 4.7.8 Sight Distance

A minimum of Safe stopping sight distance will be provided on the project stretch. The sight distance values as per IRC recommendations are as follows:

| Design Speed (km/h) | Safe stopping sight distance (m) |
|---|---|
| 100 | 180 |
| 80 | 120 |
| 60 | 80 |
| 50 | 60 |
| 30 | 30 |

## 4.8 HORIZONTAL ALIGNMENT

### 4.8.1 Radii of Curve

The project road mostly runs in straight sections and wherever curves are to be designed, the same shall have minimum radius as per IRC.

Adopting a maximum value of 7% for super elevation and 0.15 for side friction factor, the minimum radius for horizontal curves for various speeds works out to be as follows as per IRC: 38 / IRC SP-48.

| Terrain Categories | Radius of horizontal curves (m) | |
|---|---|---|
| | Desirable | Minimum |
| Plain | 400 | 250 |

Though there are no sharp curves on the existing road, it will be our endeavor to provide the desirable radius for the curves.

### 4.8.2 Super-elevation

The super elevation at curves will be arrived at as per the following equation:

$V^2/gR = (e+f)$

where:

| | | |
|---|---|---|
| V | - | Vehicle speed in m/sec. |
| G | - | Acceleration due to gravity in meters/sec$^2$ |
| e | - | Super elevation ratio in meter per meter |

| | | |
|---|---|---|
| f | - | Coefficient of side friction between vehicle tyre and pavement (taken as 0.15) |
| R | - | Radius in meters. |

The super elevation will be calculated keeping in view the horizontal radii and gradient at curves at different locations and maximum super-elevation will be restricted to 7%. But efforts shall be made to restrict the maximum super elevation to 5% wherever possible.

#### 4.8.2.1 Method for attaining super-elevation

Inner edge pivot of both carriageways is used for attaining super elevation. This method pivots the dual carriageway about the inner edge strings of both carriageways using different chainage, so the central reservation levels are not changed. The application of super elevation to the left and the right carriageways will start (or end) at different chainages, to ensure that the rate of change remains the same for both.

### 4.8.3 Transition Curves

The rate of change of super elevation will not steeper than 1 in 150. It is found that transition curve lengths designed by following IRC: 73 are insufficient in four lane situations where the carriageway is rotated about the median edge. Hence the following three formulae shall be used for calculating the transition lengths and the maximum value shall be adopted for design:

$Ls = 2.7\ V^2 / R$ From IRC 73

$Ls = 0.0215\ V^3 / CR$

$Ls = e \times w \times 150$ considering rate of change of super elevation

Where:

| | | |
|---|---|---|
| R | - | Radius of curve in meters |
| V | - | Vehicle speed in Km/hour |
| Ls | - | Length of transition in meters |
| C | - | Rate of change of acceleration. |
| e | - | Rate of change of super elevation |
| w | - | Width of road in m |

**TRANSITIONAL LENGTH DETAILS**

| Curve Radius (m) | Transition Length (m) | Curve Radius (m) | Transition Length (m) |
|---|---|---|---|
| 360 | 130 | 900 | 55 |
| 400 | 115 | 1000 | 50 |
| 500 | 95 | 1200 | 40 |
| 600 | 80 | 1500 | 35 |
| 700 | 70 | 1800 | 30 |
| 800 | 60 | | |

### 4.8.4 Widening of carriageway on Curves

At sharp horizontal curves, it is necessary to widen the carriageway to provide safe passage for vehicles. In view of the minimum radius of curves provided on this project and with the provision of 1.5 m paved shoulders, extra width on curves is unlikely to be applicable to the main carriageway. Therefore, extra widening of carriageway at curves shall not be provided.

## 4.9 VERTICAL ALIGNMENT

The vertical alignment of the carriageway will generally be compatible with the guidelines given in the IRC and shall have maximum gradient of 2.5% on flyover ramps.

- At locations of grade break greater than 0.5%, vertical curves will be provided.
- The length of vertical curve will not be less than 0.6V (kmph)/73.6 A
- At locations of sight deficiency, a minimum of Stopping Sight Distance (SSD) will be provided.

## 4.10 VERTICAL CURVES

Vertical curves will be designed to provide for visibility at least corresponding to the safe stopping sight distance. More liberal values will be adopted wherever it is economically feasible. Valley curves will be designed for headlight sight distance. The 'K' values for design control and the minimum length of vertical curves will be as follows:

| Terrain Category | 'k' value for Summit Curves | | 'k' value for Valley Curves | | Min. Length of Curve (m) |
|---|---|---|---|---|---|
| | Desirable (m) | Minimum (m) | Desirable (m) | Minimum (m) | |
| Plain | 74 | 38 | 42 | 28 | 60 |

Maximum Vertical Gradient was limited to 3.3% in plain sections and 5% in Ghat sections.

## 4.11 VERTICAL CLEARANCE

The vertical clearances as per the MORT&H Pocket Book for Highway Engineers (Second Revision) published by the IRC, New Delhi in 2002 shall be adopted:

- Vertical clearance at Vehicular underpasses

| | |
|---|---|
| Rural areas | 5.0m minimum |
| Urban Areas | 5.5m minimum |

- Vertical clearance for railway traction (Broad Gauge)

| | |
|---|---|
| Electric traction | 5.87 m minimum |
| Non-electric traction | 4.875m minimum |

- Vertical clearance for power/ telecommunication lines

| | |
|---|---|
| Lines carrying low voltage up to 110V | 5.5m minimum |
| Electric power lines up to 650V | 6.0m minimum |
| Electric power lines > 650V | 6.5m minimum |

However the vertical clearances shall be confirmed from Railways / Power Grid Corporation / Telecommunication Department during PPR Stage.

## 4.12 CROSS-FALL

Each carriageway will have unidirectional cross-fall. The cross-fall for the flexible pavement and paved shoulders will be 2.5%. For earthen shoulders, the corresponding value will be 3.50%

## 4.13 GEOMETRIC DESIGN CONTROL

The detailed design for geometric elements will cover, but not limited to the following major aspects:

- Horizontal alignment
- Longitudinal Profile
- Cross-sectional elements
- Junctions, intersections and Interchanges
- Service road on either sides of carriageway

Different options for providing grade separated interchanges and at grade intersections will be examined and the geometric design of interchanges will take into account the site conditions, turning movement characteristics, level of service, overall economy and operational safety.

## 4.14 ROADWAY WIDTH AT CROSS – DRAINAGE STRUCTURES

### 4.14.1 Culverts

The culverts will be built to the same width as the flanking roadway and will be designed as per the guidelines put forth in IRC: SP-13 2004.

## 4.15 DESIGN STANDARDS FOR STRUCTURES

### 4.15.1 General

This section deals with the standards to be adopted for ROBs, flyovers, bridges, underpasses and culverts. It also provides details of the type of materials and their specifications that would be adopted for the above structures, the loads and forces to be considered.

It is intended that the project road will accommodate 4-lane traffic (2-lane divided) at present and to be widened to 6 lanes at a later stage, if required.

### 4.15.2 Cross-sectional Elements

a) Structural width for bridges / Flyovers / Road over Rail Bridge

The structural width for all bridges will be kept as per IRC SP 84: 2014 and culverts width shall be kept same as the road carriage way width and the entire formation width will be carried out on to the structure.

b) Median width

A median width of 2.0m will be maintained between two outer faces of RCC crash barriers.

### 4.15.3 Specification for Material

a) Concrete

The grades of concrete will be either equal to or higher than those prescribed in IRC: 21-2000.

i) Concrete Grades for various structural elements.

Grade of concrete in various structural elements shall be for moderate conditions of exposure.

| | |
|---|---|
| **Superstructure** | |
| PSC Members | M40 |
| RCC T-Girder and Deck Slab | M30 |
| RCC Solid Slab | M30 |
| RCC Crash Barriers | M40 |
| **Substructure** | |
| RCC substructures and foundations | M35 |
| All PCC structural members | M20 |
| All PCC non structural members | M15 |
| **Pedestals for bearings** | |
| Pot | M40 |
| Elastomeric | M30 |

b) Steel

This shall conform to provisions given in IS: 1786, IS: 432 (Part I).

i) Reinforcement Steel

This will be; High yield strength deformed bars conforming to Fe 415/TMT.
Mild steel shall be of grade Fe 240.

ii) Pre-stressing Steel

These should conform to IS: 6006-1983 and IS: 14268-1995

System: 19K13 or 12T13 low relaxation multiple strands system
Cables: 19K13 or 12T13 low relaxation with strands of 12.7m nominal diameters.
Sheathing: 90mm OD HDPE Galvanized metal sheathing duct.

c) Bearings

i) Elastomeric Bearings

Elastomeric bearing shall be provided under RCC T-beams and RCC solid slabs type superstructures as per IRC: 83 (Part II)-2002 and shall conform to clause 2005 of MORT&H specification for Road and Bridge Works.

ii) POT cum PTFE Bearings

POT cum PTFE bearings shall be provided where we have to cater for large loads. This shall conform to IRC: 83 (Part III) and clause 2006 of MORT&H specifications for Road & Bridge works.

d) Expansion Joints

Elastomeric strip seal type expansion joints shall be provided on all the bridges and ROBs as per Clause No. 2607 of MORT&H specification for road and bridge works and interim specifications for expansion joints issued subsequently vide MORT&H's letter no. RW/NH-34059/1/96-S&R dated 25.01.2001 and addendum thereto circulated vide letter of even no; dated 30.11.2001.

In case of bridges with smaller spans, slab seal type expansion joint shall be provided.

### 4.15.4 Loads and Forces to be considered in Design

**Vertical Loads**

**a) Dead Loads**

Following unit weights shall be assumed in the design as per IRC Codes.

| | | |
|---|---|---|
| Prestressed Concrete | - | 2.5 t / cu.m |
| Reinforced Concrete | - | 2.4 t / cu.m |
| Plain Cement Concrete | - | 2.2 t / cu.m |
| Structural steel | - | 7.85 t / cu.m |
| Dry Density of Backfill Soil | - | 2.0 t / cu.m |
| Saturated Density of Backfill Soil | - | 2.2 t / cu.m |

**b) Superimposed Dead Loads**

Wearing Coat: 65mm thick asphaltic concrete with total 0.2 t / sq.m (2.2 t /cum for 11.0m wide c/way including allowance for an overlay).

Crash barriers: From design (i.e. 1.0 t / m per side)

**c) Live Loads**

Carriageway Live Loads: The following load combinations will be considered in the analysis and whichever produces the worst effect will be considered.

- One/Two/Three lanes of IRC Class A.
- One lane of IRC Class 70R (wheeled/ tracked)
- One lane of IRC Class 70R (wheeled) with one lane of IRC Class A
- Minimum clear distance between 70R vehicle and Class A vehicle, when placed side by side in combination, shall be 1.2m for design.
- Resultant live load stresses shall be reduced by 10% in case all the three lanes are loaded i.e. in case of three lanes of IRC Class 'A' or one lane of IRC Class 70R with one lane of IRC Class A.
- Impact factor shall be as per Cl. 211 of IRC: 6 2014 for the relevant load combinations. For simplicity in design, Impact factor for continuous structures shall be calculated for the smallest span of each module and used for all the spans of that module.

**d) Horizontal Forces**

i) Longitudinal Forces due to live load

Following effects shall be considered in the design.

5 Braking forces as per the provision of Cl. 214 of IRC: 6 2014.

6 Distribution of longitudinal forces due to horizontal deformation of bearings/frictional resistance offered to the movement of free bearings as per Cl. 214.5 of IRC: 6 2014.

ii) Horizontal Forces due to Water Currents

The portion of bridge, which may be submerged in running water, shall be designed to sustain safely the horizontal pressure due to force of water current as per the stipulations of Cl. 213 of IRC: 6 2014.

iii) Earth Load

1. Earth forces shall be calculated as per the provisions of Cl. 217 of IRC: 6 2014 assuming the following soil properties:

Type of soil assumed for backfilling: As per Appendix 6 of IRC: 78 2014 with dry density of 2.0 t / cu.m and submerged density of 1.2 t / cu.m.

Angle of Internal Friction : $\Phi = 30^{\circ}$

Angle of Wall Friction : $\delta = 20^{\circ}$

Coefficient of Friction '$\mu$' at base : tan (2/3 $\Phi$), while $\Phi$ is the angle of internal friction of substrata immediately under the foundations.

2. Live load surcharge shall be considered as per the provisions of Cl. 714.4 & Cl. 715.1.5 of IRC: 78 i.e. equivalent to 1.2m height of fill in case of abutments and return/wing walls and 0.6m height when there is no live load on the span.

iv) Centrifugal Forces

Centrifugal forces shall be calculated as per the provisions of Cl.215 of IRC: 6 2014 for a design speed applicable at horizontal curves.

v) Wind Effect

Structures shall be designed for wind effects as stipulated in Cl. 212 of IRC: 6 2014. The wind forces shall be considered in the following two ways and the one producing the worst effect shall govern design.

a. Full wind forces at right angles to the superstructure

b. 65% of wind force as calculated in (i) above acting perpendicular to the superstructure and 35% acting in traffic direction.

vi) Seismic Effect

The road stretch is located in Seismic Zone-II as per the revised seismap of India (IS: 1893-2002). The seismic forces will be coefficient method as suggested by the modified clause for the interim measures for seismic provisions (Cl.222 of IRC: 6-2014) published in Indian Highways, January 2003.

**e) Other Forces / Effects**

i) Temperature Effects

a. The bridge structure/components i.e. bearings and expansion joints, shall be designed for a temperature variation of + 30 degree C considering extreme climate.
b. The superstructures shall also be designed for effects of distribution of temperature across the deck depth as given in Fig. 10 of IRC6-2014, suitably modified for the surfacing thickness.

Temperature effects shall be considered as follows:

a. Effects of non-linear profile of temperature shall be combined with 50% live load and full value of 'E' shall be considered.
b. Effects of global rise and fall of temperature shall be combined with 100% live load and full value of 'E' shall be considered.

ii) Differential Shrinkage Effects

A minimum reinforcement of 0.2% of cross sectional area in the longitudinal direction of the cast-in-situ slab shall be provided to cater for differential shrinkage stresses in superstructures with cast-in-situ slab over precast girders as per Cl 605.2 of IRC: 22-1986.

However, effects due to differential shrinkage and / or differential creep shall be duly accounted for in the design.

iii) Construction Stage Loadings/Effects

A uniformly distributed load of 3.6 KN/m2 of the form area shall be considered to account for construction stage loadings in the design of superstructure elements, wherever applicable, as per Cl. 4.2.2.2.2 of IRC: 87-1984.

iv) Buoyancy

100% buoyancy shall be considered while checking stability of foundations irrespective of their resting on soil/weathered rock/or hard rock. However, the maximum base pressures shall also be checked under an additional condition with 50% buoyancy in cases where foundations are embedded into hard rock. Pore pressure uplift limited to 15% shall be considered while checking stresses of the substructure elements.

**f) Load Combinations to be considered in Design**

All members shall be designed to sustain safely the most critical combination of various loads and forces that can coexist. Various load combinations as relevant with increase in permissible stresses considered in the design shall be as per Cl. 202 of IRC: 6 2014 and Cl. 706 of IRC: 78 2014.

In addition, the stability of bridge supporting two superstructures (with an expansion joint) shall be checked under one span dislodged condition also.

**g) Exposure Condition**

Moderate exposure conditions shall be considered while designing various components of the bridge.

**h) Design Codes**

The main design criteria shall be to evolve design of a safe structure having good durability conforming to the various technical specifications and sound engineering practices.

Various Codes of Practices referred shall be as under:

a. IRC: 5-1998
b. IRC: 6-2014
c. IRC: 18-2000
d. IRC: 21-2000
e. IRC: 22-2000
f. IRC: 45-1972(reprint 1996)
g. IRC: 54-1974
h. IRC: 78-2014
i. IRC: 83-2002 (Part II)
j. IRC: 83-2002 (Part I-III)
k. IRC: SP: 13-2004
l. IS 1893-2002 – (Part-I)
m. IRC: 112 -2013
n. IRC: 75-1979 (Guidelines for the design of High Embankments).

i) Load combinations

The various load combinations to be considered will be as per the provision of IRC: 6-2014.

## 4.16 STANDARDS FOR INTERCHANGES

Interchanges at major intersections will be proposed if found necessary based on traffic analysis and economical feasibility. The design standards for the interchange elements will be as follows:

a) Design Speed

The proposed design standards for this element are as under:

**Terrain Design Speed for Interchange Elements (km/hr)**

| | Left-turning ramps | Right turning ramps/loops |
|---|---|---|
| **Plain/Rolling** | | |
| • Ruling | 90 | 50 |
| • Minimum | 70 | 50 |

Mountainous

- Ruling 50 40
- Minimum 40 30

For direct connections, a design speed of 60-65 km/hr will be adopted.

b) Radius and Sight Distance

| Description | Design Speed (Kmph) | Radius (m) | Stopping sight Distance (m) |
|---|---|---|---|
| Desirable | 80 | 230 | 130 |
| Minimum | 60 | 130 | 80 |

The desirable values are normally meant for direct ramps and diagonal connections, whereas the minimum values are for loops.

c) Gradient

Maximum gradients proposed are:

Desirable = 3%
Absolute = 5%

The limited vertical gradient is 2% at ROB / Flyover locations.

The gradients at a particular interchange are dependent upon a number of factors and will be considered in detail. For downgrade ramps, steeper gradients will be avoided as far as possible.

d) Summit and Valley Curves for Interchanges

Both summit and valley curves would be designed for stopping sight distance subject to a minimum length equal to 0.6 V, where V = Design Speed in km/h.

e) Cross-Sectional Elements

The desirable carriageway width for two lanes is 7.5 m. The width of paved shoulders would be 1.5 m on either side. The recommended cross falls are 2.5% and 3% for carriageway and untreated shoulder portions respectively.

f) Length of the Speed Change Lanes
The length of the speed change lanes for interchanges recommended is:

| Description | Design Speed kmph | Radius (m) | Stopping Sight Distance (m) | SPEED CHANGE LANE | |
|---|---|---|---|---|---|
| | | | | Acceleration Lane | Declaration Lane |
| Ramp | 80 | 230 | 130 | 300 | 130 |
| Loop | 60 | 130 | 80 | 400 | 150 |

g) Illumination
High mast lighting will be installed to illuminate the interchanges.

## 4.17 STANDARDS FOR AT-GRADE INTERSECTIONS

The standards proposed in IRC SP: 41 "Guidelines for the Design of At-Grade Intersection in Rural and Urban Areas" will be applied.

## 4.18 TRAFFIC SIGNS AND ROAD MARKINGS

The design of traffic signs and road marking shall be done according to the IRC standards. Where necessary, AASHTO standards will be used to augment the IRC standards.

Following is the list of IRC standards, which will be followed:

| | | |
|---|---|---|
| IRC: 30-1968 | - | Standard letter and numbers of different heights for use on Highway signs. |
| IRC: 35-1997 | - | Code of practice for Road markings |
| IRC: 67-2001 | - | Code of practice for Road Signs |
| IRC: 79-1981 | - | Recommended Practice for Road delineators |
| IRC: 93-1985 | - | Guidelines on design and installation of road traffic signals |
| IRC: SP-31-1992 | - | New Traffic Signs |
| IRC: SP: 55-2001 | - | Guidelines for Safety in Construction Zones |

Adequate safety measures have been considered for the design of the project road. These are indicated as below:

- Crash barriers
- Reflectors
- Proper super elevation and radii of curvature
- Traffic signage
- Lighting
- Drainage
- Seismic Stoppers for bridge structures

The safety during construction is achieved by providing

- Signs (regulatory, warning and direction)
- Delineators
- Traffic cones and cylinders
- Drums
- Barricades
- Flagmen

## 4.19 CAPACITY STANDARDS

The **Table 5.3** summarises the design service volume for various lane configurations and standards for various categories of road in plain and rolling area, design service level corresponding to B level of service based on IRC: SP-84-2009 and other standard practices.

Table 4-5: Capacity Standards

| Sl. No. | Terrain | Design Service Volume in PCUs per day | |
|---|---|---|---|
| | | Level of Service 'B' | Level of Service 'C' |
| 1 | Plain and Rolling | 40000 | 60000 |
| 2 | Mountainous and Steep | 20000 | 30000 |

## 4.20 EMBANKMENTS

### 4.20.1 Side Slopes

For earthen embankments the side slopes recommended from consideration of safety of traffic as per IRC: 36-1970, are as follows:

Up to 1.5m height - 1: 2 (V: H)
1.5m to 3.0m height - 1: 2.5 (V: H)
3.0m to 4.5m heights - 1: 3 (V: H)
4.5m to 6.0m height - 1: 4 (V: H)

However, where costs of construction and land forbid the use of such liberal slopes, the slope will be generally kept as IV: 2H. This slope is considered adequate from stability point of view. The reaches having embankment height more than 3m shall have W Beam Metal Crash Barriers on the outer edge of the highway to meet the safety standards.

For design of embankments of more than 6.0 m height, the guide lines of IRC: 75-1979 may be followed.

### 4.20.2 Slope Protection

Slopes less than 3m shall be turfed and those above this height shall be protected with stone pitching.

## 4.21 ROAD SIDE DRAINAGE

An effective drainage system shall be planned for the drainage of roadway as per stipulations of IRC SP:42-1994 for maintaining structural soundness and functionality of the project road. The following types of drains shall be provided for surface drainage of roadway and ROW:

- The underpasses shall generally be free draining.
- Longitudinal Kutcha / Pucca drains near the ROW boundary with outfalls at cross-drainage structures in rural sections. The drain size, shape and material shall be adequate to take design run off, and prevent soil erosion and stagnation of water
- Covered RCC drains in urban and semi-urban sections
- Cuts in median to drain out water from super elevated carriageway
- Combination of longitudinal drains and chute drains in high embankments of 3m and above.

## 4.22 HIGHWAY SIGNS

- The road signs shall confirm to IRC: 67-2001. For overhead signs, the standards prescribed in BIS / ASHTO / ASTM British standards or any other international standards shall be adopted in consultation with R&B(PPP).
- Design and location of route marker signs shall be as per IRC: 2-1968. The design of highway kilometre stones and 200 m stones shall be as per IRC: 8-1980 and IRC: 26-1967 respectively. The boundary stones shall be as per IRC: 25-1967.
- Road Delineators shall conform to IRC: 79-1981.
- All road signs shall be of retro-reflective sheet of high intensity grade with encapsulated lens fixed over aluminium substratum conforming to MORT&H Specifications for Road and Bridge Works.

## 4.23 ROAD MARKINGS

- Road markings shall be as per IRC: 35-1997. These markings shall be applied to road centre lines, edge lines, continuity line, stop lines, give-way lines, diagonal/chevron markings, zebra crossing and at parking areas by means of an approved self propelled machine which has a satisfactory cut-off value capable of applying broken lines automatically.
- Road markings shall be of hot applied thermoplastic paints with glass reflectorrising beads conforming to MORT&H Road and Bridge works (4th Revision) specifications.
- Traffic safety measures
- 
- The design layout and materials chosen for the safety barrier shall suitably blend with the surrounding and shall further conform to IRC: SP-44-1994 and the circulars of MORT&H
- Pedestrian guardrail shall be designed to control and guide pedestrian movement safely.
- Single W-Beam Metal Crash Barrier shall be installed mainly at major hazard locations. It will also generally be installed on sections of the road (a) where the embankment height is more than 3m (b) bridge approaches and (c) on the outside of curves. These Guardrails shall be installed along the edge of the outside shoulder with an offset of 2.5m from the edge of the pavement of carriageway.
- Double-sided W- Beam Crash Barriers shall be provided at locations where the median width is 1.20m.

All necessary road safety measures should be taken during the execution of the project. It will be mandatory for the contractor to strictly adhere to the safety norms such as wearing of helmets and reflective jackets etc for workers, fixing proper barricades such as cones, delineators and sheet barriers during the construction. Suitable provisions shall be made in the general specifications in the tender documents.

## 4.24 WAY SIDE AMENITIES

The common facilities like petrol pump, first aid, police station, restaurant, vehicle parking, etc. have been included in the general layout planning for the wayside amenities. The guidelines issued by the Ministry of Petroleum shall be followed in respect of Petrol Pumps. These facilities shall be planned at about 50Km interval.

### 4.24.1 Bus Stops

The design of pick up bus stops conforms to IRC: 80-1981. These shall be structurally safe, aesthetically pleasing and functional so as to protect the waiting passengers adequately from sun,

rain and wind. These stops shall be provided on both up & down side of Traffic in the populated areas.

### 4.24.2 Parking Areas

Parking shall be designed in the form of rectangular area parallel to the road and separated from the carriageway by a separator. The design will be based on the detailed traffic studies carried out.

### 4.24.3 Water Harvesting

Suitable water harvesting schemes shall be designed in the case of unlined open drains. Care shall be taken to minimize waste of water by providing suitable slopes and provision of filter media below the unlined drains.

### 4.24.4 Rest Areas

Rest areas shall be designed as per the assessment of public expected to use the facility. The rest areas may be included in the Wayside Amenities as described above.

### 4.24.5 Weighing Stations

The weighing station shall be provided near Toll Plazas so that over-loaded vehicles could be checked. The type of weighing system suitable for the project shall be brought out in the report, duly discussing the merits of each type of the state of the art and basis for recommending a particular system.

### 4.24.6 Truck lay-bye

The design of truck lay byes will be carried out as per MORT&H Circulars.

### 4.24.7 Arboriculture and Landscaping

The arboriculture and landscaping of the project road area shall be so designed as to give an aesthetic and pleasing sense to the users. Broadly the following features will be taken care of:

- As far as possible the existing trees / plants are retained to the extent possible.
- Landscape treatment of the project road including open space around the project corridor will be designed through planting of trees and ground cover of appropriate varieties and landscaping of locations with a view to beautify the highway and making the environment along the highway pleasing.
- The tree plantation shall be done as per the scheme to be discussed and finalised with R&B officials
- The treatment of the highway embankment slopes shall be made as per recommendations contained in IRC: 56- 1974.
- Pitching works on the slopes shall be as per MORT&H Specifications.

### 4.24.8 Toll Plaza

The design of Toll Plaza shall be based on the Technical considerations such as traffic segregation, Q length and the average waiting time.

## 4.25 PAVEMENT DESIGN

### 4.25.1 General

As per the TOR, the pavement type at this stage shall include both rigid and flexible pavement options.

The design shall be based primarily on IRC Guidelines but the Consultants shall also use international practices as given by AASTHO etc.

The design period shall be fifteen (15) years for the flexible pavement type and thirty (30) years for the rigid pavement type.

Laboratory tests would not carried out, however from the Consultant's previous experience, the CBR for the sub grade can be safely assumed as 8%.

For the design of the overlays for the existing two-lane pavement, the strengthening work shall take due considerations of the strength of the existing pavement. The overlay thickness shall be worked out for each road segment homogeneous in relation to condition, strength and sub-grade characteristics.

The rehabilitation shall also include the provision of a regulating layer or geo-grids, etc. Likewise, for existing pavements with acceptable levels of cracking, provisions of a crack inhibiting layer will also be included.

The paved shoulders shall be an integral part of the pavement for the main carriageway. The design requirements for the carriageway pavement shall therefore be applicable to the design of the paved shoulders also. The design of the granular shoulders shall take due consideration of the drainage conditions besides the structural requirements.

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

In case of existing pavement, occurrence of shoving / depression at frequent locations near the edges would be observed.

### 4.25.2 Axle Load Scenario

IRC: 37 deals with the design of flexible pavements based on the California Bearing Ratio method and cumulative axle load repetitions. Vehicle damage factors (VDF) for various vehicles are required to be derived on the basis of the axle load survey.

Other broad design parameters are:

### 4.25.3 Flexible Pavement Design

The flexible pavement design as per IRC:37 suffers from the following drawback:

i) The design curves corresponding to the standard axle load repetitions terminate at 150msa while the traffic loads on the proposed Project Road during the design life of 20-30 years will far exceed this value.

ii) It is well known that the following variables influence the fatigue life of a bituminous pavement material:

Pavement Temperature;
Percentage of Bitumen content;
Age of Bitumen;
Level of strain cycle;
Frequency of loading.

iii) While the Revision of the IRC Code for Flexible Pavements does reflect these variables by presenting three different pavement / air temperatures, the strain model assumed by us, on the other hand, tends to incorporate the effect of these variables.

iv) It is observed that IRC:37 also presents a very high sub-grade strain criteria, which is found to be approximately twice that of the alternative Western European standards. Likewise, the sub-grade strain criteria is not sub-divided into different strength criteria. The standard catalogue of pavement designs is then applied to sub-grade strength in the conventional manner. No formal method is put forward giving different criteria for arid, semi-arid or wet areas.

## 4.26 DESIGN CONSIDERATIONS

### 4.26.1 Design Life

The design life of the pavement has been assumed to be 15 years in the case of flexible pavement and 30 years in the case of a rigid pavement design. However since the traffic demand estimates have been done, as per the ToR, of a thirty year horizon period, the design life of the pavement in the case of even the flexible type, has been extended to a similar horizon period, through the incorporation of suitable additional overlays at the end of 15 years.

For the purpose of the design, a construction period of one year has been assumed.

Likewise, as per IRC Guidelines, the design life for the surfacing is assumed as 10 years, and for the base and sub-base courses, a 15 years design life has been assumed. An overlay comprising of a bituminous concrete layer is to be provided at an interval of five years so as to reach the 15 years service design period.

### 4.26.2 Design Traffic

For the purpose of structural design only the number of commercial vehicles of laden weight of 3 tonnes or more and their axle loading will be considered. To obtain a realistic estimate of design traffic due consideration shall be given to the existing traffic or that anticipated in the case of new constructions, possible changes in road network and land use of the area served, the probable growth of traffic and design life.

### 4.26.3 Adoption of Vehicle Damage Factors

The vehicle damage factor is a multiplier for converting the number of commercial vehicles of different axles loads to the number of standard axle-load repetitions. The vehicle damage factor is

arrived at from axle load surveys on typical road sections so as to cover various influencing factors such as traffic mix, type of transportation, type of commodities carried, time of the year, terrain, road conditions and degree of enforcement.

Axle load survey has been envisaged for the present scope of study, so that VDF factors derived will be used to determine the number of axle load repetitions to design the pavement crust.

### 4.26.4 New flexible pavement

- New flexible pavement will be designed as per IRC: 37

- New flexible pavement shall comprise of Bituminous Concrete (BC) using as wearing course laid on Dense Bituminous Macadam (DBM). Wet Mix Macadam (WMM) shall be provided to act as a base course. The sub-base shall comprise of granular material conforming to the grading, density and other physical requirements stipulated in MORT&H Specifications.

### 4.26.5 Strengthening of existing pavement

- Strengthening of the existing pavement shall be done in accordance with IRC: 81-1997. The strengthening layer shall comprise of BC and DBM overlaid with BC surfacing on existing Bitumen.
- Before laying the overlays, profile corrective course on the existing carriageway shall be carried out with BM / DBM / WMM / GSB as the case may be.

### 4.26.6 Pavement drainage

To ensure internal drainage of the pavement, the GSB layer, where black cotton soil is not met with, shall be extended to full width across the shoulder on the embankment to the side drain.

- In the black cotton sections, a 225mm thick sand blanket layer shall be provided over the subgrade, which shall extend to the embankment side slope.
- The finished pavement profile shall be so designed that the bottom level of the sub-grade always remains above the high flood level by 1.0 meter.

## 4.27 TYPICAL CROSS SECTIONS

Proposed typical Cross-Sections are presented in drawings and details of each typical cross section is described in **Chapter 1.0**.

## 4.28 SPECIFICATIONS

The materials to be used in the Project work and the specifications for execution of work shall conform to "MORT&H Specifications for Road and Bridge Works 4th Rev. 2001". However special Technical Specifications shall be framed wherever MORT&H specifications need change / amendments. Where these specifications are silent with regard to certain specifications for the material in question, in that case, specifications under Bureau of Indian Standards / AASHTO / ASTM / BS or any other international standard shall apply. But where these specifications are also silent, the specifications based on sound engineering practices shall be followed after due consultation with R&B official.

## 4.29 ENVIRONMENTAL AND SOCIAL ASSESSMENT

Based on the detailed report on environmental and social assessment of potential critical impacts, complying with the State, GOI, ADB / World Bank environmental requirements, environmental design will be prepared for enhancement of areas within the ROW, which would have suffered environmental degradation as a result of the proposed highway improvement.

## 4.30 DESIGN STANDARDS FOR BRIDGES/STRUCTURES

The cross drainage structures shall be classified as culverts, minor bridges and major bridges depending up on the length of structure as per IRC standards. Structures up to 6m length fall into the category of culverts, more than 6m and up to 60m in length as minor bridges and beyond 60m as major bridges. The design standards and loading to be considered for culverts, bridges, underpasses, flyovers and ROB's shall be those laid down in the latest IRC codes and/or IS codes. Where the said codes are found wanting or are silent other codes at national or international level shall be followed in consultation with the client. ROBs shall be planned and designed in consultation with the concerned Railway Authorities.

| Sl. No. | Description Details | |
|---|---|---|
| 1 | Design Speed | 100 Kmph |
| 2 | Vertical clearance over NH/SH | 5.5 m |
| 3 | Vertical clearance over rail | 7.30 m |

1. The (IRC) codes will be the basis of bridge designs, underpasses and flyover/ ROB's. For items not covered by latter, provisions of Special Publications and Specification for Roads and Bridges published by IRC shall be followed.

2. Grades of Concrete for superstructures will be as per MORT&H Specifications and IRC Standards. The Minimum grade shall be M40 for PSC and M30 for RCC respectively.

3. For substructures and foundations, the concrete grade will not be lower than M30 except for well steining and bottom plug where M25 concrete will be used. For PCC substructures minimum grade of M20 will be adopted.

4. For all new 3-lane structures, 3-lane live load will be considered as per IRC-6.

5. Locations of new Minor Bridges will generally be guided by the alignment of the highway. But, for major bridges, the bridge location and its alignment shall override the highway requirement in that portion.

6. On economic considerations and for ensuring good riding quality, wherever possible, for the new bridges the layout of the existing bridges having a number of small spans will be modified by decreasing the number of spans, maintaining the piers parallel and in line with those of the existing structure.

7. The deck will have 2.5% unidirectional camber/cross fall and the wearing course will be of uniform thickness of 15 mm Mastic and 50 mm BC. For high traffic density, thickness of mastic and BC shall be 25 mm and 40 mm respectively.

8. In general it has been observed during the preliminary study that the type foundations for the existing bridges have not suffered any distress.

9. Pile foundations may be adopted for flyovers and ROB structures, depending on the properties of the strata based on sub-soil investigation reports.

**Width of New Bridges**

IRC: SP:84-2014 manual guidelines are to be followed.

**Flyovers**

Where flyovers are proposed, minimum vertical clearance above the cross roads will be 5.5 m.

**Planning for New Bridges**

In general, the following aspects are taken into account while planning for the new bridges and structures:

- Proper location of bridge and geometrics of approaches;
- Linear waterways and minimum vertical clearances;
- Satisfactory geological conditions;
- Aligning the piers with those of the existing structure to avoid cross currents, eddies and obstruction to flow;
- Minimum distance from the existing structure shall be in consistent with construction requirements and hydraulic consideration;
- Modular approach in design for both superstructure and substructures;
- Minimum number of spans consistent with road deck levels and minimum vertical clearance above design HFL
- Continuity (Except deck continuity) to be provided in superstructure for better riding quality.

**Planning for New Culverts**

For culverts, following guidelines will be followed:

(a) For culverts in new carriageway, minimum span and vent height will be kept equal to that of those in the existing carriageway; raising of deck level according to highway alignment will be made wherever required.

(b) Weak and non-functional culverts to be dismantled and new culverts to be constructed matching with highway plan and profile.

(c) For concentric widening to four lane, new PCC abutments will be provided on both sides of the existing culverts. Existing slab is to be dismantled and new slab with specified camber to be cast for the full width.

(d) Culverts in service road locations to be extended up to the road side longitudinal drain.

(e) In new alignments and bypasses, sufficient numbers of balancing culverts are to be provided wherever alignment crosses through flat agricultural fields and lies in close vicinity to high embankments of railways and flood bunds.

(f) In case of culverts whose bed and floor have scoured off severely and considerable afflux is observed, the same will be replaced with new culverts having adequate vents or with a minor bridge, based on adequate hydrological studies.

(g) Culverts will be designed for IRC Class-A / Class-70R Tracked / Class-70R Wheeled Loading as per relevant IRC Codal Provisions.

(h) Culverts shall be constructed for full formation width of the roadway.

(i) For pipe culverts, expansion chambers shall be provided at median/ between main carriageway and service road for proper maintenance.

(j) All cross drainage pipe culverts with less than 900 mm diameter shall be replaced with new 1.2 m (minimum) diameter pipe culverts.

(k) All new pipe culverts shall be of minimum 1.2 m diameter.

**Repair / rehabilitation of existing bridges**

Repair and rehabilitation of existing bridges will be recommended based on present status of the bridge. Before taking up any repair (except for items essential for road user safety/ make safe items), a detailed condition survey shall be carried out for finding out the cause of distress and to suggest the rehabilitation / strengthening measures required.

# CHAPTER 5 – TRAFFIC SURVEYS & ANALYSES

## Hyderabad - Manneguda Road

# CHAPTER 5. TRAFFIC SURVEYS & ANALYSIS

## 5.1 INTRODUCTION

This report presents the traffic studies and analyses carried out for addressing various objectives and issues pertaining to provide the *Techno-Economic Feasibility Study and Transaction Advisory Services for 7 State Roads in the State of Telangana, India.* The results of this analysis will form inputs for forecasting future traffic, planning and designing the pavement, developing capacity augmentation proposals, designing the toll plaza and design of intersections along on the project road.

A thorough knowledge of the travel characteristics of the traffic using project road of State Highways Road-04 is essential for future traffic estimation. Hence, detailed traffic surveys have been carried out to assess the baseline traffic characteristics on SH-04 between the Hyderabad ORR junction and Manneguda road (from ex km 14.000 to ex km 59.500).

The study aims to obtaining the existing traffic and travel characteristics on the project corridor and forecasting the average annual daily traffic for project horizon year considering various constituent streams and for various scenarios.

## 5.2 IDENTIFICATION OF HOMOGENEOUS ROAD SECTIONS

The existing project stretch, which is having a length of 45.500 km, is divided into three homogeneous road sections on the basis of traffic generation and dispersal nodes located along the project road. The important dispersal / generation location identified along the project road include:

- Outer ring road jn at km 14.000 is the starting point of project stretch.
- Moinabad at km 23.600 is a major settlement and having four lane from ORR.
- Chevella at km 41.400 is the minor settlement, diversion point for Farooq Nagar.
- Manneguda at km 60.000 is the major settlement, diversion point for Vikarabad and end point of project stretch.

Considering the above mentioned traffic generation/diversion point, the project stretch is divided into three homogeneous section for the purpose of analysis and presentation of traffic and travel characteristics. **Table 5-1** gives the details of the homogeneous section defined for the study.

**Table 5-1: Homogeneous traffic section**

| Section No. | Starting | | Ending | | Length |
|---|---|---|---|---|---|
| | Existing km | Place | Existing km | Place | |
| I | Km 14.000 | ORR | Km 23.600 | Moinabad | 9.600 |
| II | km 23.600 | Near Moinabad | km 41.400 | Chevella | 17.800 |
| III | km 41.400 | Chevella | km 59.500 | Manneguda | 18.100 |

## 5.3 SURVEY METHODOLOGY

### 5.3.1 Primary surveys and considerations

To capture traffic flow characteristics, travel pattern, speed characteristics, users' preference regarding toll imposition on traffic passing through the project road and other characteristics related to miscellaneous requirements on the project road, following primary traffic surveys were conducted.

- *Classified traffic volume count (CTVC)*
- *Origin – destination survey (OD)*

- *Axle load survey*
- *Speed and delay study*

Traffic survey station for carrying out CTVC, OD and axle load surveys were selected after a site reconnaissance considering the following parameters.

- The station should represent homogeneous traffic section
- The station should be free from urban and local traffic influence
- The station should be located in a reasonably level terrain with good visibility

The summary of primary surveys conducted on the project corridor is illustrated in **Figure 5-1** below.

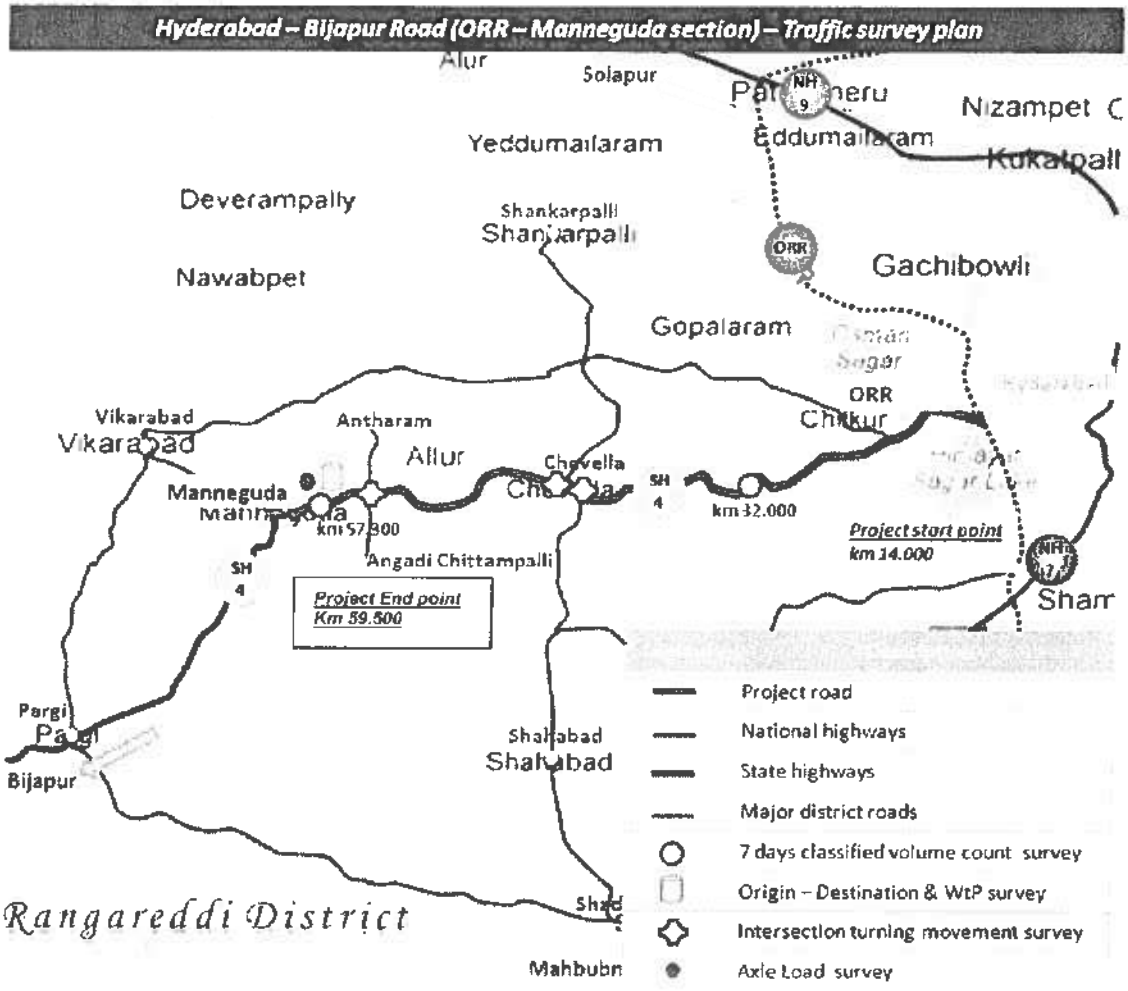
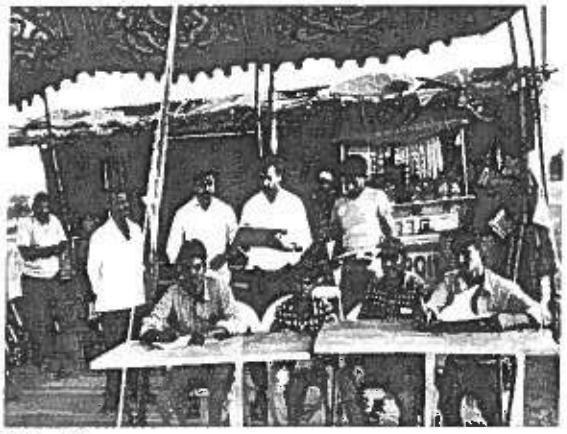



**Figure 5-1: Traffic surveys location map**

### 5.3.2 Classified traffic volume count



*Site Visit by Yadayya, DEE, Kodangal Division*

The CTVC survey was conducted at two locations, the count locations are representing mid block count station for homogeneous section of project stretch. The count was conducted continuously for 7 consecutive days and for 24 hours at count location. The surveys were as per guidelines illustrated in IRC: SP: 19 – 2001, 'Manual for Survey, Investigation and Preparation of Road Projects'. For carrying out the counts, the vehicles were grouped under the following categories (

Table 5-2).

**Table 5-2: Vehicle classification system**

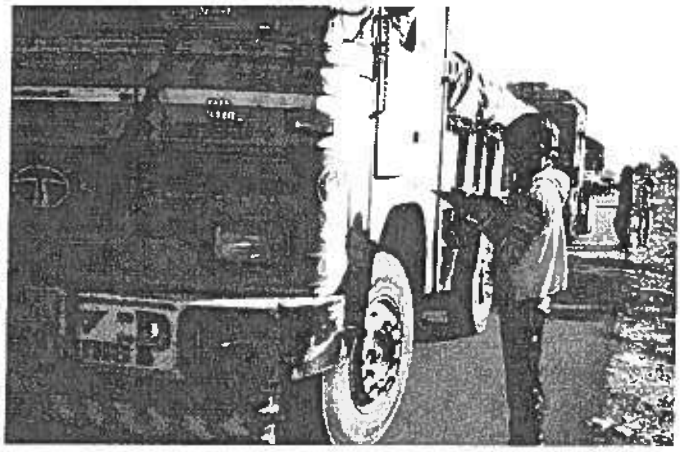
| | |
|---|---|
| **Motorised traffic** | |
| 2 wheelers: Scooters, bikes, motor cycles and mopeds etc | |
| 3 wheelers including auto rickshaw | |
| Passenger Car | Car, jeep, taxi & van |
| Bus | Mini bus |
| | Govt. bus |
| | Private bus |
| Truck | Light commercial vehicles (LCV) |
| | 2 Axle truck |
| | 3 Axle truck |
| | 4 to 6 Axle Truck |
| | Truck with more than 6 Axle |
| Other Vehicles | Agriculture Tractor, Tractor & Trailer |
| **Slow moving vehicles** | |
| | Bicycle |
| | Cycle rickshaw |
| | Animal drawn |
| | Hand cart |

For the purpose of count, a day was divided into two shifts of 12 hours each and different groups of enumerators with a supervisor were assigned for each shift. The count data was recorded at 15-minute intervals for each vehicle group for each direction of travel separately. Trained enumerators were deployed for counting and recording by making tally marks in the five-dash system. This traffic data is used for working out traffic characteristics analysis and forecast, capacity augmentation and toll analysis. The schedule of survey is given in **Table 5-3.**

Table 5-3: Schedule of traffic volume count survey

| Location | Survey Location | Existing km | Date |
|---|---|---|---|
| CTVC 1 | Tholkatte | km 32.200 | 06-01-2015 to 09-01-2015 |
| CTVC 2 | Mirzapur | km 57.300 | 06-01-2015 to 13-01-2013 |

### 5.3.3 Origin-Destination survey



The origin-destination survey was carried out with the primary objective of studying the travel pattern of goods and passenger traffic along the study corridor. The results have also been useful for identifying the influence area of the project road, estimating the growth rates of traffic and planning tolling strategies and locating toll plaza on the most viable section of the project road. The tonnage analysis will form valuable inputs for new pavement design as well as design of overlay on existing pavement.

The survey was conducted at one location for a day (24 hours) as stated in Table 5-4. Roadside interview method was adopted for the survey, in accordance with guidelines given by IRC: SP 19 – 2001. The road users were interviewed by trained enumerators to obtain the required data under the guidance of traffic engineer and supervisors. During the surveys the information pertaining to trip length, trip purpose and occupancy as applicable for various vehicle types were recorded.

Table 5-4: Schedule of origin – destination survey

| Location | Survey location/ section | Existing km | Date |
|---|---|---|---|
| OD 1 | Mirzapur | km 57.300 | 12-01-2015 |

### 5.3.4 Axle load survey

Axle Load Survey has been carried out in order to estimate vehicle damage factor (VDF) for using in design of overlay on existing pavement and new pavement design for additional lanes.

The survey was carried out at one location as shown in **Table 5-5**, using portable weigh pads. Axle loads of LCVs, and two, three and multi axle trucks are recorded on random sampling basis. The vehicles were stopped with the help of police and the drivers were directed to stop their vehicles in such a way that wheel of each axle can be weighed using the weighing pad. The readings were recorded by trained enumerators for each axle separately. In addition, information about origin, destination and type of goods transported by commercial vehicles are recorded.

**Table 5-5: Schedule of axle load survey**

| Location | Survey location/ section | Existing km | Date |
|---|---|---|---|
| AL 1 | Mirzapur | km 57.300 | 12-01-2015 |

### 5.3.5 Speed and delay survey

The speed and delay survey was conducted using moving car observer method. It was conducted for the entire project stretch. The study corridor was divided into suitable sections based on the traffic characteristics of the corridor. The test vehicle was run at the perceptible average speed of the traffic stream along the road. The observers inside the test vehicles recorded travel time and stopping delay timings along with the causes of delays. The test vehicle was made to travel on both directions of travel covering different peak and off peak traffic flow conditions.

## 5.4 DATA ANALYSIS

### 5.4.1 Traffic volume count

The classified traffic volume count survey data for one count location is analysed in order to obtain the following traffic characteristics:

- *Average hourly variation of traffic volume*
- Daily variation of traffic volume
- Average Composition of traffic
- Directional distribution of traffic
- Average Daily Traffic (ADT) volume

Daily and hourly variation of classified traffic flow is recorded by conducting traffic count at one strategically selected traffic count station. Recorded traffic data has been converted into Passenger Car Units using PCU factors as shown in **Table 5-6**. These equivalency factors are extracted from IRC: 64 – 1990, 'Guidelines for Capacity of Roads in Rural Areas'.

**Table 5-6: Passenger car equivalency factors**

| Sl. No. | Vehicle Type | PCU Factors |
|---|---|---|
| 1. | Two Wheeler | 0.50 |
| 2. | Auto–rickshaw | 1.00 |
| 3. | Car / Jeep / Van / Tempo | 1.00 |
| 4. | Mini Bus | 1.50 |
| 5. | Standard Bus | 3.00 |
| 6. | Light Commercial Vehicle (LCV), Agricultural Tractor | 1.50 |
| 7. | Two Axle Truck | 3.00 |
| 8. | Three Axle Truck | 3.00 |
| 9. | Truck Trailer | 4.50 |
| 10. | Agriculture Tractor-trailer | 4.50 |
| 11. | Animal Drawn | 8.00 |
| 12. | Cycle | 0.50 |
| 13. | Hand Cart | 3.00 |
| 14. | Cycle Rickshaw | 2.00 |

### 5.4.2 Average daily traffic (ADT)

Traffic volume count data for 7 days at each location was averaged to determine Average Daily Traffic (ADT). Traffic volume count summary sheet for each count location along with ADT tables were presented in **Appendix 5.1** to this report. The count locations ADT by vehicle type is presented in **Table 5-7**.

**Table 5-7: Average Daily Traffic at count location**

| Mode of Vehicle | km 32.000 Tholkatte | km 57.300 Mirzapur |
|---|---|---|
| Car / Jeep / Van (Private) | 2636 | 2958 |
| Car / Jeep / Van (Taxi) | 254 | 263 |
| Local/Shared Car | 42 | 134 |
| Mini Bus | 23 | 23 |
| School Bus | 74 | 26 |
| Govt. Bus | 445 | 342 |
| Pvt. Bus | 29 | 44 |
| LMV | 474 | 470 |
| LCV (4 Wheels) | 122 | 183 |
| LCV (6 Wheels) | 268 | 387 |
| 2 Axle | 187 | 463 |
| 3 Axle | 352 | 693 |
| MAV (4 - 6 Axles) | 312 | 685 |
| MAV ( 7++ Axles) | 0 | 0 |
| 3 Wheeler / Auto (G) | 121 | 97 |
| 3 Wheeler / Auto (P) | 166 | 578 |
| 2 Wheeler | 2464 | 2832 |
| Tractor | 10 | 17 |
| Tractor with Trailer | 9 | 25 |
| Cycle | 9 | 22 |
| Cycle Rickshaw | 0 | 0 |
| Animal Drawn | 0 | 4 |
| Toll Exempted Vehicles | 58 | 36 |
| **Passenger Vehicles** | **6168** | **7234** |
| **Freight Vehicles** | **1878** | **3022** |
| **Slow moving vehicles** | **9** | **26** |
| **Motorised** | **8046** | **10256** |
| **Non motorised** | **9** | **26** |
| **Tollable Vehicles** | **5218** | **6671** |
| **Non-Tollable Vehicles** | **2837** | **3611** |
| **Tollable PCU** | **8691** | **12501** |
| **Non-Tollable PCU** | **1664** | **2310** |
| ***Total (Vehicles)*** | **8055** | **10282** |
| ***Total (PCU)*** | **10354** | **14811** |

The traffic count location represents the homogenous section. The entire project section was divided into three homogenous sections. The project road section, which is between Outer ring road to Moinabad is already constructed to four lane. Chevella to Manneguda section carries more traffic (in terms of numbers and PCUs respectively). The proximity to connect the Vikarabad, Mannegud Pargi, Kodangal and Telangana Boarder and surrounding areas to Hyderabad is the reason for having more traffic on the section of the project road.

Traffic volume exhibits considerable variations in both passenger and commercial traffic. Goods vehicular movements follow the same trend throughout the day whereas passenger vehicles' flow falls in night time.

Share of passenger traffic is varying from 70.4 % to 76.6%, whereas the share of freight traffic is from 23.3 % to 29.4% and slow moving vehicles having 0.1% to 0.3%.

### 5.4.2.1 Annual average daily traffic (AADT)

AADT is the base year (2014-15) traffic. This is a product of ADT and seasonal variation factor. Seasonal variation factor can be derived using various methods. Vehicle data from toll booths check posts etc. or sale details of petrol and diesel fuels along the corridor are the commonly used sets of data. In the present case fuel sale data is used, which is collected from various fuel outlets along the project stretch. Sales of motor spirit or petrol (MS) and high speed diesel (HSD) in each month for the last one year are used to arrive at seasonal correction factors.

Due to high disparity in data values, the SCF values have shown high variation in SCF values. For present study, the values are discarded and SCF has taken as unity. The AADT values of base year (2014-15) has been used for the traffic volume projection up to horizon year and projected traffic volume for horizon years has been used in design of pavement and for projecting the tollable traffic. Summary of ADT & AADT are shown in Table 5-8.

**Table 5-8: Summary of ADT and AADT at count location**

| Sl. No. | Location | ADT | | AADT | |
|---|---|---|---|---|---|
| | | Nos. | PCUs | Nos. | PCUs |
| 1 | km 32.000 | 8053 | 10352 | 8053 | 10352 |
| 2 | km 57.300 | 10282 | 14811 | 10282 | 14811 |

### 5.4.2.2 Composition of traffic

Seven days average composition of tollable traffic at count locations is presented in

Figure 5-2 and **Table 5-9** shows the average composition of total traffic at count locations.

**Table 5-9: Average total traffic composition at count locations**

| Mode of Vehicle | km 32.000 | | km 57.300 | |
|---|---|---|---|---|
| | Nos. | % | Nos. | % |
| Car/Jeep/Van | 2636 | 32.7 | 2958 | 28.8 |
| Taxi | 254 | 3.2 | 263 | 2.6 |
| Local/Shared Car | 42 | 0.5 | 134 | 1.3 |
| Mini Bus | 23 | 0.3 | 23 | 0.2 |
| School Bus | 74 | 0.9 | 26 | 0.3 |
| Govt. Bus | 445 | 5.5 | 342 | 3.3 |
| Pvt. Bus | 29 | 0.4 | 44 | 0.4 |
| LMV | 474 | 5.9 | 470 | 4.6 |
| LCV (4 Wheels) | 122 | 1.5 | 183 | 1.8 |
| LCV (6 Wheels) | 268 | 3.3 | 387 | 3.8 |
| 2 Axle | 187 | 2.3 | 463 | 4.5 |
| 3 Axle | 352 | 4.4 | 693 | 6.7 |

| Mode of Vehicle | km 32.000 | | km 57.300 | |
|---|---|---|---|---|
| | Nos. | % | Nos. | % |
| MAV (4 - 6 Axles) | 312 | 3.9 | 685 | 6.7 |
| MAV ( 7++ Axles) | 0 | 0.0 | 0 | 0.0 |
| Auto(G) | 121 | 1.5 | 97 | 0.9 |
| Auto(P) | 166 | 2.1 | 578 | 5.6 |
| 2 Wheeler | 2464 | 30.6 | 2832 | 27.5 |
| Tractor | 10 | 0.1 | 17 | 0.2 |
| Tractor+Trailer | 9 | 0.1 | 25 | 0.2 |
| Cycle | 9 | 0.1 | 22 | 0.2 |
| Cycle Rickshaw | 0 | 0.0 | 0 | 0.0 |
| Animal Drawn | 0 | 0.0 | 4 | 0.0 |
| toll Ex Veh | 58 | 0.7 | 36 | 0.4 |
| **Passenger Vehicles** | 6168 | 76.6 | 7234 | 70.4 |
| **Freight Vehicles** | 1878 | 23.3 | 3022 | 29.4 |
| **Slow Moving** | 9 | 0.1 | 26 | 0.3 |
| **Motorised** | 8046 | 99.9 | 10256 | 99.7 |
| **Non motorised** | 9 | 0.1 | 26 | 0.3 |
| **Tollable Vehicles** | 5218 | 64.8 | 6671 | 64.9 |
| **Non-Tollable Vehicles** | 2837 | 35.2 | 3611 | 35.1 |
| **Total (Vehicles)** | 8053 | 100.0 | 10282 | 100.0 |

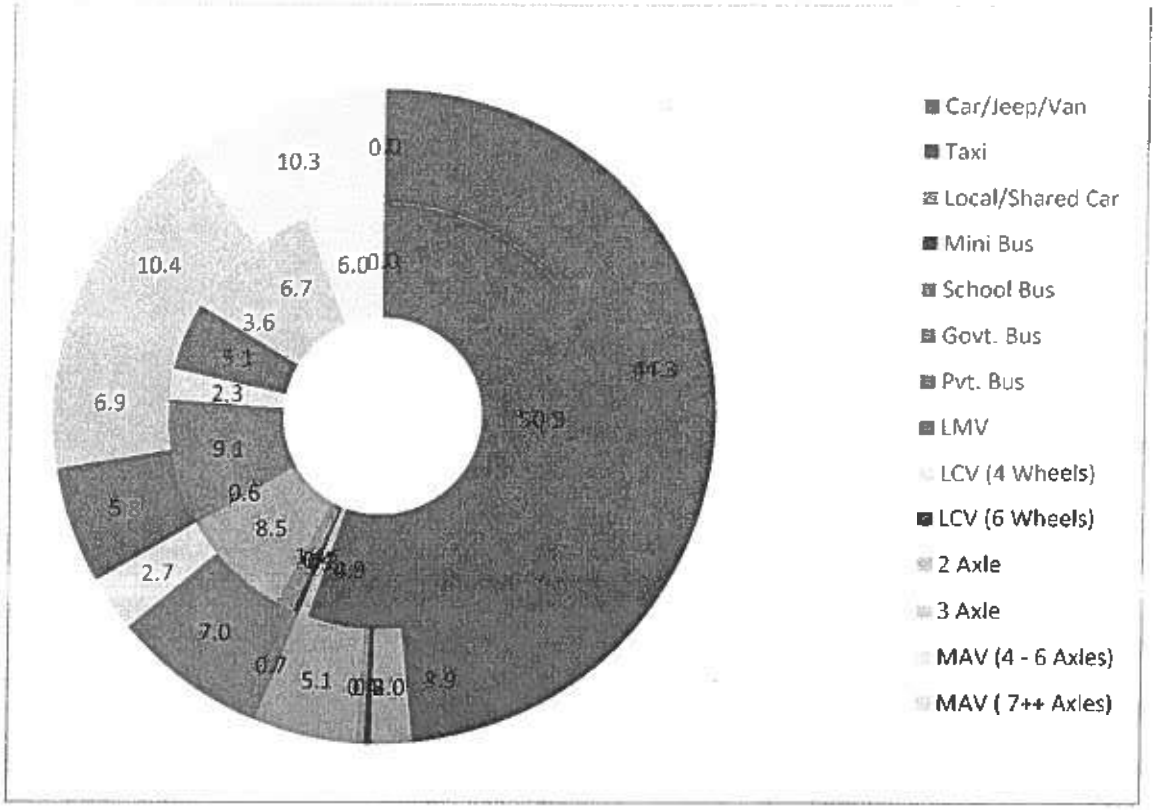



**Figure 5-2: Vehicle Composition (Tollable Vehicles)**

### 5.4.2.3 Hourly variation of traffic

Average hourly variation of traffic for count location is shown in **Figure 5-3.** It is observed that traffic

flow in day and night has considerable variation in volume. At count location peak flow happens in evening 15.00 - 16.00 at location 1 and 18.00 – 19.00 at location 2.
At count location the commercial vehicles have no such variation in day as well as night but the passenger traffic considerable decrease at night.

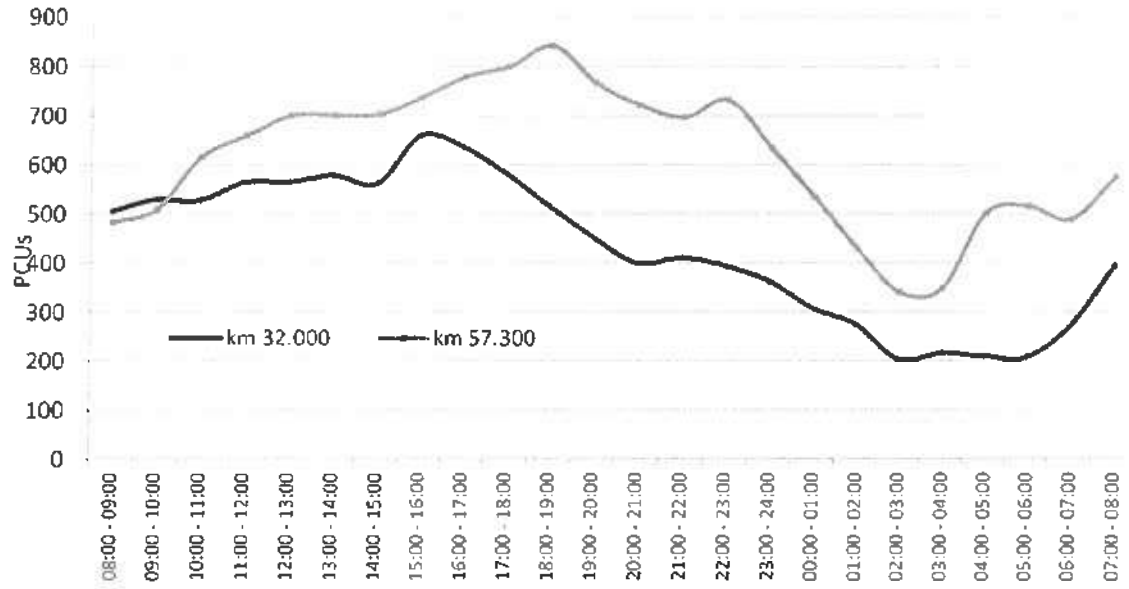



**Figure 5-3: Hourly traffic variation at count location**

### 5.4.2.4 Daily variation of traffic volume

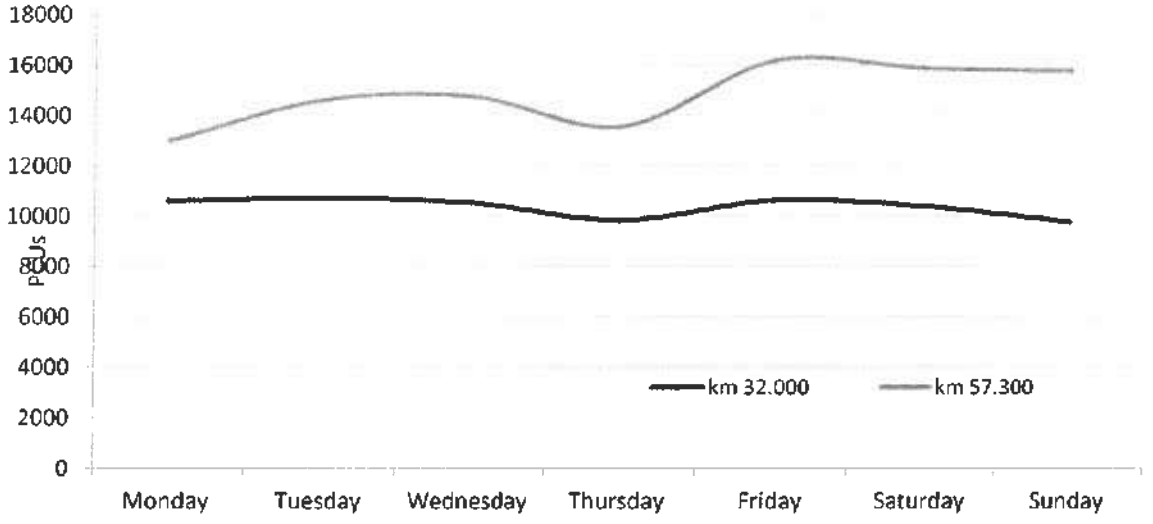



**Figure 5-4: Daily variation of traffic at count location**

Daily variation of traffic for count location is shown in **Figure 5.4.** Daily variation of traffic in terms of day factors at count location is presented in **Table 5-10.**

**Table 5-10: Day factors and maximum variations**

| Location | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|---|
| km 32.000 | 2.5 | 3.3 | 1.8 | -5.1 | 2.7 | 0.4 | -5.7 |

| Location | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|---|---|---|
| km 57.300 | -12.3 | -1.4 | -0.4 | -8.5 | 9.2 | 7.2 | 6.3 |

Daily traffic for 7 days at count location in histogram form is presented in **Figure 5-5** and the variation of daily total PCU is presented in **Table 5-11**. Also, maximum and minimum variations from average in percentages are given.

**Table 5-11: Daily Variation of Traffic Volume (PCUs)**

| Location | Mon | Tue | Wed | Thu | Fri | Sat | Sun | ADT | Maximum variation | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | + ve (%) | - ve (%) |
| km 32.000 | 10610 | 10695 | 10536 | 9827 | 10630 | 10395 | 9767 | 10352 | 3.3 | -5.7 |
| km 57.300 | 12986 | 14599 | 14752 | 13550 | 16176 | 15873 | 15750 | 14811 | 9.2 | -12.3 |

Day factor is the variation of each day's traffic to the average daily traffic. Day wise variations are observed at count locations Sunday observe lower traffic at first location and Monday at second location. Monday, Tuesday at first location and Friday at second location has observed higher traffic movement. The main attraction along this route is the presence of Vikarabad, Parigi, Kodangal, Chevella, Chilukuru and Hyderabad.

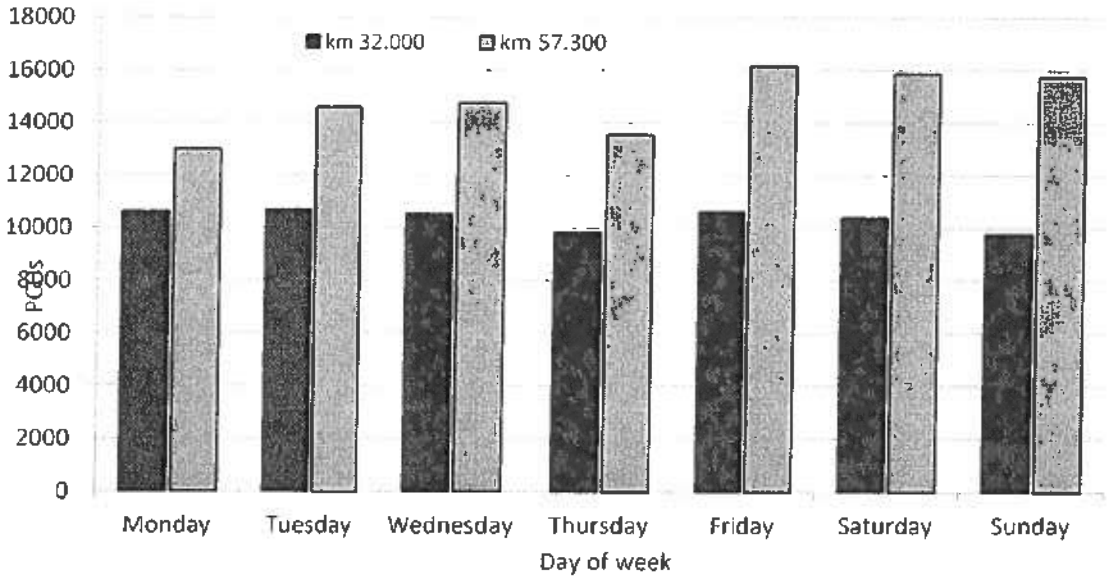



**Figure 5-5: Daily variation of traffic at count location across week**

### 5.4.2.5 Directional distribution of traffic

Directional split at count locations is shown in **Table 5-12**. This is a useful input for capacity analysis and pavement design. As seen, the directional split for up and down traffic is nearly equal.

**Table 5-12: Directional split**

| Location | Hyderabad – TS/KA border | TS/KA border - Hyderabad |
|---|---|---|
| km 32.000 | 51.7 | 48.3 |
| km 57.300 | 49.9 | 50.1 |

### 5.4.3 Origin – Destination Survey

The O – D survey has been carried out on random sample basis and sample size obtained for each class of vehicle is shown in **Table 5-13** below.

Table 5-13: Sample Size for O – D Survey

| S.No. | Vehicle type | km 57.300 |
|---|---|---|
| 1 | Car / Jeep / Van | 29.94 |
| 2 | Mini Bus | 28.70 |
| 3 | Bus | 44.17 |
| 4 | LMV | 29.57 |
| 5 | LCV | 21.73 |
| 6 | 2 Axle Truck | 40.60 |
| 7 | 3 Axle Truck | 29.62 |
| 8 | Multi Axle Truck | 26.57 |

The collected data were entered into the computer and checked manually. Incorrect entries were corrected by cross-checking it with original field data sheets. The data was also checked for inconsistencies. The checking included:

- Trips from zones to zones which cannot possibly ply through the survey location
- Vehicle type with their corresponding lead / load / occupancy for any inconsistencies

The checked and corrected data were used for final analysis.

### 5.4.3.1 Zoning system

For analysis of data collected from the field, it is required to code them for developing origin and destination matrices of trips. To assess the local traffic more precisely the zoning system is considered in four levels.

Five zones were considered along the project corridor and six zones are in immediate influence area and rest of the zones are considered as external zones. Neighbouring districts considered as IIA region and remaining districts of Telangana and rest of India were grouped to form external influencing zones. These considerations helped in arriving at 29 zones for the project. The zones are listed in **Table 5-14**.

Table 5-14: Adopted zoning system for the study

| Zone No. | Description | Remarks |
|---|---|---|
| 1 | Hyderabad, Secundrabad, Golconda, Ambarpet | HYD |
| 2 | Medchal, Bolarum, Maula ali, Lingampalli, BHEL, Gachibowli, Pocharam | NE RR |
| 3 | Rajendra nagar, Himayat sagar, Shamshabad, Vanastalipuram, LB Nagar, Dilsukh nagar, Manneguda | SE RR |
| 4 | Furukhnagar, Yacharam, Ibrahimpatnam, Rangapur | SE RR |
| 5 | Chilkur, Moinabad, Himayatnagar, Aziz nagar | RR |
| 6 | Chevella, Kesaram, Malkapur, Chinnashapur, Ibrahimpalle | RR |
| 7 | Allur, Mirjaguda, Kistapur, Angadi chittampally, Hastepur | RR |
| 8 | Manneguda | RR |
| 9 | Vikarabad, Marpalli | RR |
| 10 | Pargi | RR |
| 11 | Doma, Kulakacherla, Nancherala, Muhammadabad | RR |
| 12 | Tandur, Peddamal, Bashirabad, Rukmapur | RR |
| 13 | Bamraspet, Kodangal, Kothur | MBN |
| 14 | Indanoor, Ravulapally, Chandrakal | MBN |
| 15 | Husnabad, Daulatabad, Kosgi, Bichal | MBN |
| 16 | Rest of Mahabubnagar district | MBN |
| 17 | Medak district | MDK |
| 18 | Nalgonda district | TS |

| Zone No. | Description | Remarks |
|---|---|---|
| 19 | Nizamabad, Karimnagar, Adilabad districts | TS |
| 20 | Warangal, Khammam districts | TS |
| 21 | East godavari, West godavari, Krishna, Vishakhapatnam, Vizianagaram, Srikakulam districts | AP |
| 22 | Rest of Andhra Pradesh | AP |
| 23 | Yadgir district | KA |
| 24 | Kalaburgi, Bidar districts | KA |
| 25 | Bijapur district | KA |
| 26 | Rest of Karnataka | KA |
| 27 | Tamil Nadu, Kerala | TN/KL |
| 28 | Maharashtra | MH |
| 29 | Rest of India | RoI |

### 5.4.3.2 Expansion factors and development of O – D matrices

The origin – destination details were collected from the trip makers during the survey on sample basis. Sampling varied with the changes in traffic flow across the day. Care has been taken to eliminate any element of bias in sampling. Since data was collected on sample basis, expansion factors are required to replicate the pattern as reflected in the sample to the total number of vehicular trips made during the day. These expansion factors are calculated separately for each class of vehicle. For example, if $x_c$ is number of cars interviewed and $X_c$ is the total number of cars counted during the day, then $X_c/x_c$ would be the expansion factor for cars.

O – D matrices are developed to assess the traffic movement pattern. These matrices actually speak about distribution of trips for each zone as intra zonal and inter zonal movements. The vehicle wise O – D matrices are developed by multiplying the sample O – D matrix obtained from survey data with expansion factors. Accordingly 8 matrices, for different modes were developed for survey location.

O – D matrices for different vehicle type for project road are presented in **Appendix 5.2** to this report.

### 5.4.3.3 Trip purpose

The trip purposes of passengers as revealed in shown in **Table 5-15** and in **Figure 5-6.**

**Table 5-15: Trip purpose of passenger vehicles**

| Location | Work | Business | Education | Social | Religious / Tourism | Others |
|---|---|---|---|---|---|---|
| km 57.300 | 62.93 | 26.16 | 1.49 | 2.39 | 6.13 | 0.90 |

It was observed that the maximum number of trips contributed to work and business trips along the corridor by the passenger car vehicle.

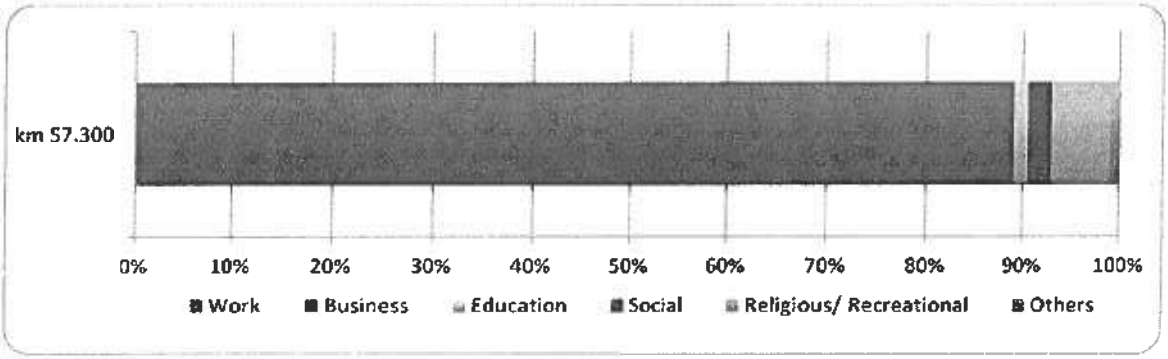



Figure 5-6: Trip purpose (%)

### 5.4.3.4 Occupancy of Passenger Vehicles

The average occupancy of the passenger vehicles are provided in Table 5.16.

Table 5-16: Average Occupancy at survey location

| Vehicle | km 57.300 |
|---|---|
| Car / Jeep | 4.30 |
| Mini Bus | 9.50 |
| Bus | 43.71 |

### 5.4.3.5 Commodity groups and analysis

The different commodities recorded during the O – D survey have been classified in 10 categories as presented in **Table 5-17**. Due consideration has been given to include all possible commodities and to categorize them into homogeneous groups.

Table 5-17: Classification of commodities

| No. | Commodity Type |
|---|---|
| 1 | Food grains and other agricultural products<br>(Rice, wheat, pulses, maize, chilly, sugar, cotton, coffee, tea etc.) |
| 2 | Fruits, vegetables – Perishables |
| 3 | Building materials and Hardware |
| 4 | Petroleum, oil and lubricants (POL) |
| 5 | Minerals, chemicals, fertilizer, iron and steel |
| 6 | Finished and manufactured products<br>(Products of steel, machinery, electric & electronics, automobile, plastic etc.) |
| 7 | Parcel service |
| 8 | Miscellaneous goods (livestock, textile etc) |
| 9 | Empty vehicles |
| 10 | Cement |

The commodity movement pattern along the corridor is analysed and presented in **Table 5.18**. The percentage of each commodity is shown mode wise at survey location. **Figure 5.7** shows the bar chart of each commodity.

Table 5-18: Distribution of goods carried by commercial vehicles

| Vehicle type | Commodity type (in %) | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| km 57.300 | | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV | 10.53 | 5.26 | 5.26 | 2.63 | 2.63 | 7.89 | 0.00 | 0.00 | 63.16 | 2.63 | 100.00 |
| LCV | 12.16 | 2.70 | 5.41 | 0.00 | 0.00 | 2.70 | 4.05 | 4.05 | 67.57 | 1.35 | 100.00 |
| 2 A | 21.09 | 4.69 | 10.16 | 9.38 | 4.69 | 4.69 | 2.34 | 4.69 | 26.56 | 11.72 | 100.00 |
| 3 A | 3.45 | 1.72 | 8.62 | 3.45 | 10.34 | 1.72 | 13.79 | 0.00 | 44.83 | 12.07 | 100.00 |
| MAV | 3.95 | 0.00 | 32.89 | 2.63 | 7.89 | 0.00 | 6.58 | 0.00 | 13.16 | 32.89 | 100.00 |

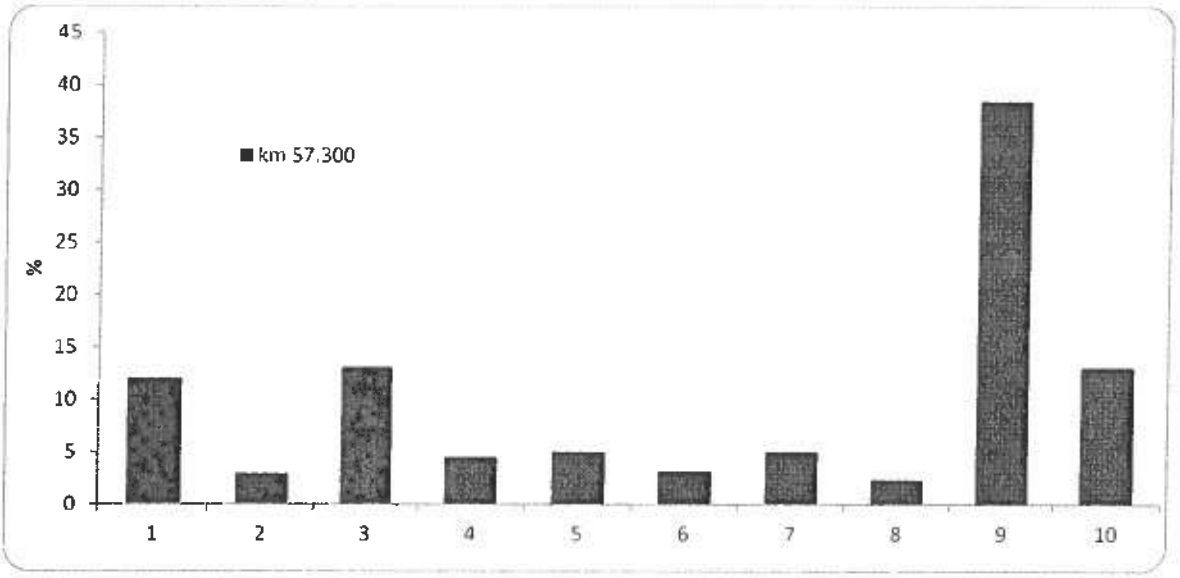



**Figure 5-7: Percentage distribution of commodities**

The share of food grains and agricultrual products are around 15% followed by building materials, wood products and hardware has a share of 13.1%. Cement products are having a share of 13.10%. and all other category commodities are observed varying in between 2% to 5% only. The empty vehicles plying on the corridor varying around 38.5% due to majority of the commodity movements are either pickup or drop by the vehicles.

### 5.4.4 Axle load survey

Axle load survey has been carried out in order to estimate vehicle damage factor (VDF) for using in design of overlay on existing pavement and new pavement for additional lanes.

#### 5.4.4.1 Calculation of VDF

The vehicle damage factor is a multiplier for converting the number of commercial vehicles of different axle loads to the number of standard axle load repetitions. Design of new pavement for additional lane or strengthening of existing pavement is based upon the cumulative number of 8.17 tonne equivalent standard axles (ESA) that will pass over during the 15-year design period. The classes of traffic which lead to significant axle loads (or damage) to the pavement and accordingly considered for design are: LCVs, two/three axle and multi axle trucks. Cumulative standard axle (CSA) is calculated in accordance with the guidelines provided in IRC: 37 – 2010 and IRC: SP 73 - 2007. The overloaded vehicles have serious adverse impact on the performance of pavement. It has been ascertained that the damaging effect of axles on flexible pavement is approximately proportional to the fourth power of the axle load.

Equivalency factors as recommended by IRC have been used to convert the axle load spectrum into an equivalent number of standard axles. Equivalency factors as recommended by IRC have been used to convert the axle load spectrum into an equivalent number of standard axles. The equivalency factors are derived for each axle load category from the fourth power rule. The product

of frequency of axles for each axle load category and corresponding equivalency factors gives the ESA for corresponding axle load category. The VDF is calculated by dividing the total number of ESA by the number of vehicles weighed. The calculated VDF of LCV, 2 axles, 3 axles and multi axle trucks are shown in

Table 5-19 below.

**Table 5-19: Observed and recommended VDF**

| Location | km 57.300 | | |
|---|---|---|---|
| Mode | Hyd – Border | Border - Hyd | Combined |
| LCV | 0.06 | 0.65 | 0.37 |
| 2-axle | 1.80 | 1.75 | 1.79 |
| 3-axle | 2.20 | 3.47 | 2.67 |
| MAV | 3.08 | 9.17 | 5.88 |
| Bus | 0.72 | | 0.72 |

### 5.4.4.2 Computation of Design Traffic

The design traffic is considered in terms of the Cumulative Standard Axles (CSA) to be carried during the design life of 20 years on the road. The computation involves initial volume of commercial vehicles per day, lateral distribution of traffic, growth rate, design life in years and vehicle damage factor (number of standard axle per commercial vehicle) to convert commercial vehicles to standard axles.

The following equation has been used to calculate the cumulative number of standard axles in accordance with IRC: 81 – 1997 and IRC: 37 – 2001.

$$N_s = \frac{365 \times A\left[(1+r)^x - 1\right]}{r} \times F$$

Where

Ns = The cumulative number of standard axles to be catered for in the design.

A = Initial traffic, in the year of completion of construction, in terms of the number of commercial vehicles per day duly modified to account for lane distribution.

r = Annual growth rate of commercial vehicles, %

x = Design life in years

F = Vehicle Damage Factor (number of standard axles per commercial vehicle)

The Million Standard Axles (MSA) from base year to horizon year for commercial traffic has been estimated using VDF values derived from axle load survey for LCV, 2, 3 and multi axle trucks. The VDF values for both directions are used for calculations, in project stretch. The calculated MSA values are discussed in the Pavement design chapter.

### 5.4.5 Accident scenario

The improvement proposals have to address the safety issues on project corridor, and road accidents are the direct and most powerful indicators of safety hazards on the road. The accident records were collected from Chevella police stations which has the project corridor falling under their jurisdiction for the past. The summary of the accidents held on the road are presented in **Table 5-20** below.

Table 5-20: Accident summary

| Particulars | 2012 | 2013 | 2014 |
|---|---|---|---|
| No of accidents | 34 | 43 | 43 |
| No of persons died | 25 | 27 | 26 |
| No of persons inured | 68 | 48 | 65 |
| No of vehicles involved | 56 | 75 | 72 |

The police records state that majority of these accidents were either due to over speeding or negligent driving. The discussions held with police officials and local residents reveal that the poor geometrics, riding conditions, potholes, edge drops, lack of shoulders, criss crossing of pedestrians and cattle etc. were leading to accidents, though specific accident black spots were not identified. The improvement proposals will be addressing these issues for the safety of road users and other stake holders.

### 5.4.6 Speed and delay survey

Speed and delay survey is carried out during morning and evening in both peak and off peak hours and for both directions of project road. The journey time, journey speed, running time and running speed along the project road are shown in **Table 5-21.**

Table 5-21: Observed running time and speed along the project stretch

| Homogeneous road section | Distance km | Average journey time | Average journey speed | Average running time | Average running speed |
|---|---|---|---|---|---|
| | | min | km/hr | min | km/hr |
| **Peak hour** | | | | | |
| ORR – Moinabad | 9.6 | 11.2 | 51.4 | 10.9 | 52.8 |
| Moinabad – Chevella | 17.0 | 20.1 | 50.7 | 20.0 | 51.1 |
| Chevella – Manneguda | 10.0 | 25.2 | 23.8 | 25.0 | 24.0 |
| **Off-peak hour** | | | | | |
| ORR – Moinabad | 9.6 | 10.7 | 53.8 | 9.8 | 58.8 |
| Moinabad – Chevella | 17 | 18.7 | 54.4 | 18.5 | 55.2 |
| Chevella – Manneguda | 10 | 24.4 | 24.6 | 24.3 | 24.7 |

It is observed during the survey that the good riding condition helps in attaining the average peak hour speed of 52 kmph and off-peak hour speed of 58 kmph. The survey data can be used for analysing the bypass options for the delays generally occurring in built-up areas.

## 5.5 TRAFFIC FORECAST

### 5.5.1 General

Investment priorities are governed by the traffic demand, assessed benefits and cost of the project. Demand plays the important role, governing which type of facility / infrastructure needs to be created. This in turn determines likely benefits and costs to develop the same. A highway project of this nature calls for significant investment. Prediction of traffic demand becomes an important task and has to be carried out near accurately. Accurate estimation of traffic has direct bearing on the viability of the project. Recognizing this, efforts need to be made to carefully assess all the parameters that help in predicting the traffic demand in future, which necessitates realistic estimation of traffic growth rates. Traffic growth on a road facility is generally estimated on the basis of historical trends. In the present case, traffic growth rates have been estimated using elasticity method as per IRC: 108 – 1996. Demand changes are usually because of shifts in the pattern of

economic activities in the surrounding regions. Hence, future traffic estimation necessitates a preview, however imprecise, of the probable pattern of future growth of the economy.

### 5.5.2 Past vehicle registration details

It is revealed from OD survey that the project stretch is mainly influenced by Telangana and Karnataka states. For establishing growth rates, data of Telangana & Andhra Pradesh, Karnataka and India have been considered.

The vehicle registration data for Andhra Pradesh and Commercial vehicles in India have been collected and presented in **Table 5-22** below.

**Table 5-22: Past vehicle registration data**

| Year | Two wheeler | Car / Jeeps | Bus | Commercial vehicles |
|---|---|---|---|---|
| *TS&AP* | | | | |
| 2004-05 | 3781537 | 523025 | 39876 | 163028 |
| 2005-06 | 4181080 | 550311 | 41622 | 174735 |
| 2006-07 | 4686543 | 634708 | 45359 | 196703 |
| 2007-08 | 5262009 | 731711 | 51477 | 218730 |
| 2008-09 | 5851816 | 826961 | 57817 | 233412 |
| 2009-10 | 6514516 | 910616 | 60661 | 236208 |
| 2010-11 | 7488694 | 1025385 | 64619 | 241660 |
| 2011-12 | 8608056 | 1215059 | 73439 | 257852 |
| **CAGR** | **12.47** | **12.80** | **9.12** | **6.77** |
| *TS&AP* | | | | |
| 2004-05 | 3957742 | 614914 | 88267 | 179566 |
| 2005-06 | 4313910 | 716490 | 94875 | 219200 |
| 2006-07 | 4972750 | 826571 | 79907 | 247293 |
| 2007-08 | 5379728 | 908337 | 86185 | 261362 |
| 2008-09 | 5925914 | 992060 | 132862 | 345343 |
| 2009-10 | 6404905 | 1113624 | 144107 | 377495 |
| 2010-11 | 7033045 | 1248151 | 150086 | 415491 |
| 2011-12 | 7737366 | 1394928 | 156640 | 454582 |
| 2012-13 | 8575104 | 1558832 | 165173 | 506340 |
| **CAGR** | **10.52** | **11.06** | **7.82** | **11.25** |

| *India* | |
|---|---|
| **Year** | **CVs ('000)** |
| 2000-01 | 2948300 |
| 2001-02 | 2973740 |
| 2002-03 | 3491637 |
| 2003-04 | 3748484 |
| 2004-05 | 3877622 |
| 2005-06 | 4274984 |
| 2006-07 | 5118880 |
| 2007-08 | 5600938 |
| 2008-09 | 6040924 |
| 2009-10 | 6431926 |
| 2010-11 | 7064495 |
| **CAGR** | **9.13** |

*Source :*
*Road Transport Year Book by MORTH Publication, Govt. of India*
*Commissioner of transport, Govt. of Telangana and Govt. of Andhra Pradesh.*
*Road transport department, Govt. of Karnataka*

### 5.5.3 Past growth of the economy

Growth of traffic on the project road is influenced by existing development and future growth prospects of the influencing regions. The time series data of state income NSDP at constant (2004-05) prices, state population, per-capita income of PIA state and GDP as published by Central Statistical Organization have been collected and studied to assess the past performance of the influencing state economies. **Table 5-23** depicts these economic indicators.

The growth rate of population in Telangana & Andhra Pradesh in the period of 2001 to 2011 was 1.058 % per annum has been observed.

**Table 5-23: Economic indices of states and India at constant prices (2004 - 05)**

| Year | NSDP (Rs Crores) | % growth | Per capita NSDP (in Rs) | % growth |
|---|---|---|---|---|
| *Telangana & Andhra Pradesh* | | | | |
| 2004-05 | 20130348 | | 25321 | |
| 2005-06 | 22090120 | *9.74* | 27486 | *8.55* |
| 2006-07 | 24458678 | *10.72* | 30114 | *9.56* |
| 2007-08 | 27272585 | *11.50* | 33239 | *10.38* |
| 2008-09 | 29225819 | *7.16* | 35272 | *6.12* |
| 2009-10 | 30366813 | *3.90* | 36303 | *2.92* |
| 2010-11 | 33292480 | *9.63* | 39434 | *8.62* |
| 2011-12 | 35880144 | *7.77* | 42119 | *6.81* |
| 2012-13 | 37887853 | *5.60* | 44089 | *4.68* |
| **CAGR** | **8.23** | | **7.18** | |
| *Karnataka* | | | | |
| 2004-05 | 14872898 | | 26882 | |
| 2005-06 | 16403065 | *10.29* | 29295 | *8.98* |
| 2006-07 | 18108596 | *10.40* | 31967 | *9.12* |
| 2007-08 | 20380990 | *12.55* | 35574 | *11.28* |
| 2008-09 | 21830924 | *7.11* | 37687 | *5.94* |
| 2009-10 | 21836349 | *0.02* | 37294 | *-1.04* |
| 2010-11 | 24081677 | *10.28* | 40699 | *9.13* |
| 2011-12 | 25083139 | *4.16* | 41959 | *3.10* |
| 2012-13 | 26678414 | *6.36* | 44183 | *5.30* |
| **CAGR** | **7.58** | | **6.41** | |

| GDP of India | | |
|---|---|---|
| Year | GDP (Rs Crores) | % growth |
| 1999-00 | 2,246,276 | |
| 2000-01 | 2,342,774 | *4.30* |
| 2001-02 | 2,472,052 | *5.52* |
| 2002-03 | 2,570,690 | *3.99* |
| 2003-04 | 2,777,813 | *8.06* |
| 2004-05 | 2,971,464 | *6.97* |
| 2005-06 | 3,253,073 | *9.48* |
| 2006-07 | 3,564,364 | *9.57* |
| 2007-08 | 3,896,636 | *9.32* |
| 2008-09 | 4,158,676 | *6.72* |
| 2009-10 | 4,507,637 | *8.39* |
| 2010-11 | 4,885,954 | *8.39* |
| 2011-12 | 5,202,514 | *6.48* |
| | | |
| **CAGR** | **7.16** | |

| Census Year | TS&AP | Karnataka |
|---|---|---|
| 2001 | 76210007 | 52,850,562 |
| 2011 | 84665533 | 61,130,704 |
| CAGR | 1.058 | 1.466 |

### 5.5.4 Transport demand elasticity

As discussed earlier, the elasticity approach has been used for determining growth rates of future traffic. Since time series traffic data on project road is not available, traffic growth rates and elasticity values are established by using registered vehicles as the dependent variable.

**Description of Regression Analysis**

The Regression Analysis tool performs linear regression analysis by using the "least squares" method to fit a line through a set of observations. We can analyze how a single dependent variable is affected by the values of one or more independent variables. In the present case, registered vehicles by type are the dependent variables whereas the economic parameters are independent variables. Once the relation is established by regression, the measures explained below are used to accept or reject the same.

***t-statistic***

The t-statistic is a measure of how strongly a particular independent variable explains variations in the dependent variable. The larger the t-statistic, the better is the independent variable's explanatory power. Next to each t-stat is a P-value. The P-value is used to interpret the t-stat. In short, the P-value is the probability that the independent variable in question has nothing to do with the dependent variable. Generally, we look for a P-value of less than 0.05, which means there is a 5% chance that the independent variable is unrelated to the dependent variable. If the P-value is higher 0.10, a strong argument can be made for eliminating this particular independent variable from a model because it *isn't statistically significant*.

***R Square***

R Square is another measure of the explanatory power of the model. In theory, R square compares the amount of error explained by the model as compared to the amount of error explained by averages. The higher the R-Square, the better it is.

A regression analysis was carried out on the database to arrive at the transport demand elasticity and growth rates using each category of vehicle with various combinations of economic parameters and population of the respective states. The resultant elasticity values, growth rates, $R^2$ values and t-statistic are presented in **Table 5-24.** The highlighted parameters are selected for traffic forecast in each case, based on best fit. For commercial vehicles, Andhra Pradesh and India growth trend is analyzed.

**Table 5-24: Observed transport demand elasticity values and traffic growth**

| Vehicle Type | Indicator | Elasticity | GR (%) | R-square | t-stat |
|---|---|---|---|---|---|
| ***Telangana & Andhra Pradesh*** | | | | | |
| Car | Population | 11.561 | 12.228 | 0.9932 | 29.510 |
| Bus | Population | 8.443 | 8.931 | 0.987 | 21.562 |
| Trucks | NSDP | 0.810 | 6.847 | 0.9703 | 13.995 |
| Two Wheeler | Population | 11.050 | 11.688 | 0.9974 | 47.806 |
| ***Karnataka*** | | | | | |
| Car | Population | 7.222 | 10.588 | 0.9962 | 56.191 |
| Bus | Population | 5.356 | 7.852 | 0.891 | 9.890 |
| Trucks | NSDP | 1.775 | 13.033 | 0.9637 | 13.641 |
| ***India*** | | | | | |
| Trucks (AI) | GDP | 1.216 | 10.130 | 0.9852 | 18.231 |

***Projected transport demand elasticity***

In order to arrive at realistic future elasticity for the project road, various factors relating to vehicle technology changes, in addition to character of traffic and travel pattern on the project road, have been considered.

High elasticity of cars being witnessed now is because of large demand facilitated by financing schemes and loans. Factors like growth of household incomes (particularly in urban areas), reduction in the prices of entry-level cars, growth of the used car market, changes in life-style, growing personal incomes, desire to own a vehicle, facilitated by availability of loans/financing schemes on easy terms etc. have all contributed to the rapid growth in ownership of cars. However, such trend would slow down and elasticity can be expected to decline.

Over the years, there has been a change in passenger movement with more and more people shifting towards personalized modes. Moreover, buses are usually plying on fixed pre-decided routes and thus elasticity values for buses have been considered accordingly.

With the changing freight vehicle mix in favour of LCVs for short distance traffic and 3-axle/MAVs for long-distance traffic, higher elasticity values for these have been considered as compared to 2-axle trucks. Considering the ongoing technical advancements in automobile industry, some of the standard two axle trucks would gradually be replaced by three axle truck and MAVs, leading to reduction in number of trucks. This shift has already been observed in various parts of the country.

Transport demand elasticity by vehicle type, over a period of time, tends to decline and approach unity or even less. As the economy and its various sectors grow, every region tends to become self-sufficient. Moreover, much of the past growth has been associated with the country's transition from a largely rural subsistence economy to cash-based urban economy, dominated by regional and national linkages. As the transition proceeds, its impact on transport pattern can be expected to become less dominant. Therefore, the demand for different type of vehicles falls over time, despite greater economic development. In other words the values of elasticity tend to decrease with economic development in future years due to changes in the structure of economy, with higher contribution from service sector and higher value of industrial outputs. The same is also clear from the relationships of the economy and transport demand elasticity over time, both nationally and internationally. The elasticity values have therefore been moderated for the future years as given in **Table 5-25.**

**Table 5-25: Projected transport demand elasticity values**

| Vehicle Type | Indicator | 2015-19 | 2020-24 | 2025-29 | Beyond 2029 |
|---|---|---|---|---|---|
| ***Telangana & Andhra Pradesh*** | | | | | |
| Two Wheeler | Population | 11.050 | 10.950 | 10.850 | 10.750 |
| Car | Population | 9.248 | 9.148 | 9.048 | 8.948 |
| Bus | Population | 7.599 | 7.499 | 7.399 | 7.299 |
| Trucks | NSDP | 0.729 | 0.629 | 0.529 | 0.429 |
| ***Karnataka*** | | | | | |
| Car | Population | 7.222 | 7.122 | 7.022 | 6.922 |
| Bus | Population | 5.356 | 5.256 | 5.156 | 5.056 |
| Trucks | NSDP | 1.775 | 1.675 | 1.575 | 1.475 |
| ***India*** | | | | | |
| Trucks (AI) | GDP | 1.216 | 1.166 | 1.116 | 1.066 |

### 5.5.5 Perspective growth: state and national economies

Against the discussed background, any agenda for future growth of the state economies has to take into account past trends, future prospects, and the emerging challenges. The growth prospects for the state have been developed taking into consideration the past performance of the state

economies and the economic growth envisaged for the future. The pace with which the regional economies grow with the envisaged growth of the state is a major contributing factor in growth of traffic.

The growth of NSDP of Telangana & Andhra Pradesh from 2004-05 to 2011-12 has been 8.61 %. These economies are continuously gaining strength and are heading towards new heights of development. The economy of Andhra Pradesh has achieved a growth of 7.10 in last five years. Therefore considering the present economic scenarios, a realistic growth slopping down from 7.00 to 5.80 % assumed for the four period blocks for the state respectively. Similarly population growth rates also have been considered and therefore growth of PCI levels. The population projection is guided by the paper, *The population Projections for India and States, Report of the Technical Group on Population Projections Constituted by the National Commission on Population, May 2006, published by Office of the Registrar General & Census Commissioner, India*.

Considering the present GDP growth and its future targets, a realistic growth rate of 6.50 % to 5.75 % has been assumed. The perspective economy growth rates considered are presented in **Table 5-26.**

**Table 5-26: Projected growth rates of indicators**

| Indicator | 2015-19 | 2020-24 | 2025-29 | Beyond 2029 |
|---|---|---|---|---|
| ***Telangana & Andhra Pradesh*** | | | | |
| PCI | 6.10 | 5.85 | 5.60 | 5.35 |
| NSDP | 7.00 | 6.60 | 6.20 | 5.80 |
| Population | 0.90 | 0.75 | 0.60 | 0.45 |
| ***Karnataka*** | | | | |
| PCI | 5.30 | 5.05 | 4.80 | 4.55 |
| NSDP | 6.50 | 6.10 | 5.70 | 5.30 |
| Population | 1.20 | 1.05 | 0.90 | 0.75 |
| ***India*** | | | | |
| GDP | 6.50 | 6.25 | 6.00 | 5.75 |

### 5.5.6 Projected traffic rates

The production and sale data of commercial vehicles has been collected for last 10 years from SIAM (Society of Indian Automobile Manufactures) and analysed.

It is found that production / sale of multi axle trucks have increased whereas the same has decreased for 2-axle trucks in the recent past. The exhibit shows the ratio of sale of multi-axle trucks / 2-axle trucks. Based on the present composition of goods vehicles, overall growth of goods vehicles and average load carried by each vehicle type, tonnage has been calculated for 5 year blocks for present and future composition of traffic. The difference in the present and future tonnage gives the additional traffic due to change in modal share which has been converted into vehicles. On this basis growth rate of 2-axle trucks and multi-axle trucks have been moderated keeping the overall growth rates of trucks constant.

Normally, the growth potential of passenger traffic in a region depends on its population and economic growth rates. Therefore, both these parameters have been incorporated in forecasting of passenger traffic. Further, taking into account the fact that the different modes of passenger traffic grow at different rate, the elasticity (as discussed earlier) with respect to population and income growth rates is graded differently by different modes.

Growth potential of goods traffic is different from passenger traffic. This is more directly related to

zone's economic activity and production levels than its population and income growth, although the latter may strongly correlate with the former, especially the income growth.

In view of the above discussions, it is felt that the future growth rates should neither be under nor over targeted. The complexities involved and sensitive dimensions of economy are many, so it is important that its larger issues are to be addressed by constructing different scenarios. Thus an effort has been made to develop three different scenarios of varying growth rates of economic indicators as under:

- ***Optimistic Scenario***
- ***Most likely Scenario***
- ***Pessimistic Scenario***

Considering all the above discussed points, the growth rates were conceived using methods discussed earlier and have been modified accordingly. The basic growth factors are considered to be realistic rates. In the calculation, the growth rate of economic indicators was treated with ±0.5 sensitivity and the pessimistic and optimistic values were arrived at. The final recommended growth rates are given in **Table 5-27**.

**Table 5-27: Estimated and recommended traffic growth rates**

| Mode | 2015-19 | 2020-24 | 2025-29 | Beyond 2029 |
|---|---|---|---|---|
| ***Most likely*** | | | | |
| Car | 8.34 | 6.89 | 5.47 | 4.09 |
| Bus | 6.84 | 5.62 | 4.44 | 3.28 |
| LCV | 5.75 | 4.76 | 3.85 | 3.02 |
| 2 Axle Truck | 2.13 | 1.84 | 1.49 | 0.66 |
| 3 Axle Truck | 6.45 | 5.25 | 4.24 | 3.43 |
| Multi Axle Truck | 5.85 | 4.75 | 3.80 | 3.00 |
| ***Optimistic*** | | | | |
| Car | 10.63 | 9.15 | 7.71 | 6.30 |
| Bus | 8.74 | 7.50 | 6.29 | 5.11 |
| LCV | 6.16 | 5.13 | 4.17 | 3.29 |
| 2 Axle Truck | 2.55 | 2.21 | 1.80 | 0.93 |
| 3 Axle Truck | 6.88 | 5.63 | 4.57 | 3.71 |
| Multi Axle Truck | 6.25 | 5.10 | 4.09 | 3.24 |
| ***Pessimistic*** | | | | |
| Car | 6.05 | 4.63 | 3.24 | 1.87 |
| Bus | 4.94 | 3.75 | 2.59 | 1.46 |
| LCV | 5.33 | 4.39 | 3.53 | 2.76 |
| 2 Axle Truck | 1.71 | 1.48 | 1.17 | 0.39 |
| 3 Axle Truck | 6.02 | 4.87 | 3.91 | 3.15 |
| Multi Axle Truck | 5.46 | 4.40 | 3.50 | 2.75 |

The forecasted traffic for three scenarios for project section is presented in **Appendix 5.3** to this report.

### 5.5.6.1 Traffic forecast for non–motorised traffic

The slow moving vehicles essentially cater to short haul traffic, meeting localised demand for transportation of individual passenger and goods to market centres and urban centres. Non–motorised traffic, especially pedal cycles, cycle rickshaws and animal drawn vehicles will be gradually being replaced by motorised vehicles. Therefore, it is assumed that animal drawn vehicles' and pedal cycles' volume are expected to decline by a negative growth of 2 per annum because of economic improvement. The growth rates of tractors have been however considered as 2 per annum.

## 5.6 TOLL PLAZA

The project stretch is divided into three homogenous section as discussed earlier in this Chapter. Two toll plazas are proposed for the project stretch and optimization of toll revenue.
Table 5-28 below depicts the locations of toll plazas.

**Table 5-28: Toll plaza locations**

| Toll plaza | Chainage (Existing) | Village / location | Tollable section (Existing) | Tollable length (Existing) | Tollable PCU in 2014-15 |
|---|---|---|---|---|---|
| 1 | km 53.600 | Near Antharam | *km 14.000 – km 59.500* | 45.500 | 12501 |

## 5.7 CAPACITY ANALYSIS

Capacity analysis for project road has been carried out in order to define the Level of Service (LoS) offered by road section under the prevailing roadway and traffic conditions.

### 5.7.1 Capacity and level of service guidelines

Capacity and design service volumes for various lane configurations are specified in IRC: 64 – 1990, 'Capacity of Roads in Rural Areas', IRC: SP: 73 – 2007, 'Manual of Specifications and Standards for Two-laning of Highways through Public Private Partnership' and IRC: SP: 84 – 2009, 'Manual of Specifications and Standards for Four-laning of Highways through Public Private Partnership'. The project stretch passes through plain terrain predominantly. The capacity standards for LoS B and LoS C considered is as given in

Table 5-29 below.

**Table 5-29: Design service volume standards**

| Road | Shoulder Type | Plain Terrain | |
|---|---|---|---|
| | | LOS B | LOS C |
| Intermediate lane | Earthen shoulders | 6000 | 8400 |
| 2 Lane | Earthen shoulders | 15000 | 21000 |
| | Paved shoulders | 18000 | 25200 |
| 4 Lane | Earthen shoulders | 35000 | 52500 |
| | Paved shoulders | 40000 | 60000 |

### 5.7.2 Projected traffic levels

The capacity analysis was done for entire project road with respective homogeneous sections. The projected traffic volumes for the projected road are given in **Table 5-30**. For Section I the volume of Section II has taken presently.

**Table 5-30: Projected sectional traffic (AADT) in PCUs**

| Section | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| I | 10355 | 14470 | 19212 | 24238 | 29058 | 34895 | 41969 |
| II | 10355 | 14470 | 19212 | 24238 | 29058 | 34895 | 41969 |
| III | 14811 | 20361 | 26691 | 33349 | 39715 | 47391 | 56662 |

### 5.7.3 Capacity augmentation proposals (lane requirement)

Projected sectional AADT was compared with design service volume. The design service volume for project road is considered at the end of LOS B and LOS C and capacity augmentation is suggested for road section, which carry traffic volume more than design service volume.

It is reminded that the lane adequacies shown are based on present and future traffic and guidelines

proposed in codes mentioned in Section 2.4.1. The IRC SP: 73 – 2007 proposes 2-lane with granular shoulder for roads where traffic is less than 8000 PCUs (at the time of bidding) and 2-lane with paved shoulder where traffic exceeds 10000 PCUs. If traffic is between 8000 and 10000 PCUs, the Government may take decision whether to go for stage construction.

Table 5-31 shows the year up to which LoS B and LoS C will serve and when the facility is falling to next LOS, for most likely scenario.

**Table 5-31: Year upto which LoS B and LoS C will serve**

| LoS | LoS B | | | LoS C | | |
|---|---|---|---|---|---|---|
| Section | I | II | III | I | II | III |
| IL | - | - | - | - | - | - |
| 2L + ES | 2020 | 2020 | 2015 | 2026 | 2026 | 2020 |
| 2L + PS | 2023 | 2023 | 2018 | 2031 | 2031 | 2023 |
| 4L + ES | 2040 | 2040 | 2031 | Beyond 2045 | Beyond 2045 | 2042 |
| 4L + PS | 2043 | 2043 | 2035 | | | Beyond 2045 |
| 6 Lane | Beyond 2045 | Beyond 2045 | Beyond 2045 | | | |

In the table, the last year up to which the facilities of Intermediate lane, 2-lane and 4-lane will continue to be in LoS B is shown. For example, consider homogeneous section III. The existing 2 lane facility will serve in LoS B till 2015. The 4-lane facility should be ready by end of 2015, for the road section to continue in same LoS. The four lane facility will serve in LoS B up to 2035 and it will fall in LoS C after 2035 onwards. That indicates, for the facility to continue in LoS B, its capacity should be augmented (6 laning) by end of 2035.

# CHAPTER 6 – PRELIMINARY ENVIRONMENTAL ASSESSMENT

## Hyderabad - Manneguda Road

# CHAPTER 6. PRELIMINARY ENVIRONMENTAL ASSESSMENT

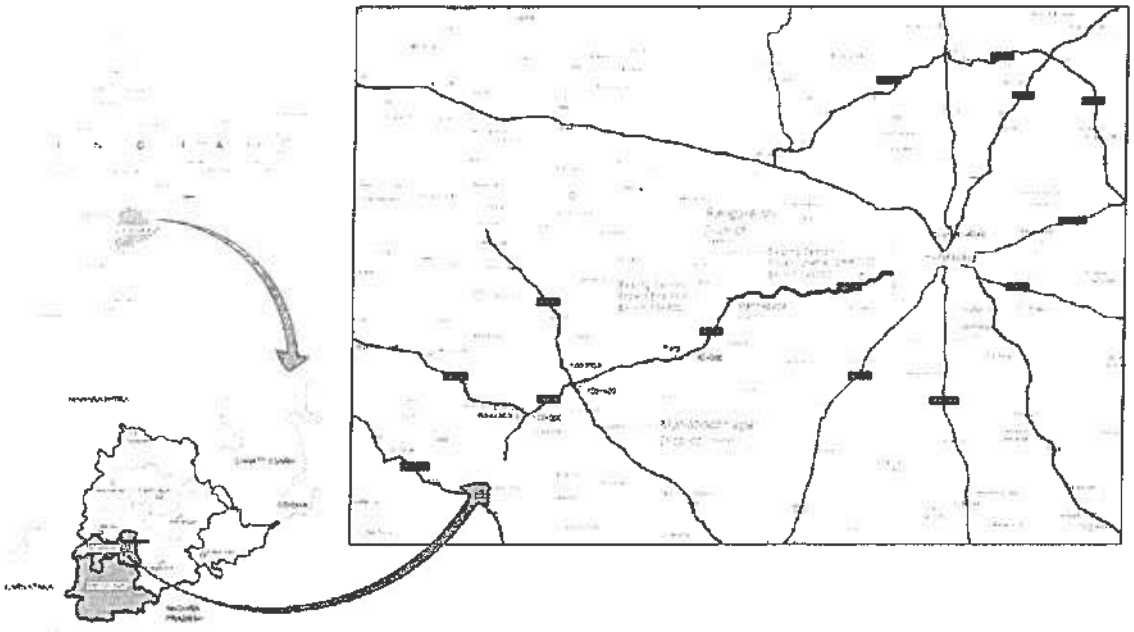
## 6.1 PROJECT BACKGROUND

The National Highways Authority of India has decided to conduct a Feasibility Assessment for 4/6-laning of the section from km 14/000 Hyderabad Outer Ring Road (Appa junction) to km 59/500 near Manneguda in the State of Telangana. Roads and Buildings Department PPP wing, Government of Telangana has appointed M/s. Feedback Infra Private Limited. for providing the required consultancy services for Techno-Economic Feasibility Study and Transaction Advisory Services for 7 Roads in the State of Telangana.

## 6.2 PROJECT ROAD

The Project Road starts at km 14.000 Hyderabad Outer ring road (Appa junction) and ends at km 59.500 near Manneguda. The total length of the project stretch under study is 45.5 km. The project stretch passes through Ranga Reddy and Vikarabad (erstwhile Ranga Reddy) Districts.

**Figure 6-1: Location of Project Road**



## 6.3 PROJECT AREA

Project road stretch mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appareddy guda, Chevella, Indrareddy nagar.

## 6.4 PROJECT PROPONENT

Roads and Buildings Department PPP wing, Government of Telangana.

## 6.5 NEED OF THE PROJECT AND BENEFITS ASSOCIATED

- Will provide easy access to commuters of the settlement located along the road;

- Will cater the traffic growth on the road;
- Will provide easy accessibility for school, medical facilities, etc. for the nearby settlements with urban centres (Hyderabad, Moinabad and Chevella);
- Project Road would bring about all-round development activities in the region, such as movement of people and goods, agriculture, commerce, education, health and social welfare, or even maintenance of law and order and security.

## 6.6 SCOPE OF PRELIMINARY ENVIRONMENT ASSESSMENT STUDY

Preliminary Environment Assessment has been carried out to identify critical issues and areas that would be studied in detail for detailed EIA study. Further details will be taken up during subsequent stages of the project preparation, if required. This report has been prepared based mainly on field survey and collection of secondary data.

In this stage, existing environmental set-up of the study corridor in particular were studied and is described in subsequent sections. However, existence of sensitive receptors was also studied beyond the study area for assessment of noise and air impact. The entire study was carried out within existing policy, legal and administrative framework considering the applicable environmental legislation, regulations and guidelines.

## 6.7 METHODOLOGY

Environmental study has been carried out to identify critical issues and areas that would be studied in detail for impact assessment, mitigation measures and management plan. Findings of the preliminary environmental assessment are presented in this report. Further details will be taken up during subsequent stages of the project preparation. This report has been prepared based on field survey and secondary data mostly.

In the stage, existing environmental set-up of the study corridor in general i.e., the Corridor of Impact (CoI) and the existing Right of Way (RoW) in particular were studied and is described in subsequent sections. The entire study was carried out within existing policy, legal and administrative framework considering the applicable environmental legislation, regulations and guidelines.

### 6.7.1 Approaches to Study

For the present study, the scope of work defined by Project Proponent has been considered. The scope of prelim environment assessment in brief is:

- Preliminary Baseline scenario;
- Co-ordination of environmental study with the feasibility study;
- Legal and policy framework;
- Important environmental features along the road alignment;
- Assessment of potential impacts and
- Mitigation measures.

### 6.7.2 Steps in Study Process

Study process mainly consists of the following types of activities:

***Study of Background Information***

*Study of Project Documents*: The project documents have been studied to have the understanding of the project objectives, its main components, its boundaries etc.

*Study of Laws and regulations:* Laws and regulations enacted by Government of India and Telangana

state relevant to road construction and environment were studied.

*Study of Guidelines, Standards etc.:* Various documents and publications of the Ministry of Environment, Forest and Climate Change (MoEF&CC) and Indian Road Congress (IRC) were studied.

***Reconnaissance / Onsite Study***

A team of environmental and social experts carried out reconnaissance survey of the project road. Important environmental components including protected areas, water bodies, forests, public utilities, community resources, cultural sites, high pollution zone, accident-prone areas etc. along the corridor of impact zone were studied. The important environment components are given in Table below. Discussions with local people and administrators were also conducted to obtain their opinion about the project.

**Table 6-1: Important Environment Components**

| S. No. | Environmental Attributes | Environmental Components |
|---|---|---|
| 1 | Topography | Terrain |
| 2 | Land use | Agriculture, settlements, forest, industrial areas etc. |
| 3 | Water resources | Rivers, canals and ponds in study area |
| 4 | Forests and Wild Life | Designated Protected Areas like Biosphere Reserves, National Parks and Sanctuaries etc.) within 15 km from the project road<br>Presence of RF, PF other forests within study area<br>Flora and Fauna |
| 5 | Road side Plantations | Plantation in RoW |
| 6 | Settlements | Towns and villages abutting the road corridor<br>Details of affected structures |
| 7 | Sensitive Receptors | Sensitive receptors such as educational and health facilities etc. |
| 8 | Drinking water sources | Wells, hand pumps, community water points / taps etc. |
| 10 | Religious Structures | Temples, shrines, mosque, church, gurudwara etc. |
| 11 | Cultural Properties | Protected / unprotected archaeological monuments |
| 12 | Common Property Resources | Community areas; cremation / burial grounds etc. |
| 14 | Environment Conditions | Assessment of Ambient Air Quality, Ambient Noise Level, Ground and Surface Water Quality, Soil Characteristics based on secondary data and visual observations |

***Analysis of Data and Screening Exercise***

The data collected through the above steps were compiled to develop the environmental scenario of the project area and the sensitive components within that. The full road length and CoI were put under screening to identify the hot spot zones. The identification of hot spots in project area would help in further detailed study and preparation of Environmental Impact Assessment report and Environmental Management Plan for the project at later phase.

## 6.8 PROJECT DESCRIPTION

### 6.8.1 Existing Feature Of Road

#### 6.8.1.1 Alignment

- The Project Road is State Highway-SH-4 (In principle declared as NH-163) which Starts at Existing km. 14.000 Hyderabad ORR (Appa junction) and ends at Existing km. 59.500 near Manneguda, Length of the project stretch is 45.50 km.

- The existing project road is a predominantly 2-lane carriageway with average width of 7m and 4-Lane exists from Ch 14/000 to Ch 21/000 with median width of 0.5m and at Moinabad and Chevella towns. Many substandard horizontal curves and vertical curves exist along the alignment. Among these, some curves are observed to have insufficient sight distance.
- Mrugavani National Park exists on right side of the project road from Km 15/000 to Km 17/000.
- Project road traverses through Reserve Forest locations and the total length of forest area along the project road is about 6.73 Km.
- Congestion of traffic at urban and semi-urban places along project road is causing reduction in travel speeds.
- The existing pavement for the entire project stretch is flexible pavement. The condition of the pavement varies from Good to Poor. Earthen Shoulder is existing throughout the stretch varies from 1.0 to 2.0m. Pavement condition of the earthen shoulders is fair to poor.

#### 6.8.1.2 Right of way

The existing Right of Way (RoW) is varies from 16 - 30 m.

#### 6.8.1.3 Road inventory

The existing road inventory has been presented in below table.

Table 6-2: Existing Road Inventory

| Major Intersection | Minor intersection | Major bridges | Minor bridges | ROB | Culverts |
|---|---|---|---|---|---|
| - | 44 | - | 1 | - | 30 |

*Source: Primary Road Inventory Survey*

#### 6.8.1.4 Traffic

Summary of ADT and AADT are shown in table below.

Table 6-3: Summary of ADT and AADT at count locations

| Sl. No. | Location | ADT | | AADT | |
|---|---|---|---|---|---|
| | | Nos. | PCUs | Nos. | PCUs |
| 1 | km 32.000 | 8053 | 10352 | 8053 | 10352 |
| 2 | km 57.300 | 10282 | 14811 | 10282 | 14811 |

*Source: Design Report*

### 6.8.2 Proposed Features Of Road

#### 6.8.2.1 Alignment Proposal

- The design length of Project Road section is 46.391 km.
- The width of basic traffic lane is taken to be 7.0 m for proposed 4-lane with 0.5m shyness and 12.0 m depressed median.
- Paved shoulder is proposed on the project stretch. The width of paved shoulder is 1.5 m in rural and 2.0 m width footpath in built-up sections. These will provide platform for better traffic operations, lower maintenance cost and facility of directly using these as part of carriageway when the road is widened in future.
- Earthen shoulders are proposed to be 2.0 m wide on either side of proposed main carriageway, whereas it will be absent in urban sections.
- Curve improvements/Realignments/bypasses are proposed at the following Locations:

**Table 6-4: Proposed Major Re-alignments/By-passes**

Following are the Curve Improvements and realignments proposed for the project road:

| Sl. No | Existing Chainage (km) | | Design Chainage (km) | | Design Length (m) | Remarks |
|---|---|---|---|---|---|---|
| | From | To | From | To | | |
| 1 | 19.490 | 20.300 | 19+500 | 20+225 | 725 | Realignment |
| 2 | 27+850 | 28+275 | 28+000 | 28+400 | 400 | curve improvement |
| 3 | 28+500 | 28+865 | 28+615 | 29+000 | 385 | |
| 4 | 30+875 | 31+300 | 31+025 | 31+460 | 435 | |
| 5 | 31+700 | 33+050 | 31+860 | 33+175 | 1315 | |
| 6 | 45+550 | 45+800 | 46+430 | 46+680 | 250 | |
| 7 | 48+210 | 48+780 | 49+110 | 49+660 | 550 | |
| 8 | 52+635 | 53+000 | 53+540 | 53+850 | 310 | |
| 9 | 57+230 | 57+370 | 58+090 | 58+240 | 150 | |

- Bypasses: The project stretch passes through heavy built-up areas of Moinabad and Chevella. Therefore bypasses are proposed for Moinabad and Chevella town.

**Table 6-5: Proposed Bypasses**

| Sl. No. | Name of Bypass | Existing Chainage (Km) | | Design Chainage (Km) | | Length (km) |
|---|---|---|---|---|---|---|
| | | From | To | From | To | |
| 1 | Moinabad Bypass | 22.000 | 26.120 | 21+950 | 26+300 | 4.35 |
| 2 | Chevella Bypass | 38.650 | 44.120 | 38+700 | 45+060 | 6.36 |

*Source: Design Data*

### 6.8.2.2 Pavement

Flexible pavement is proposed through-out the stretch except toll plaza locations.

### 6.8.2.3 Right of Way

The proposed RoW for this project road is 60 m

### 6.8.2.4 Cross Drainage Structure

The details are presented below.

**Table 6-6: Proposed Cross Drainage Structures**

| VUP/LVUP | Minor Bridges | | | | Culverts | | | |
|---|---|---|---|---|---|---|---|---|
| New | New | Re-construction | Widening | Rehabilitation | New | Re-construction | Widening | Rehabilitation |
| 10/8 | 2 | - | - | - | 96 | 21 | - | - |

*Source: Design Data*

#### 6.8.2.5 Other Structures

- Proposed Project Road will be having plaza, Truck lay byes, Bus Shelter, Bus Bay.

#### 6.8.2.6 Drains

- Unlined drains in Rural Sections and Lined Drains in Urban Sections are proposed.

#### 6.8.2.7 Land Acquisition

- The Land Acquisition Report (LAR) will be prepared during Preliminary Project Report stage (after alignment approval from client) in accordance with TOR and as outlined in Telangana R&R Policy.

#### 6.8.2.8 Proposed Traffic

Summary of projected traffic scenario at count locations:

**Table 6-7: Summary of AADT at count locations**

| Section | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| I | 10355 | 14470 | 19212 | 24238 | 29058 | 34895 | 41969 |
| II | 10355 | 14470 | 19212 | 24238 | 29058 | 34895 | 41969 |
| III | 14811 | 20361 | 26691 | 33349 | 39715 | 47391 | 56662 |

*Source: Traffic Study (Primary Data)*

## 6.9 LEGISLATIVE FRAMEWORK

### 6.9.1 Environment Legislation – India

The Government of India has formulated various policy guidelines; acts and regulations aimed at protection and enhancement of environmental resources. The following table summarizes the existing legislations pertaining to the project, the various clearances required for the project and the status as on date. The summary of environment laws and their applicability is given in table below:

**Table 6-8: Environment Laws and their Applicability**

| # | Law / Regulation / Guidelines | Relevance | Applic-ability (Yes / No) | Reason for Application | Implementing / Responsible Agency |
|---|---|---|---|---|---|
| 1 | The Environmental (Protection) Act. 1986, and the Environmental (Protection) Rules, 1987-2002 (various amendments) | Umbrella Act. Protection and improvement of the environment. Establishes the standards for emission of noise in the atmosphere. | Yes | All environmental notifications, rules and schedules are issued under the act | MoEF&CC, State Dept. of Environment and Forest, CPCB and SPCB |
| 2 | The EIA Notification, 14th September 2006 and | Identifies expansion of National highways projects greater than 100 km involving additional RoW | No | Expansion/Re-alignment of the Project Road is within | MoEF&CC and SEIAA |

| # | Law / Regulation / Guidelines | Relevance | Applic-ability (Yes / No) | Reason for Application | Implementing / Responsible Agency |
|---|---|---|---|---|---|
| | subsequent amendments | or land acquisition greater than 40 m on existing alignments and 60 m on re-alignments or by-passes and All new state highway projects and SH expansion projects in hilly terrain (above 1000 MSL) and or ecological sensitive areas (item 7 (f) of schedule) as one of the projects requiring prior clearance. | | the Threshold Limits prescribed as per the notification and subsequent amendments. | |
| | | Opening of New Borrow Area | Yes | Prior Environmental Clearance to be taken by Contractor if there is any need for opening of new borrow area | |
| | | Opening of new Quarry Area (including excavation of River bed) | Yes | Prior Environmental Clearance to be taken by Contractor if there is any need for opening of quarry area | |
| 3 | Notification for use of Fly ash, 3rd November 2009 and its amendment on 25th January 2016 | No agency, person or organization shall, within a radius of 300 kilometres of a thermal power plant undertake construction or approve design for construction of roads or flyover embankments with top soils; the guidelines or specifications issued by the Indian Road Congress (IRC) as contained in IRC specification No. SP: 58 of 2001 as amended from time to time regarding use of fly ash shall be followed and any deviation from | Yes | Kothagudem Thermal Power Station (KTPS), Kakatiya Thermal Power Station, Dr. Narla Tatarao Thermal Power Station (VTPS) and National Thermal Power Station (Ramagundam) are within radius of 300 km. | MoEF&CC, SPCB |

| # | Law / Regulation / Guidelines | Relevance | Applic-ability (Yes / No) | Reason for Application | Implementing / Responsible Agency |
|---|---|---|---|---|---|
| | | this direction can only be agreed to on technical reasons if the same is approved by Chief Engineer (Design) or Engineer-in-Chief of the concerned agency or organization or on production of a certificate of "fly ash not available" from the Thermal Power Plant(s) | | | |
| 4 | The Water (Prevention and Control of Pollution) Act, 1974and its subsequent amendments | Central and State Pollution Control Board to establish / enforce water quality and effluent standards, monitor water quality, prosecute offenders, and issue licenses for construction / operation of certain facilities. | Yes | Consent required for not polluting ground and surface water during construction | State Pollution Control Board |
| 5 | The Air (Prevention and Control of Pollution) Act. 1981and its subsequent amendments | Empowers SPCB to set and monitor air quality standards and to prosecute offenders, excluding vehicular air and noise emission. | Yes | Consent required for establishing and operation of batching plants and crushers | State Pollution Control Board |
| 6 | Noise Pollution (Regulation And Control) Act, 1990and its subsequent amendments | Standards for noise emission for various land uses | Yes | Construction machineries and vehicles to conform to the standards for construction | State Pollution Control Board |
| 7 | Forest (Conservation) Act, 1980 | Conservation and definition of forest areas. Diversion of forest land follows the process as laid by the Forest conservation Act. | Yes | Project Stretch passes through Chilkur RF, Mudimial RF and Kandlapalli RF and felling of trees in PRoW. | State Forest Department, MoEF&CC. |
| 8 | Coastal Regulatory Zone Notification, 2011 | Protect and manage coastal areas | No | The project area is not within designated coastal zone | MoEF&CC, State Department of Environment |

| # | Law / Regulation / Guidelines | Relevance | Applic-ability (Yes / No) | Reason for Application | Implementing / Responsible Agency |
|---|---|---|---|---|---|
| 9 | WildLife Protection Act, 1972 | Protection of wild life in sanctuaries and National Park | No | The project road is within 1 km radius of Mrugvani National Park, but NO WIDENING is proposed in this region. | NBWL, SBWL and Chief Wildlife Warden |
| 10 | Ancient Monuments and Archaeological sites and Remains Act 1958 and its subsequent amendments | To protect and conserve cultural and historical remains found. | No | If present, NoC is required. | Archaeological Survey of India, State Dept. of Archaeology |
| 11 | The Motor Vehicle Act. 1988 and its subsequent amendments | Empowers State Transport Authority to enforce standards for vehicular pollution. From August 1997 the "Pollution Under Control Certificate is issued to reduce vehicular emissions | Yes | All vehicles used for construction will need to comply with the provisions of this act. | State Motor Vehicles Department |
| 12 | The Explosives Act (and Rules) 1884 (1983) | Sets out the regulations as to regards the use of explosives and precautionary measures while blasting and quarrying | Yes | Use of blasting materials if required for new quarrying operation and storing of Diesel / Petrol in the camp site, to be obtained by the contractor / Concessionaire | Chief Controller of Explosives |
| 13 | Public Liability And Insurance Act, 1991 | Protection to the general public from accidents due to hazardous materials | Yes | Hazardous materials like Bitumen shall be used for road construction | State Pollution Control Board |
| 14 | Hazardous Waste (Management, Handling and Transboundary Movement) | Protection to the general public against improper handling and disposal of hazardous wastes | Yes | Hazardous wastes shall be generated due to activities like of maintenance and repair work | State Pollution Control Board |

| # | Law / Regulation / Guidelines | Relevance | Applic-ability (Yes / No) | Reason for Application | Implementing / Responsible Agency |
|---|---|---|---|---|---|
| | Rules, 2008 and its subsequent amendments' | | | on vehicles | |
| 15 | Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 | Protection against chemical accident while handling any hazardous chemicals resulting | Yes | Handling of hazardous (flammable, toxic and explosive) chemicals during road construction | District and Local Crisis Group headed by the DM and SDM |
| 16 | Mines and Minerals (Regulation and Development) Act, 1957 as amended in 1972 | Permission of Mining of aggregates and sand from river bed and aggregates | No | No mining of sand or aggregates. These materials shall be procured from approved agencies | State Department of Mining |
| 17 | The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) BOCW Act, 1996 | Employing Labour / workers | Yes | Employment of labours | District labour Commissioner |

## 6.10 BASELINE ENVIRONMENT SCENARIO

### 6.10.1 Study Area

Details of affected structure and trees were collected for Corridor of Impact. Details of sensitive receptors, those are located beyond CoI were also collected as the noise and air pollution may take place beyond direct area of impact.

### 6.10.2 Data Collection

Efforts have been made to collect the latest information both at regional as well as local level especially along the project roads alignment.

### 6.10.3 Secondary Data

Data collection from the secondary sources has been done from various authentic and published sources. Following are some important information available from secondary sources.

- Project objectives, technical information on existing road features from Contract Document;
- Climatic condition and long-term meteorological data from Indian Meteorological Department and government websites;
- Geology, seismicity, soil and topography from government websites and district groundwater

brochure of CGWB;
- Land Use from Google Earth and observation during surveys;
- Toposheet, Google Earth and field observation; and
- Published literature for Baseline Profile.

### 6.10.4 Primary Data

Field study shall be carried out to generate and collect primary data in the study corridor, which involves:
- Inventory of road features like drinking water source, water bodies, community structures, environmentally sensitive locations areas, congested locations etc. from physical surveys;
- Enumeration of roadside trees; and
- Environmental Baseline.

### 6.10.5 Physical Environment

#### 6.10.5.1 Climate and Meteorology

The Ranga Reddy and Vikarabad (erstwhile Ranga Reddy) districts fall under the Koppen climate classification. Following table depicts the climate over a period of 30 years (1981 – 2010) with Hyderabad (20 km from Appa Junction, aerially) as nearest IMD stations for the project road.

**Table 6-9: Meteorological Data – IMD Station at Hyderabad**

| Month | Station | Mean Temperature (°C) | | Relative Humidity (%) | Wind Speed (kmph) | Wind Direction (from) | Monthly Total Rainfall (mm) |
|---|---|---|---|---|---|---|---|
| | | Max | Min | | | | |
| Jan | Hyderabad | 32.7 | 12.0 | 72 | 6.0 | SE | 9.3 |
| Feb | | 35.7 | 14.5 | 63 | 6.6 | E | 9.2 |
| Mar | | 38.9 | 17.9 | 55 | 6.8 | E | 17.8 |
| April | | 41.2 | 20.3 | 52 | 7.3 | SE | 21.7 |
| May | | 42.4 | 21.9 | 49 | 10.4 | W | 31.7 |
| June | | 40.3 | 20.9 | 70 | 14.8 | W | 111.2 |
| July | | 35.0 | 20.6 | 79 | 14.9 | W | 179.2 |
| Aug | | 33.2 | 20.6 | 82 | 13.8 | W | 207.0 |
| Sep | | 33.8 | 20.3 | 79 | 9.5 | NW | 132.9 |
| Oct | | 33.6 | 16.5 | 73 | 6.9 | NE | 103.6 |
| Nov | | 32.0 | 13.1 | 68 | 6.4 | E | 26.1 |
| Dec | | 30.9 | 11.4 | 69 | 5.6 | E | 4.9 |

*Source: India Meteorological Department*

#### 6.10.5.2 Land

The present day landforms in the district are the products of different geomorphic processes such as erosion, deposition, crustal movements coupled with climatic changes operating on the surface. The specific geomorphic groups are (i) Residual hills (ii) Plateau (Deccan traps) (iii) Pediment Inselberg complex (iv) Pediplain and (v) Flood plain.

#### 6.10.5.3 Terrain

The terrain on the project stretch is predominantly plain and rolling.

Figure 6-2: Elevation Profile of the Project Road

*Source: Google Earth*

### 6.10.5.4 Land Use

The land use pattern along the project road comprises of Built up, Agricultural and barren, in which predominant land use pattern is agriculture. Land use along the Project stretch is shown below table.

**Table 6-10: Land Use Land Cover along the Project Road**

| S. No. | Land use pattern | % of Land use |
|---|---|---|
| 1 | Agriculture land | 60.74% |
| 2 | Built-up | 1.93% |
| 3 | Semi Built-Up | 1.07% |
| 4 | Barren land | 16.98% |
| 5 | Industrial area | 6.02% |
| 6 | Forest area | 13.26% |

*Source: Primary Data*

### 6.10.5.5 Physiography

The Ranga Reddy (erstwhile) district represents a variety of geological formations and contains rich deposits of economically important minerals. The rock formations are mainly divided into four geological formations, i.e., Archeans, Gondwanas, Puranas and Recent (Alluviums). Ranga Reddy is drained by Musi with Osman Sagar, Himayath Sagar and Gandipet as Major Lakes (drinking water source).

### 6.10.5.6 Seismicity

The project road lies in the stable seismic zone. The entire stretch of the project highway traverses through sub category seismic zone II of seismic zoning classification system as defined by the Seismic Zoning Committee. The project corridor thus is in a zone of "Least Active".

### 6.10.5.7 Geology

The Ranga Reddy (erstwhile) district is underlain by various geological formations like Archaean granites and gneisses, Proterozoic Bhima series and the younger Deccan traps. The Archaean crystalline rocks occupy nearly three fourths of the districts comprising older metamorphic rocks, peninsular gneissic complex (migmatites) and younger intrusive rocks. Intrusive of dolerite dyke are common in the area. The upper pretoerozoic sediments of Bhima group comprising of limestones and shales occur in the western most corner of the Ranga Reddy district, NW of Kotepally. The shale beds show intercalations of limestone. The basaltic flows of the Deccan Traps cover either the Bhima sediments or the granitoids around Vikarabad, Tandur and Parigi. The thickness of each flow varies from 15 to 20 m. Intra-trappean beds are thin and comprise conglomerates, chert and sandstone. The thickness of infra-trappeans varies from 0.5 to 8 m and these are fossiliferous. A series of WNW – ESE trending faults are seen in the southeastern part of the area.

### 6.10.5.8 Soil

The different types of soils encountered in Ranga Reddy (erstwhile) district are Red soils, Medium Black soils and mixed soils.

### 6.10.5.9 Air Quality

Vehicular pollution and fugitive dust are the sources of air pollution in study area. Proposed improvement in the road condition will help in reduction of vehicular pollution.

### 6.10.5.10 Noise

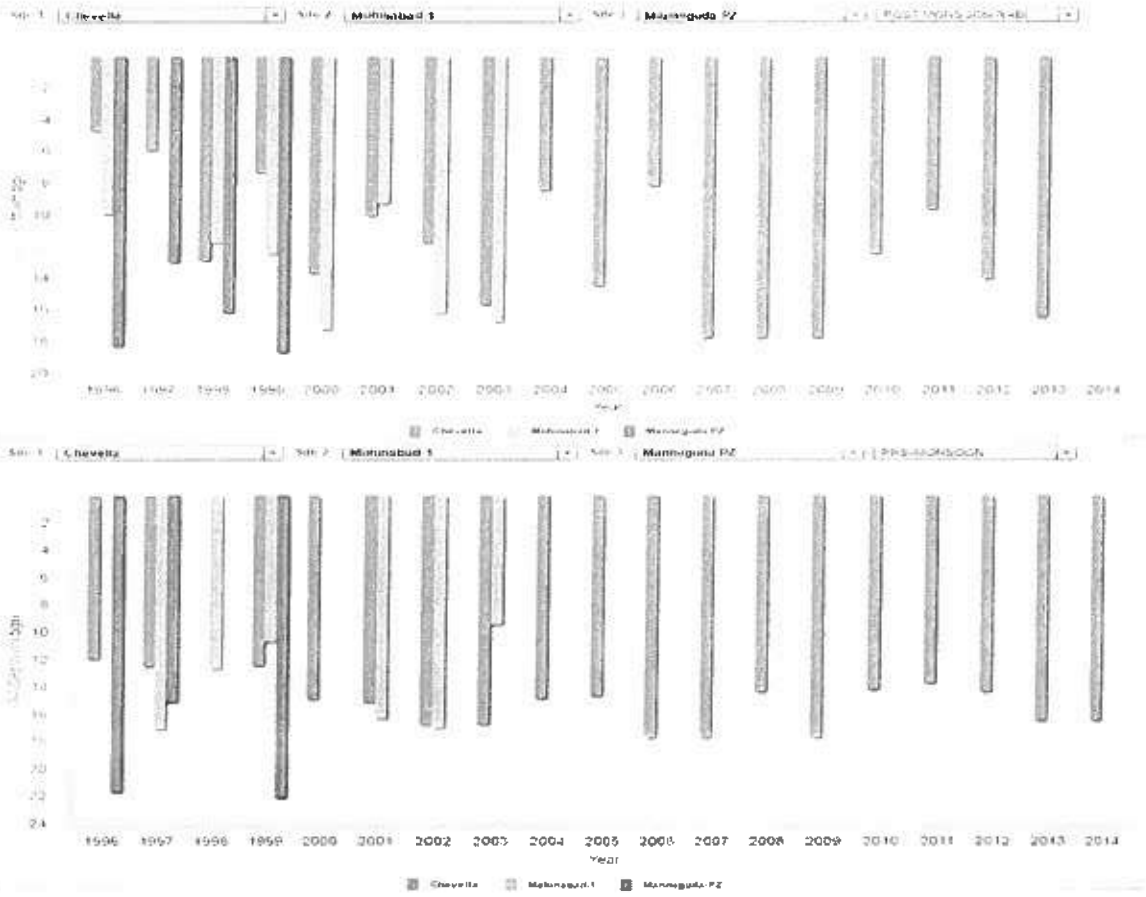
The noise level on road side was found slightly on higher side compare to applicable residential area noise standards. However, this noise is expected to reduce due to improvement of the road.

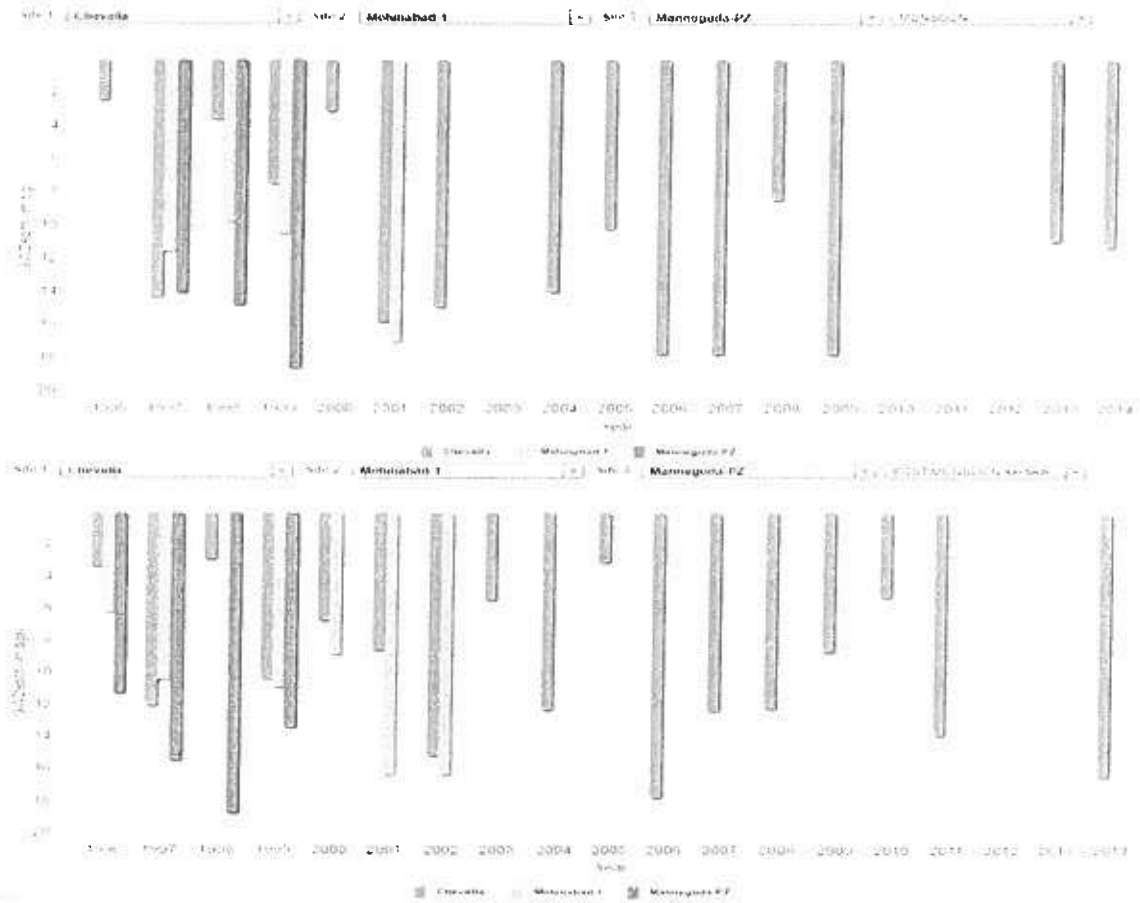
### 6.10.5.11 Water Environment

**Ground Water Scenario**

Analysis of water levels from May 2014 – Jan 2015 reveals that the water level of 0 to 20 mbgl is more prevalent in the project stretch. The graphical representation of Ground Water Depth (GWD) along the project road in different depth ranges is presented.

**Figure 6-3: Ground Water Scenario near Project Stretch (Ranga Reddy District)**





*Source: http://india-wris.nrsc.gov.in*

**Surface Water Scenario**

The district is drained by the river Musi. The reservoirs Osmansagar and Himayatsagar are constructed across rivers Musi and Musa respectively. These reservoirs supply drinking water to Hyderabad and Secunderabad cities and nearby localities in Ranga Reddy District. All the streams are ephemeral in nature. Trellis type of drainage is observed in Musi catchment area. The drainage density varies from 0.4 to 4.0 km/sq. km. Surface water bodies present along project road are presented in below tables.

**Table 6-11: Surface Water Bodies along the Project Road Section**

| Sl. No | Side LHS/RHS | Existing Chainage | Design Chainage | Distance from proposed ROW (m) |
|---|---|---|---|---|
| -- | -- | -- | -- | -- |

*Source: Primary Study*

**Table 6-12: Details of Canals**

| Sl. No | Side | Existing Chainage (km) | | Design Chainage (km) | | length along the road(m) | Distance from proposed ROW (m) |
|---|---|---|---|---|---|---|---|
| | | From | To | From | To | | |
| -- | -- | -- | -- | -- | -- | -- | -- |

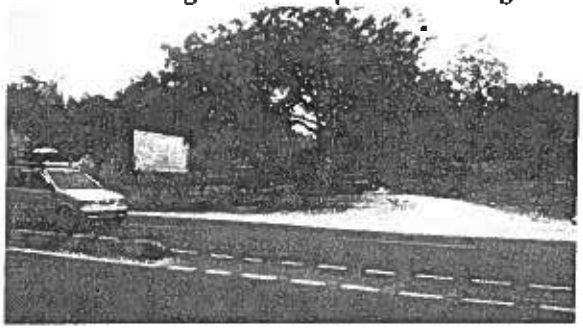
*Source: Primary Study*

### 6.10.6 Biological Environment

#### 6.10.6.1 Protected Areas

Mrugavani National Park (MNP), notified protected area [Dt. July, 21 1998 under section 35(4) of Wildlife (P) Act, 1972] is located within 1 km radius of project site, where **NO WIDENING** is proposed.

**Figure 6-4: Snapshots of Mrugavani National Park along the Project Road**



#### 6.10.6.2 Forest

Below is the table representing the forest plots along the project road.

**Table 6-13: Forest Cover along the Project Road**

| Existing Chainage (km) | | Name of the Forest / Protected Area | Side | Distance from Existing Center Line (m) | Length of Forest / Protected Area along the road (m) |
|---|---|---|---|---|---|
| From | To | | | | |
| **Shamshabad Division, Chilkur Range** | | | | | |
| 32.84 | 33.13 | Mudimiyal Reserve Forest | RHS | 20 | 290 |
| 33.13 | 33.26 | Mudimiyal Reserve Forest | RHS | Varying (from 18 m to 80 m) | 130 |
| 33.42 | 37.76 | Mudimiyal Reserve Forest | Both | 10 | 4340 |
| **Vikarabad Division, Vikarabad Range** | | | | | |
| 56.87 | 57.00 | Khandlapally Reserve Forest | LHS | 11 | 130 |
| 57.00 | 58.10 | Khandlapally Reserve Forest | Both Sides | 6 | 1100 |
| 58.10 | 58.84 | Khandlapally Reserve Forest | LHS | 11 | 740 |
| **Total length of forest along the proposed road** | | | | | 6730 |

- **Total Area of the forest to be diverted (in Ha): 42.7413 Ha.**

Figure 6-5: Snapshots of Forest along the Project Road

Mudimiyal Reserve Forest

Kandlapally Reserve Forest

### 6.10.6.3 Flora

Telangana being located strategically in the central region of the Indian sub-continent has representatives of the magnificent Indian plant and animal life. The vegetation found in the state is largely of dry deciduous type with a mixture of Teak, and species of the genera Terminalia, Pterocarpus, Anogeissus etc. The varied habitat harbors a diversity of fauna which includes Tiger, Panther, Wolf, Wild Dog, Hyena, Sloth Bear, Gaur, Black Buck, Chinkara, Chowsingha, Nilgai, Cheetal, Sambar and a number of Birds and Reptiles in the forest. The government has launched a new scheme Haritha Haram to make entire Telangana green. Telangana government has decided to launch a massive tree plantation program to bring entire Telangana under green cover in the next three years. It is estimated that the entire Telangana state requires 210 crore saplings to bring 33 per cent of the area under green cover.

## 6.11 Social and Cultural Feature

### 6.11.1 Settlements Along The Project Road Section

There are a total of 3 settlements varying in size and populations along the project corridor. The details of settlements are given in the following table:

Table 6-14: Settlements along Project Road

| S. No. | Existing Chainage | | Length (km) | Name of the Settlement |
|---|---|---|---|---|
| | From | To | | |
| 1 | 23+200 | 26+220 | 3.02 | Moinabad Village |
| 2 | 40+920 | 42+740 | 1.82 | Chevella Village |
| 3 | 60+065 | 60+500 | 0.435 | Manneguda |

*Source: Primary Study*

Table 6-15: Sensitive Receptors along Project Road

| S. No. | Existing Chainage (km) | Side | Distance from Edge of RoW (m) | Name of School/College/Hospital etc. |
|---|---|---|---|---|
| 1 | 21+800 | LHS | No boundary | Hospital |
| 2 | 21+820 | LHS | No boundary | BHASKAR MEDICAL COLLEGE |
| 3 | 22+000 | LHS | No boundary | BHASKAR PHARMACY COLLEGE |
| 4 | 22+870 | RHS | - | K.G REDDY COLLEGE |
| 5 | 39+035 | RHS | - | school |
| 6 | 40+550 | RHS | - | P INDRA REDDY MEMORIAL ENGINEERING COLLEGE |
| 7 | 45+370 | RHS | - | ALHABEEB COLLEGE BY AZHAR 07BATCH ECE |

*Source: Primary Study*

### 6.11.2 Census

The project highway passes through Shamshabad (emerged from erstwhile Ranga Reddy) and Ranga Reddy districts in Telangana. As per the 2011 census, Telangana has a total population of 351.94 lakhs and the total male and female population of the state is 177.04 lakhs and 174.90 lakhs respectively. The population density per sq. km. is 307. The total number of literates of the state is 207.84 lakhs while the sex ratio is 988. The demographic profile of Project District and Project State are presented in table below.

**Table 6-16: Census (2011)**

| Demographics | | Ranga Reddy* | Telangana |
|---|---|---|---|
| Total Population | Persons | 5,296,741 | 351.94 Lakhs |
| | Male | 2,701,008 | 177.04 Lakhs |
| | Female | 2,595,733 | 174.90 Lakhs |
| Sex Ratio | | 961 | 988 |
| Population density (per sq. km.) | | 707 | 307 |
| Number of Literate Population | Persons | 3,538,028 | 207.84 Lakhs |
| | Male | 1,948,784 | 117.49 Lakhs |
| | Females | 1,589,244 | 90.35 Lakhs |

*Source: Census of India 2011 (*Data before Bifurcation of Districts in Telangana)*

### 6.11.3 Cultural / Archaeological Resources

No Notified Archaeological site is located within 300m from the project area. Number of religious places is observed along the project road section. The details are presented below.

**Table 6-17: Religious Structures along the Project Stretch**

| S. No. | Existing Chainage | Religious Structure | Side |
|---|---|---|---|
| 1 | 15+220 | Temple | LHS |
| 2 | 17+400 | RATNESHWARA SWAMY TEMPLE BUS STOP | RHS |
| 3 | 20+480 | SWAMINARAYAN TEMPLE | LHS |
| 4 | 39+210 | Temple | RHS |
| 5 | 49+135 | Temple | RHS |

*Source: Primary Study*

### 6.12 STAKEHOLDER CONSULTATION

**Process and Methodology**

As a part of the project preparation and to ensure that the community support is obtained and the project supports the felt needs of the people; stakeholder consultations are carried out as an integral component. Individual interviews, field level observations, community consultations and meetings are used to collect stakeholders input on the project. Meetings with community are conducted in both ways i.e. formal as well as informal.

**Areas / Issues that are of Concern to the Stakeholders**

- Compensation for loss of properties at market rate;
- Land and Resettlement issues;
- Drainage system and drinking water facilities issues;
- Provision of new bus shelters in lieu of demolished shelters;
- Provision of public toilet facility;

- Employment to local people during construction work;
- Provision of footpath in settlement area;
- Felling of trees and
- Pollution due to vehicular emission and generation of dust and noise.

## 6.13 POTENTIAL ENVIRONMENTAL IMPACTS

The environmental components are mainly impacted during the construction and operational stages of the project and have to be mitigated for and incorporated in the engineering design. Environmental mitigation measures represent the project's endeavour to reduce its environmental footprint to the minimum possible. These are conscious efforts from the project to reduce undesirable environmental impacts of the proposed activities and offset these to the degree practicable. Enhancement measures are project's efforts to gain acceptability in its area of influence. They reflect the pro-active approach of the project towards environmental management.

### Impacts on Climate

Slight change in the micro-climate of the area is expected due to Heat Island Effect as unpaved area will be converted into the paved road. However, Impact on the climate conditions from the proposed project will not be significant in long run as deforestation and / or removal of vegetation will be compensated by compensatory plantation to the tune of double the area denuded.

### Impact on Air Quality

There will be rise in Particulate Matter (PM) levels during the construction activities, which shall again be within prescribed limit after the construction activities are over.

### Impact on Noise Levels

The area is likely to experience an increment in noise level due to increase in vehicle movement.

### Impact on Water Resources and Quality

The construction and operation of the proposed project road will not have major impacts on the surface water and the ground water quality in the area. Contamination to water bodies may result due to spilling of construction materials, oil, grease, fuel and paint in the equipment yards and asphalt plants. This will be more prominent in case of locations where the project road crosses rivers, nallahs, etc. Mitigation measures have been planned to avoid contamination of these water bodies.

### Impact on Ecological Resources

The proposed development may lead to temporary loss of micro ecosystem. However, in the long run the impacts will be compensated in terms of compensatory afforestation and avenue plantation.

**Impact on** Land

During the construction of the proposed project, the topography will change due to cuts and fills for project road and construction of project related structures etc. Provision of construction yard for material handling will also alter the existing topography. The change in topography will also be due to the probable induced developments of the project. Land acquisition is proposed.

## 6.14 MITIGATION AND ENHANCEMENT MEASURES

Mitigation and enhancement measures have been planned for identified adverse environmental impacts. The project impacts and management plan suggested thereof are summarized in table below.

Table 6-18: Impact and Mitigation

| Particulars | Stages | Potential Impacts | Mitigation Measures |
|---|---|---|---|
| **Physiographic Environment** | | | |
| Topography | Preconstruction and Construction | Slight changes are expected due to proposed project<br>Impacts are marginal, but permanent. | Proper planning to keep the land reformation up to bare minimum<br>No new quarry for the project<br>If quarry is required then obtain Prior Environmental Clearance from SEIAA (if applicable) and Quarry Development Plan need to be enforced<br>Blasting to be done as per requirement and with proper safe guards is envisaged |
| Geology | Preconstruction and Construction | Impacts are moderate because of extraction of sand | If new sand quarry is opened required then obtain Prior Environmental Clearance from SEIAA (if applicable) and Quarry Development Plan needed |
| **Climate** | | | |
| Temperature / Rainfall / Humidity | Preconstruction and Construction | Tree felling will have an impact of micro-climate of the area<br>Heat island effect due to increase in paved roads<br>Low spatially restricted short-term impact | Compensatory afforestation of the trees to be cut as per Telangana Forest Department guidelines.<br>With the proposed avenue plantation scheme, the micro climate of the project corridor will be smoothening |
| **Land** | | | |
| Loss of Forest | Design, Preconstruction and Construction | Felling of trees in PRoW | Compensatory Plantations<br>Payment of NPV |
| Induced Development | Preconstruction and Construction | Insignificant change in the land use pattern | Civil authorities to plan and guide any induced development using the |

| Particulars | Stages | Potential Impacts | Mitigation Measures |
|---|---|---|---|
| | | | prevailing regulatory framework |
| **Soil** | | | |
| Soil Erosion | Preconstruction, Construction and Operation | In Road slopes and spoils Erosion in excavated areas/areas with felled trees. | Embankment protection through pitching and turfing<br>Regular water sprinkling in excavated areas<br>Grass mat provision. |
| Contamination of Soil | Preconstruction, Construction and Operation | Scarified bitumen wastes<br>Oil and diesel spills<br>Emulsion sprayer and laying of hot mix<br>Production of hot mix and rejected materials<br>Residential facilities for the labor and officers | Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 and its subsequent amendments to be enforced.<br>Oil Interceptor will be provided in storage areas for accidental spill of oil and diesel<br>Rejected material to be laid as directed by monitoring consultant.<br>Septic tank to be constructed for waste disposal. |
| **Water** | | | |
| Impact on Water Resource | Design, Preconstruction, Construction and Operation | Physical Impact/Partial loss of small water bodies<br>Depletion of ground water recharge<br>Contamination from fuel and lubricants and waste disposal in camp area<br>Contamination of surface water system due to run-off from road construction area | Wise design; compensatory digging<br>Provision of Storage / harvesting structure of water, wherever feasible<br>Oil Interceptor, sedimentation chambers, oils and grease separators and Septic tank in construction camp to be provided.<br>Enforcement of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 and its subsequent amendments<br>Both side drain facility to suitably divert the run-off from roads<br>Existing cross drainage structures have been planned to maintain for proper cross drainage. |
| **Air** | | | |
| Dust generation | Preconstruction and Construction | Shifting of utilities, removal of trees and vegetation, transportation of material | Regular Sprinkling of Water<br>Fine materials/Aggregate/Sand to be completely covered, during transport and stocking.<br>Hot mix plant to be installed in |

| Particulars | Stages | Potential Impacts | Mitigation Measures |
|---|---|---|---|
| | | | down wind direction with at least 500m distance from nearby settlement.<br>Regular monitoring of particulate matter in Ambient Air |
| Gaseous pollutants | Preconstruction, Construction and Operation | Operation of Hot mix plant and vehicle operation for material transportation | Air pollution Norms will be enforced.<br>Only PUC certified vehicles and machineries shall be deployed<br>Laborers will be provided with mask.<br>Regular gaseous pollution monitoring in ambient air |
| Ambient air quality | Operation | Generation of Dust<br>Air pollution from traffic | Paving of shoulders<br>Compliance with statuary regulatory requirements |
| **Noise** | | | |
| Pre-Construction Activity | Pre-Construction | Man, material and machinery movements<br>Establishment of labor camps, onsite offices, stock yards and construction plants | No Horn Zone sign, Speed Barriers near sensitive receptors<br>Camps will be setup more than 500 m away from settlements. |
| Construction Activity | Construction | Operation of high noise equipment like hot mix plant, diesel generators etc.<br>Community residing near to the work zones. | Camp will be setup more than 500 m away from the settlements, in down wind direction.<br>Noise pollution regulation to be monitored and enforced.<br>Provision of Noise barriers etc. |
| Operation Stage | Operation | Indiscriminate blowing of horn near sensitive area | No Horn Zone signs at silent zones (schools, hospitals etc.).<br>Provision of Noise Barriers at sensitive areas |
| **Ecology** | | | |
| Flora | Preconstruction, Construction | Loss of vegetation cover<br>Felling of trees | Felling only unavoidable trees<br>Compensatory Afforestation.<br>Plantation of trees along the project road, median and in areas realigned and maintaining the same for a minimum of three years |
| Fauna | Preconstruction, Construction and Operation | Loss of insect, avian and small mammalian species due to felling of trees<br>Accidental run over | Speed breaker and limit in sensitive areas<br>Wise selection of alignment. |
| **Social** | | | |
| Socio | Design, | Loss of livelihood | Rehabilitation Action Plan |

| Particulars | Stages | Potential Impacts | Mitigation Measures |
|---|---|---|---|
| Environment | Preconstruction and Construction | Loss of CPRs, Religious Structures | Relocation of CPRs, Religious Structures to suitable place |
| **Public Health and Road Safety** | | | |
| Health and safety | Preconstruction, Construction and Operation | Psychological impacts on project affected people<br>Migration of worker may lead to sanitation problem creating congenial condition for disease vectors<br>Discomfort arising of air and noise pollution<br>Hazards of accident | Continued consultation with PAPs and the competent authority for speedier settlements of appropriate compensation package and resettlement.<br>Ensuring sanitary measures at construction camp to prevent water borne disease and vector borne disease.<br>Provision for appropriate personal protective equipment like earplugs, gloves gumboot, and mask to the work force.<br>Safe traffic management at construction area.<br>Drive slow sign and speed barriers near community facilities like school, hospital, etc. |

## 6.15 INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The responsibility of implementing the mitigation measures lies with Environment Team duly appointed by the Contractor and Concessionaire. The overall supervision of Environmental monitoring works during construction and operation stage shall be carried out by client, with the help of the Supervision/Independent/Authority Engineer. To mitigate the potential negative impacts of proposed development and measurement the performance of mitigation measures, an EMMP is being developed. The Concessionaire shall finalise the EMP and EMOP and obtain the approval of the same from the Supervision / Independent / Authority Engineer.

## 6.16 ENVIRONMENTAL BUDGET

An indicative Environmental Budget is presented in below table. However, precise budget by covering various environmental management measures shall be worked out and furnished in detailed EIA.

**Table 6-19: Environmental Budget**

| Item No. | Component | Description | Unit | Quantity | Unit cost (INR) | Total cost (INR) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Detail Cost | Cost in Crores |
| 1 | **MITIGATION / ENHANCEMENT COST** | | | | | | |
| 1.1 | **Pre-construction Stage** | | | | | | |
| 1.1.1 | Land acquisition | -- | Covered in RAP Budget | | | 0.00 | 0.000 |
| 1.1.2 | Water | Relocation and construction of affected hand pumps, water storage tanks, open wells, water taps, OHT etc. as per directions of the Engineer. | Covered in Utility Shifting Budget | | | 0.00 | 0.000 |
| 1.2 | **Construction Stage** | | | | | | |
| 1.2.1 | Horticulture | Compensatory Re-plantation to offset the loss of trees due to widening of the project corridor in accordance to the relevant forest laws (Minimum of 2 trees planted for every tree cut) including Plantation and maintenance at locations and as per directions of the forest department or administrative department | No. | 5284 | 2,000.00 | 1,05,68,000.00 | 1.057 |
| 1.2.2 | | Planting of flowering, shade, medicinal, ornamental and fruit bearing trees in suitable area @ 400 numbers per Km. (single row of 200 on each side) in rural areas | No. | 18200 | 500.00 | 91,00,000.00 | 0.910 |
| 1.2.3 | | Circular tree guard and /other for protection of plantation | No. | 18200 | 500.00 | 91,00,000.00 | 0.910 |
| 1.2.4 | | Landscaping and aesthetics of junctions and at other locations as per design, drawings and direction of the Environmental Engineer / Environmental Specialist of the Engineer | LS | - | 5,00,000.00 | 5,00,000.00 | 0.050 |

| Item No. | Component | Description | Unit | Quantity | Unit cost (INR) | Total cost (INR) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Detail Cost | Cost in Crores |
| 1.2.5 | Slope / Embankment protection | Turf of embankment with grasses and herbs. | sq. m. (Covered in Engineering Cost) | | | 0.00 | 0.000 |
| 1.2.6 | Soil and Ground Water | Providing Oil Interceptors as per design and drawing at vehicle work shop areas and as per directions of the Environmental Specialist / Environmental Engineer of the Engineer. | No. | 3 | 30,000.00 | 90,000.00 | 0.009 |
| 1.2.7 | Surface Water | Silt Fencing for Water Bodies adjacent to the road | m | 100 | 1,100.00 | 1,10,000.00 | 0.011 |
| 1.2.8 | Flora | Cost of transport and distribution of cooking fuel to construction workers to prevent indiscriminate felling of trees | month | 24 | 4,000.00 | 96,000.00 | 0.010 |
| 1.2.9 | Air | Dust Management with sprinkling of water, covers for vehicles transporting construction material | km | 45.500 | 30,000.00 | 13,65,000.00 | 0.137 |
| 1.2.10 | Noise | 1) provision of and 2) Dismantling and new construction of compound wall of noise sensitive features up to a height of total 2m above ground level complete in all respect as per Technical Specifications and as per the direction of the Engineer. | m | 30 | 1,000.00 | 30,000.00 | 0.003 |
| 1.2.11 | Solid Waste Disposal | Disposal of Sewage and other wastes in the construction yard and labor camps as per directions of the Environmental Specialist / Environmental Engineer of the Engineer. | month | 24 | 5,000.00 | 120000.00 | 0.012 |
| 1.2.12 | Cultural properties | Relocation of cultural properties | Covered in RAP Budget | | | | 0.000 |
| 1.2.13 | Roadside amenities | Construction of Bus Bays | Covered in Engineering Cost | | | 0.00 | 0.000 |
| **1.3** | **Operation Stage** | | | | | | |

| Item No. | Component | Description | Unit | Quantity | Unit cost (INR) | Total cost (INR) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Detail Cost | Cost in Crores |
| 1.3.1 | Horticulture | Maintenance of flowering, shade, medicinal, ornamental and fruit bearing trees in suitable area @ 400 numbers per Km. (single row of 200 on each side) in rural areas for 3 Years | No. | 18200 | 1,500.00 | 2,73,00,000.00 | 2.730 |
| **TOTAL MITIGATION / ENHANCEMENT COST** | | | | | | **5,83,79,000.00** | **5.838** |
| **2** | **MONITORING COST** | | | | | | |
| **2.1** | **Construction Stage** | | | | | | |
| 2.1.1 | Air | Sampling and monitoring ambient Air Quality and gaseous pollutants as per CPCB Standard Procedures at 4 locations including approved hot mix plant locations, sensitive area and chainages as per direction by Environmental Specialist / Environmental Engineer of the Monitoring Consultant for three seasons a year for 2.0 years as per the Monitoring Plan given in EMP | No. of Samples | 288 | 1,000.00 | 2,88,000.00 | 0.029 |
| 2.1.2 | | Analysis charges of Ambient air from samples collected for parameters as per AAQ Standards Notification, 2009 in consultations and directions of the Engineer and NHAI as per MoEF&CC charges. | No. of Samples | 288 | 3,000.00 | 8,64,000.00 | 0.086 |
| 2.1.3 | Water Quality | Collection of grab samples of water quality at 2 locations at chainages identified by the engineer for 2 years (twice a year) in pre and post monsoon seasons as per the Monitoring Plan given in EMP /as per direction of Environmental Specialist / Environmental Engineer of the Monitoring Consultant | No. of Samples | 8 | 400.00 | 3,200.00 | 0.000 |

| Item No. | Component | Description | Unit | Quantity | Unit cost (INR) | Total cost (INR) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Detail Cost | Cost in Crores |
| 2.1.4 | | Analysis of water quality at locations in the monitoring plan for pH, Turbidity, total solids, turbidity COD, BOD, DO, Chlorides, Hardness, Oil and Grease, TSS, TDS, Total Coliform, Iron, Fluorides, Nitrates, E. coli, Total coliform and fecal coliform as specified in "Standard Methods for Examination of Water and Wastewater" published by WEF, AWWA and APHA as per direction of Environmental Specialist / Environmental Engineer of the Engineer and as per MoEF&CC rate list. | No. of Samples | 8 | 6,000.00 | 48,000.00 | 0.005 |
| 2.1.5 | Noise | Monitoring Noise level at Equipment Yards, Sensitive area and Settlements using hand held noise meters at 2 locations at chainages identified by the Engineer as per directions of Environmental Specialist / Environmental Engineer of the Monitoring Consultant for three seasons in a year for 2 years as per the Monitoring Plan given in EMP | No. | 12 | 1,500.00 | 18,000.00 | 0.002 |
| 2.1.6 | Soil | Monitoring Soil at 2 locations at chainages identified by the Engineer as per directions of Environmental Specialist / Environmental Engineer of the Monitoring Consultant for twice a year for 2 years as per the Monitoring Plan given in EMP | No. | 8 | 1,500.00 | 12,000.00 | 0.001 |
| 2.1.7 | Transportation Cost | Transportation cost for monitoring of noise, air and water during construction period | L.S. | - | 1,50,000.00 | 1,50,000.00 | 0.015 |
| 2.1.8 | Environmental Enhancement | Enhancement of Pond | L.S. | | 0.00 | 0.00 | 0.000 |
| 2.1.9 | | Facility for Roadside Drinking Water | 8 | | 25,000.00 | 2,00,000.00 | 0.020 |
| 2.2 | Operation Stage | | | | | | |

| Item No. | Component | Description | Unit | Quantity | Unit cost (INR) | Total cost (INR) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Detail Cost | Cost in Crores |
| 2.2.1 | Air | Sampling and monitoring ambient Air Quality and gaseous pollutants as per CPCB Standard Procedures at 2 locations including sensitive area and chainages as per direction by Environmental Specialist of Consultant for once in a month for 3 seasons in every alternate year for 5 years | No. of Samples | 144 | 2,000.00 | 2,88,000.00 | 0.029 |
| 2.2.2 | | Analysis charges of Ambient air from samples collected for parameters as per AAQ Standards Notification, 2009 in consultations and directions of the Consultant and PWD as per MoEF&CC charges. | No. of Samples | 144 | 5,000.00 | 7,20,000.00 | 0.072 |
| 2.2.3 | Water Quality | Collection of grab samples of water quality at 2 locations at chainages for twice a year in pre and post monsoon seasons in every alternate year for 5 years as per direction of Environmental Specialist / Environmental Engineer of the Consultant | No. of Samples | 12 | 400 | 4,800.00 | 0.000 |
| 2.2.4 | | Analysis of water quality at locations in the monitoring plan for pH, Turbidity, total solids, COD, BOD, DO, Chlorides, Hardness, Oil and Grease, TSS, TDS, Total Coliform, Iron, Fluorides, Nitrates, E. coli, Total coliform and fecal coliform etc. as specified in "Standard Methods for Examination of Water and Wastewater" published by WEF, AWWA and APHA as per direction of Environmental Specialist / Environmental Engineer of the Consultant and as per MoEF&CC rate list. | No. of Samples | 12 | 6,000.00 | 72,000.00 | 0.007 |
| 2.2.5 | Noise | Monitoring Noise level at Sensitive area and Settlements using hand held noise meters at 2 locations for once a year for every alternate year for 5 years as per directions of Environmental Specialist / Environmental Engineer of the Monitoring Consultant | No. | 6 | 2,500.00 | 2,25,000.00 | 0.023 |

| Item No. | Component | Description | Unit | Quantity | Unit cost (INR) | Total cost (INR) | |
|---|---|---|---|---|---|---|---|
| | | | | | | Detail Cost | Cost in Crores |
| 2.2.6 | Soil | Monitoring Soil at 2 locations at chainages identified by the Engineer as per directions of Environmental Specialist / Environmental Engineer of the Engineer for twice a year for every alternate year of 5 years as per the Monitoring Plan given in EMP | No. | 12 | 2,501.00 | 30,012.00 | 0.003 |
| 2.2.7 | Transportation Cost | Transportation cost for monitoring of noise, air and water during operation period for 5 years considering every alternate year. | L.S. | - | 1,25,000.00 | 1,25,000.00 | 0.013 |
| **TOTAL MONITORING COST** | | | | | | **30,48,012.00** | **0.305** |
| **3** | **MISCELLANEOUS COST** | | | | | | |
| 3.1 | Training | Training | L.S. | - | 2,50,000.00 | 2,50,000.00 | 0.025 |
| 3.2 | Advocacy and Policy Making | Holding meetings for policy planning and subsequent review meetings with Revenue Department, Forest Department, local representatives, NGOs, etc. regarding development controls. | year | 12 | 15,000.00 | 1,80,000.00 | 0.018 |
| 3.3 | Administrative Charges including logistics | Maintenance of vehicle with the Environment Cell, Data processing, administrative support, stationery etc. | month | 24 | 5,000.00 | 1,20,000.00 | 0.012 |
| 3.4 | Miscellaneous Items | Digital Camera for the Environment Cell | No. | 1 | 5,000.00 | 5,000.00 | 0.001 |
| 3.5 | | Portable sound level meter | No. | 1 | 50,000.00 | 50,000.00 | 0.005 |
| **TOTAL MISCELLANEOUS COST** | | | | | | **6,05,000.00** | **0.061** |
| **TOTAL COST** | | | | | | **6,20,32,012.00** | **6.203** |
| **Contingency @ 5% on Total Environmental Cost** | | | | | | **3101600.60** | **0.310** |
| **GRAND TOTAL** | | | | | | **65133612.60** | **6.513** |
| **Rate per kilometer** | | | | | | **1431507.97** | **0.14** |

# CHAPTER 7 – INITIAL SOCIAL ASSESSMENT AND RESETTLEMENT PLAN

## Hyderabad - Manneguda Road

## LIST OF ABBREVIATIONS

### ABBREVIATIONS

| | | |
|---|---|---|
| AIDS | - | Acquired Immune Deficiency Syndrome |
| BPL | - | Below Poverty Line |
| CoI | - | Corridor of Impact |
| ESMU | - | Environmental and Social Management Unit |
| FGD | - | Focused Group Discussion |
| GoB | - | Government of Bihar |
| Ha | - | Hectares |
| HH | - | Household |
| HIV | - | Human Immunodeficiency Virus |
| HPP | - | HIV/AIDS Prevention Plan |
| IPDP | - | Indigenous Peoples Development Plan |
| Km | - | Kilometre |
| LA | - | Land Acquisition |
| Pvt. Ltd. LHS | - | Left Hand Side |
| MDR | - | Major District Road |
| M&E | - | Monitoring and Evaluation |
| NGO | - | Non-Governmental Organization |
| NRRP | - | National Rehabilitation and Resettlement Policy |
| OBC | - | Other Backward Community |
| OP | - | Operational PolicyPAF - Project Affected Family |
| PAP | - | Project Affected Person |
| PIU | - | Project Implementation |
| Unit R&BD | - | Roads and Buildings |
| Department R&R | - | Resettlement and |
| Rehabilitation RAP | - | Resettlement |
| Action Plan | | |
| RHS | - | Right Hand Side |
| RoW | - | Right of Way |
| RPF | - | Resettlement Policy Framework |
| SC | - | Scheduled Caste |
| SH | - | State Highway |
| SIA | - | Social Impact |
| Assessment sq.m | - | Square Meter |
| ST | - | Scheduled Tribe |
| TCIF | - | Transport Corporation of India Foundation |
| WHH | - | Woman Headed Household |

# CHAPTER 7 INITIAL SOCIAL ASSESSMENT AND RESETTLEMENT PLAN

## 7.0 EXECUTIVE SUMMARY

The Project Road is section of SH-4(declared as NH-163), which starts at Existing Ch: 14/000 (Design Ch: 14+000) Hyderabad (from ORR-Appa Junction) and ends at Existing Ch:59/500 (Design Ch: 60+391) near Manneguda. The deisgned length of the project stretch is 46.391 km. The project stretch passes through Rangareddy and Vikarabad Districts and mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra reddy nagar. This chapter will give a general description of the project, existing features and design proposals to upgrade the facility to Four/Six-lane divided highway.

| Sl. No | Name of the Road | Awarded Length in km as per original contract Agreement | Modified Length in km as per | Additional Length in km |
|---|---|---|---|---|
| 1 | Sanga Reddy – Narsapur – Toopran – Gajwel – Bhongir – Chityal Road ( Km 0/0 on SH-17 to MDR km 43/8) | 164 | 164 | - |
| 2 | Mahaboobnagar – Nalgonda Road (Km 0/0 to km 163/2). | 163.2 | 163.2 | - |
| 3 | Hyderabad – Narsapur – Medak Road (Km 16/0 to Km 78/0) | 28 | 62 | 34 |
| 4 | Jangaon – Cheryal – Duddeda road (Km 0/0 to Km 46/4) | 46.4 | 46.4 | - |
| 5 | Jangaon – Suryapet Road (Km 0/0 to Km 84/4) | 84.4 | 84.4 | - |
| 6 | Suryapet – Mothey – Khammam Road (Km 0/0 to Km 58/3) | 58.3 | 58.3 | - |
| **7** | **Hyderabad – Bijapur Road (Hyderabad – Manneguda – Pargi – Kodangal – Karnataka Border) (Km 14/0 to Km 132/300)** | **36.4** | **108.7** | **81.9** |
| | **Total** | **580.7** | **696.6** | **115.9** |

**Chapter 7.1** & **Chapter 7.2** deals with the overall objectives and tasks of conducting Social impact study. The objective of Social Impact Assessment (SIA) is to identify and examine the potential adverse and beneficial consequences of the proposed roads in the different stages of project cycle, so that due consideration can be given to these aspects in project, i.e., planning, design and implementation. The overall objective of SIA is to ensure that the potential social impacts and issues are recognized and effectively addressed. This chapter also describes the project background, project description, objectives and scope of study, data collection sources and reporting requirements. A socio-economic profile of the project-affected villages/households (PAHs) is essential to create database and develop indicators for the evaluation of the Social Impact Assessment. To understand the socio-economic context of the proposed project and for providing necessary inputs for social analysis of the project, relevant baseline data on socio-economic and cultural conditions was collected from various available primary and secondary sources like personal observation & enquiry, consultation with knowledgeable persons of the villages, District Census handbook and District Gazetteers etc.

**Chapter 7.3** Describes the Socio - Economic profile of the affected villages/ settlements in the concerned district (Vikarabad & Rangareddy).

**Chapter 7.4** The chapter presents a detailed study of the proposed improvements

**Chapter 7.5** The chapters presents a detailed study of the minimise advers impacts

**Chapter 7.6** The chapters presents a detailed study of the ownership of affected properties-151 structures being affected and resettlement options as expressed by the affected people etc. Particulars of 8 community or government establishments that shall be impacted due widening of the road. Apart from these details of impacted structures; households' features like religious category, social category, family size, vulnerable group, occupational pattern etc are also summarised to present a social profile of affected households.

**Chapter 7.7** describes the public consultation with the PAPs, Village sarpanch and other stakeholders. They expressed valuable suggestions on various aspects of the project. Their views and alternative suggestions offered by them regarding the proposed are discussed in this chapter.

Chapter 7.8 signifies the critical stretches on account of various reasons such as presence of religious/cultural structure, heavily built-up residential or commercial area, livelihood loss of significant number of persons etc.

**Chapter 7.9** describes the efforts to minimize adverse social impact which has been analyzed on the basis of revealed fact, perceived impact on population and properties, identified hot spots, design consideration and issues raised during consultation with varied stakeholders and affected population. The proposed mitigation measures ensured the minimum impact on residence, livelihood of people, and also suggested measures to keep away from religious or community structures.

**Chapter 7.10** deals with Resettlement and Legal Framework regarding implementation of the project and compensation and entitlement to the affected people. For this project, The policy framework and entitlements for the project are based on the national law *The Right to Fair Compensation and Transference in Land Acquisition, Rehabilitation and Resettlement Act,2013*, (LARR 2013) its 2014 Ordinance and is applicable for deciding compensation and assistance to affected families. Public consultation has been taken up as an integral part of social assessment process of the project.

A tentative R&R cost has been estimated in **Chapter 7.11** for inclusion in the overall project cost. The budget for the proposed Resettlement Plan works out to be around **Rs. 300.52 Crores.** This amount covers the cost of structures, R&R assistance, cost of relocation/ enhancement of religious/community, and other necessary expenses. It is prepared based on information of during field survey and the guidelines of National Resettlement and Rehabilitation Policy, The policy framework and entitlements for the project are based on the national law *The Right to Fair Compensation and Transference in Land Acquisition, Rehabilitation and Resettlement Act,2013*, (LARR 2013) its 2014 Ordinance.

## 7.1 SOCIAL IMPACT ASSESSMENT

### 7.1.1 PROJECT IDENTIFICATION

### 7.1.2 GENERAL

In order to be able to appreciate the site conditions and project requirements, our team of key professionals, along with support staff conducted a site visit and inspected the project stretch of SH-4(*declared as NH-163*), which starts at Existing Ch: 14/000 (Design Ch: 14+000) Hyderabad (*from ORR-Appa Junction*) and ends at Existing Ch:59/500 (Design Ch: 60+391) near Manneguda for the construction of road in Vikarabad and Rangareddy Dist.

### 7.1.3 OBJECTIVES AND SCOPE OF THE PROJECT

The main objective is to establish the Technical, Economical, and Financial viability of the selected roads and prepare preliminary engineering designs and preliminary project reports for the identified roads. The viability of the project designed as a partially access controlled facility shall be established taking in to account the requirement with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, underpasses / flyovers / ROB's rehabilitation and widening of existing and / or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates vis-à-vis the investment and financial return through toll and other revenues. **Table 7-1**

The scope of the project is to establish the Technical, economical and financial viability of the project and prepare Techno-Economic Feasibility Study and Preliminary Engineering Design Report for rehabilitation and upgrading of the existing 7 State roads to 2-lane with paved shoulders/ 4-lane with central median/ divided carriage way configuration in a sound technical and most economical manner, taking into consideration the environment and social aspects of the area.

The transaction advisory services role will be for procurement of construction agency.

**Table 7-1: Junction wise road length (km)**

| S.No | Name of the Road | Awarded Length in km as per original contract Agreement | Modified Length in km as per | Additional Length in km |
|---|---|---|---|---|
| 1 | Sanga Reddy – Narsapur – Toopran – Gajwel – Bhongir – Chityal Road ( Km 0/0 on SH-17 to MDR km 43/8) | 164 | 164 | |
| 2 | Mahaboobnagar – Nalgonda Road (Km 0/0 to km 163/2). | 163.2 | 163.2 | |
| 3 | Hyderabad – Narsapur – Medak Road (Km 16/0 to Km 78/0) | 28 | 62 | 34 |
| 4 | Jangaon – Cheryal – Duddeda road (Km 0/0 to Km 46/4) | 46.4 | 46.4 | |
| 5 | Jangaon – Suryapet Road (Km 0/0 to Km 84/4) | 84.4 | 84.4 | |

| S.No | Name of the Road | Awarded Length in km as per original contract Agreement | Modified Length in km as per | Additional Length in km |
|---|---|---|---|---|
| 6 | **Suryapet – Mothey – Khammam Road (Km 0/0 to Km 58/3)** | **58.3** | **58.3** | |
| 7 | Hyderabad – Bijapur Road (Hyderabad – Mannegudda – Pargi – Kodangal – Karnataka Border) (Km 14/0 to Km 132/300) | 36.4 | 108.7 | 81.9 |
| | **Total** | **580.7** | **696.6** | **115.9** |

The project road (SH-4) Hyderabad-Moinabad-Chevella-Mannegudda is declared as National Highway and named as NH-163. The project is transferred to National Highway Authority of India through tripartite-supplementary agreement dated 28th April 2017 between National Authority of India and Roads & Building Department of Telengana and Feedback Infra Pvt. Ltd. The present Technical Feasibility Report is pertaining to Hyderabad-Moinabad-Chevella-Mannegudda Road.

### 7.1.4 SOCIAL DEVELOPMENT OBJECTIVES OF THE PROJECT

The objective of the project is to augment capacity for safe and efficient movement of traffic in the National Highways corridor where the intensity of traffic has increased significantly. In this context, the social development objectives of the project comprise the following:

- Everybody concerned is a partner in the development process;
- No one is adversely affected due to the implementation of the project; any adverse impact is to be appropriately mitigated;
- Maximization of the benefits to the people arising from the road rehabilitation and capacity augmentation programme while minimizing the negative social impacts on the affected people by incorporating the social safety measures.

### 7.1.5 PROJECT DESCRIPTION

The Project Road is section of SH-4(In principle declared as NH-163), which starts at Existing Ch: 14/000 (Design Ch: 14+000) Hyderabad (from ORR-Appa Junction) and ends at Existing Ch:59/500 (Design Ch: 60+391) near Manneguda. The length of the project stretch is 46.391 km. The project stretch passes through Rangareddy and Vikarabad Districts and mainly passes through Aziz nagar, Himayat nagar, Moinabad, Appa reddy gudda, Chevella, Indra reddy nagar. This chapter will give a general description of the project, existing features and design proposals to upgrade the facility to Four/Six-lane divided highway.

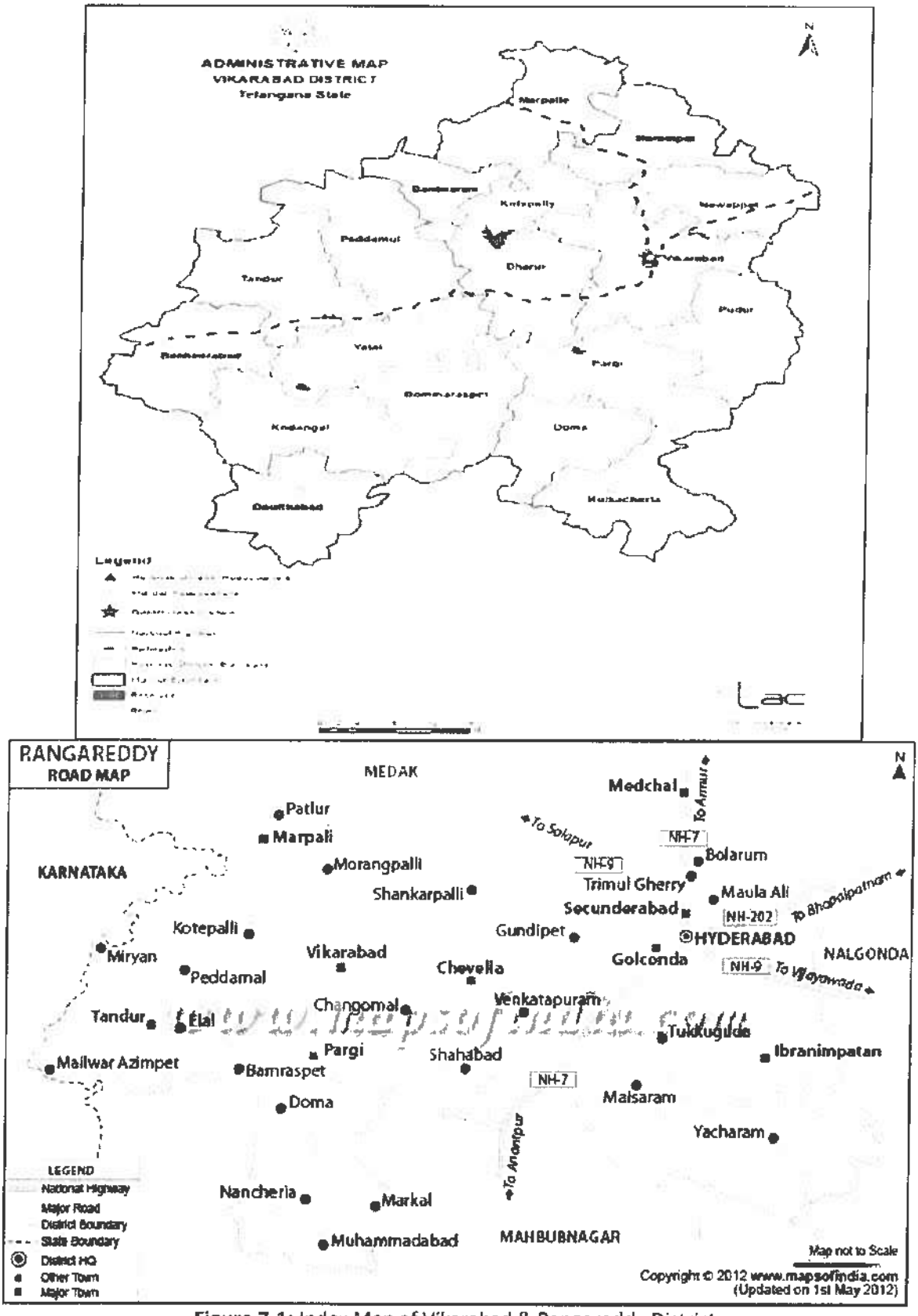



**Figure 7-1:** Index Map of Vikarabad & Rangareddy Districts

### 7.1.6 CROSS SECTION TYPE ALONG THE PROJECT CORRIDOR

The Project Highway shall be constructed to Four/Six lane configuration for the Project length. Typical cross sections required to be developed in different segments of the project highway are given below.

| Sl. No. | Design Chainage in Km | | Length in Km | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 14+000 | 18+500 | 4500 | Fig. 2.4A | |
| 2 | 18+500 | 19+600 | 1100 | Fig. 2.6B | |
| 3 | 19+600 | 20+145 | 545 | Fig. 2.6A | Approach |
| 4 | 20+145 | 20+170 | 25 | Fig. 7.8 | VUP |
| 5 | 20+170 | 20+500 | 330 | Fig. 2.6A | Approach |
| 6 | 20+500 | 21+770 | 1270 | Fig. 2.6B | |
| 7 | 21+770 | 22+320 | 550 | Fig. 2.6A | Approach |
| 8 | 22+320 | 22+345 | 25 | Fig. 7.8 | VUP |
| 9 | 22+345 | 22+670 | 325 | Fig. 2.6A | Approach |
| 10 | 22+670 | 24+400 | 1730 | Fig. 2.3A | |
| 11 | 24+400 | 25+044 | 644 | Fig. 2.6A | Approach |
| 12 | 25+044 | 25+059 | 15 | Fig. 7.8 | VUP |
| 13 | 25+059 | 26+070 | 1012 | Fig. 2.6A | Approach |
| 14 | 26+070 | 26+095 | 25 | Fig. 7.8 | VUP |
| 15 | 26+095 | 26+420 | 325 | Fig. 2.6A | Approach |
| 16 | 26+420 | 27+580 | 1160 | Fig. 2.2C | |
| 17 | 27+580 | 28+018 | 438 | Fig. 2.6A | Approach |
| 18 | 28+018 | 28+033 | 15 | Fig. 7.8 | VUP |
| 19 | 28+033 | 28+380 | 347 | Fig. 2.6A | Approach |
| 20 | 28+380 | 28+610 | 230 | Fig. 2.2C | |
| 21 | 28+610 | 28+970 | 360 | Fig. 2.2A | |
| 22 | 28+970 | 29+570 | 600 | Fig. 2.2C | |
| 23 | 29+570 | 30+330 | 760 | Fig. 2.2B | |
| 24 | 30+330 | 30+824 | 494 | Fig. 2.6A | Approach |
| 25 | 30+824 | 30+836 | 12 | Fig. 7.8 | LVUP |
| 26 | 30+836 | 31+230 | 394 | Fig. 2.6A | Approach |
| 27 | 31+230 | 31+600 | 370 | Fig. 2.2B | |
| 28 | 31+600 | 32+186 | 586 | Fig. 2.6A | Approach |
| 29 | 32+186 | 32+198 | 12 | Fig. 7.8 | LVUP |
| 30 | 32+198 | 32+800 | 602 | Fig. 2.6A | Approach |
| 31 | 32+800 | 33+393 | 593 | Fig. 2.3B | Approach |
| 32 | 33+393 | 33+408 | 15 | Fig. 7.8 | VUP |
| 33 | 33+408 | 34+150 | 742 | Fig. 2.3B | Approach |
| 34 | 34+150 | 36+100 | 1950 | Fig. 2.2B | |
| 35 | 36+100 | 36+614 | 514 | Fig. 2.6A | Approach |
| 36 | 36+614 | 36+626 | 12 | Fig. 7.8 | LVUP |

| Sl. No. | Design Chainage in Km | | Length in Km | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 37 | 36+626 | 37+100 | 474 | Fig. 2.6A | Approach |
| 38 | 37+100 | 38+200 | 1100 | Fig. 2.2B | |
| 39 | 38+200 | 39+120 | 920 | Fig. 2.3B | Approach |
| 40 | 39+120 | 39+145 | 25 | Fig. 7.8 | VUP |
| 41 | 39+145 | 39+700 | 555 | Fig. 2.3B | Approach |
| 42 | 39+700 | 40+670 | 970 | Fig. 2.3A | |
| 43 | 40+670 | 41+120 | 450 | Fig. 2.3B | Approach |
| 44 | 41+120 | 41+145 | 25 | Fig. 7.8 | VUP |
| 45 | 41+145 | 41+800 | 655 | Fig. 2.3B | Approach |
| 46 | 41+800 | 42+300 | 500 | Fig. 2.3A | |
| 47 | 42+300 | 42+340 | 40 | Fig. 7.3 | MNB at 42+320 |
| 48 | 42+340 | 42+895 | 555 | Fig. 2.3A | |
| 49 | 42+895 | 42+905 | 10 | Fig. 7.3 | MNB at 42+900 |
| 50 | 42+905 | 44+480 | 1575 | Fig. 2.6A | Approach |
| 51 | 44+480 | 44+505 | 25 | Fig. 7.8 | VUP |
| 52 | 44+505 | 45+050 | 545 | Fig. 2.6A | Approach |
| 53 | 45+050 | 45+620 | 570 | Fig. 2.2B | |
| 54 | 45+620 | 46+630 | 1010 | Fig. 2.6A | Approach |
| 55 | 46+630 | 46+645 | 15 | Fig. 7.8 | VUP |
| 56 | 46+645 | 47+300 | 655 | Fig. 2.6A | Approach |
| 57 | 47+300 | 47+730 | 430 | Fig. 2.2C | |
| 58 | 47+730 | 47+930 | 200 | Fig. 2.2A | |
| 59 | 47+930 | 48+280 | 350 | Fig. 2.2B | |
| 60 | 48+280 | 48+430 | 150 | Fig. 2.2D | |
| 61 | 48+430 | 49+030 | 600 | Fig. 2.2B | |
| 62 | 49+030 | 49+550 | 520 | Fig. 2.2A | |
| 63 | 49+550 | 49+963 | 413 | Fig. 2.3B | Approach |
| 64 | 49+963 | 49+975 | 12 | Fig. 7.8 | LVUP |
| 65 | 49+975 | 50+350 | 375 | Fig. 2.3B | Approach |
| 66 | 50+350 | 52+080 | 1730 | Fig. 2.2B | |
| 67 | 52+080 | 52+480 | 400 | Fig. 2.2D | |
| 68 | 52+480 | 52+650 | 170 | Fig. 2.2B | |
| 69 | 52+650 | 53+292 | 642 | Fig. 2.3B | Approach |
| 70 | 53+292 | 53+304 | 12 | Fig. 7.8 | LVUP |
| 71 | 53+304 | 53+600 | 296 | Fig. 2.3B | Approach |
| 72 | 53+600 | 53+830 | 230 | Fig. 2.2A | |
| 73 | 53+830 | 55+180 | 1350 | Fig. 2.2B | |
| 74 | 55+180 | 55+733 | 553 | Fig. 2.3B | Approach |
| 75 | 55+733 | 55+745 | 12 | Fig. 7.8 | LVUP |
| 76 | 55+745 | 56+130 | 385 | Fig. 2.3B | Approach |
| 77 | 56+130 | 57+350 | 1220 | Fig. 2.2B | |

| Sl. No. | Design Chainage in Km | | Length in Km | Typical Cross Section of manual | Remarks |
|---|---|---|---|---|---|
| | From | To | | | |
| 78 | 57+350 | 57+908 | 558 | Fig. 2.3B | Approach |
| 79 | 57+908 | 57+920 | 12 | Fig. 7.8 | LVUP |
| 80 | 57+920 | 58+290 | 370 | Fig. 2.3B | Approach |
| 81 | 58+290 | 59+400 | 1110 | Fig. 2.2B | |
| 82 | 59+400 | 59+749 | 349 | Fig. 2.6A | Approach |
| 83 | 59+749 | 59+761 | 12 | Fig. 7.8 | LVUP |
| 84 | 59+761 | 60+100 | 339 | Fig. 2.6A | Approach |
| 85 | 60+100 | 60+391 | 291 | Fig. 2.2D | |
| Total Length (Km) | | | 46391.036 | | |

### 7.1.7 SOCIAL BENEFITS OF THE PROJECT

The road project is expected to bring positive benefits for the road users and communities along the project corridors. The project road is expected to bring positive benefits for the road users and communities along the project corridors and sometimes it may affect negatively to some segment of population.

### 7.1.8 HIV / AIDS ALONG THE PROJECT ROAD

Prevention and control of HIV/AIDS transmission is one of the important social responsibilities of the project. Hence prevention and control of transmission of HIV/AIDS is an important component of SIA. For details on the proposed measures to control spread of HIV/AIDS in project road corridors and in order to know about these fatal highway/road diseases along the project area, Consultant has conducted individual interviews, personal contacts, and discussion with the pedestrians, local community people etc. The discussion with different stakeholders emphasizes on the targeted intervention programs during project implementation and operation phase. Thus, awareness campaign will be required more at the time of construction of the road.

### 7.1.9 THE SCOPE OF SOCIAL ASSESSMENT

Final Feasibility project report assesses the likely impacts of development projects on the properties, people and key stakeholders considering the options of 4/6 laning of the project (within 60mt of road width). Modified FR includes the detailed identification of broad categories of affected properties, the impact of the project on the project-affected people (PAPs) and it focuses on both beneficial and adverse social impacts. The scope of social impact includes identification of problems and issues related to the project road and people dependent on them for their livelihoods. Further, the scope is also extended to chalk out the following:

- A mechanism to identify the opportunities, constraints, impacts and social risks associated with policy and project design.
- An approach to identify and mitigate the potential social risks, including adverse social impacts, of investment projects.
- Providing various feasible options with minimum social risks, that would be mitigated at a later stage.

### 7.1.10 METHOD AND TOOLS USED FOR THE STUDY

This report has been based, largely, on primary data collected during field survey and is well supported by a review of available secondary data for preparation of baseline information. The field research includes detailed social survey of the project affected persons and properties within a perpendicular width of 60 meters (30.0 mtrs on either side from the centerline).

### 7.1.11 DATA COLLECTION FROM PRIMARY SOURCES

The objective, survey coverage and design of the schedule are as follows:-

**Asset inventory**

- ***Objective:*** To assess the type and extent of loss on properties, enumeration of structures/properties within the corridor of impact together with their area, type of construction, uses, ownership and its location (in terms of distance) from the existing centre line of the road.

- ***Survey Coverage***: 100% census survey of the properties falling within 60 meters of the proposed road and the socio-economic survey for in depth analysis is carried out on 25 percent of the total affected households. This survey provides a baseline against which mitigation measures and support has been evaluated & measured.

- ***Design of Schedule:*** The schedule developed for this survey was based on the requirements of the project's Terms of Reference, which spell out the documentation of all properties/structures irrespective of their legal status at the initial stage in order to confine future influx of population along the project road.

### 7.1.12 DATA COLLECTION FROM SECONDARY SOURCES

Relevant baseline data on socio-economic and cultural conditions were collected from various available secondary sources, like Census Handbooks, official websites of Government of Telangana maintained by the NIC, etc. to understand the socio-economic context of the proposed project and for providing necessary inputs for social analysis of the project.

### 7.1.13 KEY INFORMANT INTERVIEWS

Information sharing is the first principle of participation. In many cases, opposition to a project arises from lack of information or due to misinformation. This lack of information is not only limited to the stakeholders or to the people who are likely to be affected; but it may also be related to the consultants or the people who are involved with the process of decision-making. To avoid the possibility of gathering wrong and biased information, onsite interviews were conducted with the local, socially respectable persons, elderly people, people who were involved with the decision-making process and various other respectable representatives of society. Consultations were carried out with these people, considered them as key informants.

### 7.1.14 COMPILATION OF DATA

The data collected and recorded by the enumerators in questionnaires have been compiled and processed on computers using MS-Excel (MS-Office Version 2007).

### 7.1.15 DATA ANALYSIS

The processed data of the detailed survey have been summarized in tables and analyzed so that the prevailing social situation is visualized and potential social issues are addressed and estimated. The analysis would contribute to the detailed study of the project and will help in suggesting various socially viable alignment options for engineering design. It will also suggest appropriate mitigation measures to make the project socio-economically acceptable.

### 7.1.16 REPORTING REQUIREMENTS

At this stage the reporting requirement of the study is to assess and analyze the potential impact on the properties, people and key stakeholders. It also includes identification of broad categories of affected properties and project-affected people (PAPs) including assessment of beneficial and adverse social impacts. The Social Impact Assessment report will include identification of problems and issues related to the project road and people dependent on it for their livelihoods. The report will identify and also mitigate the potential social risks, including adverse social impacts and will provide various feasible options with minimum social risks that would be mitigated at a later stage.

## 7.2 OBJECTIVES AND STUDY METHODOLOGY

### 7.2.1 OBJECTIVES

The overall objective of the study is to assess the adverse impacts of the project road on property and life of people and also prepare a time bound resettlement action plan to assist the project affected persons (PAPs) in getting their entitlements (compensation - for affected land, structure and other properties and assets and R&R assistances) to enable them in improving or at least restoring their living standards and income earning capacity.

The specific objectives of the study are as under:

- Collect information using suitable tools regarding project impacts;
- Differentiate the properties and assets likely to be affected by type of ownership and construction, etc;
- Assess the extent of loss of properties (land, structure and others) of individual as well as that of community and loss of livelihood;
- Conduct meaningful consultations with likely PAPs, community and other stakeholders;
- Establish a baseline profile of population, social structure, employment, sources of income, access to social services and facilities, etc.

The various activities that have been carried out as part of the study are summarized as under :

### 7.2.2 PROPERTIES AND ASSETS AFFECTED

Structures and other properties likely to be affected within the corridor of impact (keeping in view the minimum land width requirement i.e., 60 m in settlement and market sections of the existing carriageway) were identified by measuring the distance of structures from the centre line of the existing carriageway and also by following the proposed alignment plan. Any structure (residential, commercial, small business units, etc) and CPRs that fell within the proposed ROW (corridor of impact) either partially or fully were considered as likely affected structures. Approximate dimension of structures falling within the limits (COI) were measured. Simultaneously, names of owners + possessors of structures, tenants associated with the likely affected structures and properties were also noted. The information on likely affected structures and other properties were recorded in a format. Data generated from this activity have been used to assess the project impacts.

### 7.2.3 CENSUS AND SOCIO ECONOMIC SURVEY

Census and socio-economic survey was conducted for each structures and properties covering owners and tenants. The survey was carried out by using a Census and Socio-economic survey questionnaire. This survey was conducted to generate baseline information on socio-economic conditions of the PAPs and also to assess the extent of impacts due to proposed upgrading of project road. Census and socio-economic survey was conducted by engaging a team of surveyors recruited locally. The survey was conducted under the overall supervision of R&R expert. It was conducted amongst all the project affected households and business units within the corridor of impact. The survey was administered to head of the household; preferably otherwise an adult member of the household was requested to provide the response. The socio-economic questionnaire was developed keeping in view the aims and objectives and baseline data needed for assessing the socio-economic conditions of project affected persons with specific concern to vulnerable sections of the society (SC, ST, Women Headed Household,

Disabled, Elderly Persons, etc) for monitoring the status of project affected persons during and after the implementation of project. The socio-economic questionnaire covered data generation on demography, occupation, sources of income, land holding, ownership of dwelling and other properties, livestock holding, and their views on the project and option for resettlement and rehabilitation.

### 7.2.4 CONSULTATIONS

Consultations with potential project affected persons and local people were conducted at Chevelle & Mirzaguda to inform people about the proposed upgrading and strengthening of the project and also to understand know their issues, concerns and perceptions. Consultations at these places were conducted in view of exploring the possibility of alternatives because of congested nature of the place. To disseminate information about the project and also to involve larger participation in consultation meetings people were informed by the members of the survey team in advance specifying date, venue and time. In addition, spot consultations in groups and individual consultations were also held at several places during the field survey work. Outcome of the consultations was shared with the design team of the consultant for integrating the social concerns wherever feasible. The main objective of consultations were to promote public understanding and find out meaningful solutions of developmental problems such as local needs and problems, loss of livelihoods, impact on religious structures,alternatives, resettlement issues, etc.

## 7.3 SOCIO – ECONOMIC PROFILE OF PROJECT INFLUENCE AREA

### 7.3.1 INTRODUCTION

The following sections provide briefly the socio-economic profile of the state (Telengana), Project Influence Area (PIA) and Direct Impact Zone (DIZ). The Direct Impact are the census villages and towns in which upgrading of project road is likely to affect land, structure and other properties.

### 7.3.2 OVERVIEW OF TELENGANA


Figure 7-2: Over view of Telangana

### 7.3.3 PROJECT INFLUENCE AREA (PIA)

An Agro-climatic zone is a land resource mapping unit,defined in terms of climate,land form and soils and having a specific range of potentials and constraints for land use. Based on rainfall, type of soils and cropping pattern, etc., the State is divided into four agro-climatic zones. They are

1)NorthernTelanganaZone
2)CentralTelanganaZone

3)SouthernTelanganaZone
4) High altitude and Tribal zone

### 7.3.4 VIKARABAD - THE PHYSICAL FEATURES AND THE DISTRICT PROFILE

#### a. Area and Location

Vikarabad district is carved out of erstwhile Rangareddy district. The district shares boundaries with Sangareddy, Rangareddy, Mahabubnager and the state of Karnataka. The district comprises 18 mandals and 2 revenue divisions – Vikarabad and Tandur. The district headquarters is located at Vikarabad town. The district is spread over an area of 3,386.00 square kilometres (1,307.34 sq mi).

**Demographics**

Telugu is the Local Language here. Total population of Vikarabad (CT) is 9,27,140 according to census 2011.Density of population is 274 persons per sq. Km Sex ratio (Female per 1000 Males) is 1,001. Literate rate of the district is 57.91. All the numbers are according to 2011 census.

#### b. Climate and Rainfall

The region experiences hot and dry summer throughout the year except during the South West Monsoon season. The year may broadly be divided into four seasons. It experiences cold season from December to Mid February, summer season from Mid February to first week of June. South West monsoon season from June to September and retreating monsoon or the past monsoon season during October to November.

#### c. Tourism and Infrastructure

Ananthagiri hills area of this district is an attractive tourist spot where the river Musi, originates and flows through city of Hyderabad. The presence of ancient Anantha Padmanabha Swamy (Lord Vishnu) Temple and the mesmerizing scenic beauty of the hills attract many nature lovers and devotees to this area. The district is also home for many temples like Pambanda Rama lingeshwara temple, Bugga Rameshawaram, Bhukailas, Ekambareshawar, Jhuntupally Rama and Kodangal Venkteshwara Swamy temples. Projects such as Kotipally, Jhuntupally, Laknapur, Sarpan Pally, besides also being the places of tourists' interest, also cater to the irrigation needs of the district.

### 7.3.5 RANGAREDDY - THE PHYSICAL FEATURES AND THE DISTRICT PROFILE

#### a. Area and Location

The District is located in the Central Part of the Deccan Plateau and lies between 160 30` and 180 20` of North Latitude and 770 30` and 790 30` of East Longitudes. The District is bounded on the North by Medak District, East by Nalgonda District, South by Mahaboobnagar District, West by Gulbarga District & North West of Bidar District of Karnataka State. It covers an area of 7564.88 Sq. Kms. Area of Rangareddy is 7493 Sq. Km. It is 20th largest district in Andhra Pradesh and 112th largest in India in terms of total area. Note: Kutch district(45441 sq.km) of Gujarat is the largest and Mahe district(9 sq km) of Puducherry is the smallest district in India.

b. Demographics

In 2011, Rangareddy had population of 5,296,741 of which male and female were 2,701,008 and 2,595,733 respectively. In 2001 census, Rangareddy had a population of 3,575,064 of which males were 1,839,227 and remaining 1,735,837 were females. Rangareddy District population constituted 6.26 percent of total Maharashtra population. In 2001 census, this figure for Rangareddy District was at 4.69 percent of Maharashtra population.

c. Climate and Rainfall

There are no remarkable fluctuations in the temperature as the district generally tends to be dry. It gets quite warm during the summer months of April, May and June and also continues to be warm in the rest of the year except during December and January where the temperature drops slightly. The maximum and minimum temperatures have been recorded as 42.90 and 16.20 centigrade respectively. The hot weather period in the district is between March to May, followed by South-west monsoon period between June to September, Northeast monsoon period between October to December and winter period during January to February.

d. Economy

Medium-scale industries and Cement Corporation Of India (CCI)'s cement factories are established at Tandur. Another major company is Hyderabad Chemicals and Fertilizers, established at Moula-Ali in 1942. In 2006 the Indian government named Ranga Reddy one of the country's 250 most backward districts (out of a total of 640). It is one of the nine districts in Telangana currently receiving funds from the Backward Regions Grant Fund Programme (BRGF).

## 7.4 PROPOSED IMPROVEMENTS

### 7.4.1 INTRODUCTION

The available ROW along the project site location is 30.0m as per existing. The Right of Way requirement for the proposed improvement is 60.0m. Chapter-8 IMPROVEMENT PROPOSAL AND DESIGN STANDARDS.

### 7.4.2 CARRIAGEWAY CONFIGURATION

Table 7-2: Carriageway Width

| Sl. No | Description | Element | Width in meters(m) | |
|---|---|---|---|---|
| 1 | Type 2.2A, 2.2B,2.2C, 2.2D - Realignment, Bypass and Eccentric Widening in Rural Area | Main Carriageway | 2 x 7.00 | 14 |
| | | Paved Shoulder | 2 x 1.50 | 3 |
| | | Shy off | 2x0.6 | 1.2 |
| | | Median | 1x12 | 12 |
| | | Earthen Shoulder | 2 x (2.00+1.00) | 6 |
| | | Utility Corridor | 2 x 2.00 | 4 |
| | | Space left for Drain, and Future Widening | | 19.8 |
| | | **Proposed ROW** | | **60** |
| 2 | Type 2.6B - 4 lane divided carriage way with service roads in urban area | Main Carriageway | 2 x 7.00 | 14 |
| | | Paved Shoulder | 2 x 2 | 4 |
| | | Shy off | 2 x 0.5 | 1 |
| | | Median | 1 x 1.5 | 1.5 |
| | | Footpath/Space for Future widening | 2 x 8.75 | 17.5 |
| | | Service Road | 2 x 7.5 | 15 |
| | | Drain | 2 x 1.50 | 3 |
| | | Utility Corridor | 2 x 2 | 4 |
| | | **Proposed ROW** | | **60** |
| 2 | Type 2.3A - Rural Area with Depressed Median with service roads in Bypass Location | Main Carriageway | 2 x 7.00 | 14 |
| | | Paved Shoulder | 2 x 1.50 | 3 |
| | | Divider | 2 x 1.50 | 3 |
| | | Median | 1 x 12 | 12 |
| | | Service Road | 2 x 7.5 | 15 |
| | | Earthen Shoulder | 2 x 1.50 | 3 |
| | | Utility Corridor | 2 x 2 | 4 |
| | | **Proposed ROW** | | **60** |
| 3 | Type 2.4A- Concentric Widening near Mrugavani National Park | Main Carriageway | 2 x 7.00 | 14 |
| | | Median | 1 x 1.5 | 1.5 |
| | | Shy off | 2 x 0.5 | 1 |
| | | **Proposed ROW** | | **Overlay** |
| 4 | Type 2.6A - LVUP/VUP/Flyover Approach with slip roads in Built-up | Main Carriageway | 2 x 10.5 | 21 |
| | | Median | 1 x 2.5 | 2.5 |
| | | Shy off | 2 x 0.5 | 1 |
| | | Paved Shoulder | 2 x 2.00 | 4 |

| Sl. No | Description | Element | Width in meters(m) | |
|---|---|---|---|---|
| | Locations | Shy off | 2 x 0.5 | 1 |
| | | RCC Crash Barrier | 2 x 0.5 | 1 |
| | | Divider | 2 x 4.25 | 8.5 |
| | | Slip Road | 2 x7.0 | 7 |
| | | Shyoff | 2 x (0.25+0.25) | 1 |
| | | Footh path/Drain | 2 x 1.50 | 3 |
| | | Utility Corridor | 2 x 2.00 | 4 |
| | | Space left for Extra widening | 2 x 3 | 6 |
| | | **Proposed ROW** | | **60** |
| 5 | Type 2.3B - LVUP/VUP/Flyover Approach with slip roads in Bypass/Rural Locations | Main Carriageway | 2 x 10.5 | 21 |
| | | Median | 1 x 4 | 4 |
| | | Shy off | 2 x 0.5 | 1 |
| | | Paved Shoulder | 2 x 2.00 | 4 |
| | | Shy off | 2 x 0.5 | 1 |
| | | RCC Crash Barrier | 2 x 0.5 | 1 |
| | | Divider | 2 x 1 | 2 |
| | | Slip Road | 2 x5.5 | 11 |
| | | Shyoff | 2 x (0.25+0.25) | 1 |
| | | Earthen Shoulder | 2x1.5 | 3 |
| | | Utility Corridor | 2 x 2.00 | 4 |
| | | Space left for Extra widening | 2 x 3.5 | 7 |
| | | **Proposed ROW** | | **60** |

## 7.5 MINIMIZING ADVERSE IMPACTS

### 7.5.1 DESIGN CONSIDERATIONS

The basic design standards adopted for the structural designs are as per the requirements laid down in the latest editions of IRC codes of practices & standard specifications and guidelines of Ministry of Road Transport & Highways. Additional technical references are used wherever the provisions of IRC/IS codes are found inadequate.

- The corridor of impact (CoI) +proposed cross-section would be restricted within the existing right of way. In case of exception, both options (within the existing right of way and the alignment proposal with forest land diversion) would be analyzed before a final decision is made.

- Decision on bypasses and realignments will be taken based on a comparison of options with or without the proposed change in design on a case-to-case basis.

- Alternatives were explored to minimize the adverse impacts of the proposed intervention as far as possible. Some of the specific measures adopted for minimizing the adverse impact are as under.

- Adverse impacts on structures in congested sections or habitations and market sections were minimized by limiting the land width requirement to 54m.

### 7.5.2 ROAD SAFETY AND SIGNAGE

Proper signage and markings are vital for safety and guidance of the drivers. Junction improvement drawings shall show warning and regulatory signs at appropriate locations. The signs are of reflector type to be noted easily at night. All road signs are in conformity with the provisions of IRC 67 – 2012- Code of Practice for Road Signs and IRC SP 31 –1992 - New Traffic Signs. Roadside lighting is provided for the flyover as well as service roads. Lamp poles are fixed at the edges of flyover. The road markings are in conformity with IRC 35 – 1997 Code of Practice for Road Markings with Paint and other IRC Standards.

## 7.6 SOCIO-ECONOMIC PROFILING OF THE PROJECT AFFECTED HOUSEHOLDS

### 7.6.1 INTRODUCTION

The Social Impact Assessment at this stage aims to identify congested areas, potential impacts on the community and settlement to provide the basic information to the Engineering Design team to integrate it with technical design. The thrust of this integration is to minimize the adverse impacts, if any, with the best possible engineering solutions at the most appropriate cost.

It needs to be mentioned here that the impacts on population, properties and assets have been examined in view of three options in mind.

The present exercise will explore the potential impact on the population as well as on the properties in both the scenario. Social impact will assess within 60 mtrs of ROW of road width. Assessment of impact was made using Google map, Design and Field Survey.

### 7.6.2 PROPERTIES LIKELY TO BE AFFECTED

The properties likely to be affected by the proposed road are surveyed by using structured schedule. These properties may include houses, shops, offices, religious establishments, markets, community halls or any other structure. It has been attempted to get the details of various structures that are located within the proposed ROW of the project road.

The initial social survey, conducted within 60 meters indicates that there are significant numbers of structures falling within the proposed road. The survey shows that as many as 178 structures within the 60 mtrs of proposed right of the way on the existing road. The structures include the private properties, religious properties, community properties and government properties. The following sections deals with the details of the affected structures along the project road.

### 7.6.3 OWNERSHIP OF THE PROPERTIES LIKELY TO BE AFFECTED

As mentioned above that the analysis of affected properties has been done. Analysis has been done to consider widening of the road up to 60 meters. The total numbers of properties documented have been analyzed under different categories in terms of its uses, such as private, religious, public /Govt. etc. Out of the total 179 properties that are likely to be affected, 150 are private properties (properties that are owned by individuals and do not have govt. or community ownership), while 7 are religious properties, which include Temple & Masjid. Moreover, 11 Government properties and 11 (colleges-9 + statue-2) are community structures are also likely to be negatively impacted.

The property falling within the corridor of impact as per its type of ownership has been documented in **Table 7-3 (Annexure 6.1,6.2,6.3 & 6.4)**.

**Table 7-3: The property falling within the corridor of impact as per its type of ownership**

| Sl. No. | Type of Properties | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Private | 150 |
| 2 | Religious | 7 |
| 3 | Government office/Community | 22 |
| **Total** | | **179** |

*Source: Census Survey,2017*

### 7.6.4 TYPE OF CONSTRUCTION OF THE STRUCTURES

Taking into consideration of widening of the road up to 60 meters, after analysis it reveals that maximum numbers of the constructed structures, which are likely to be impacted within the corridor of impact, are pucca (128) however 19 are kutcha structures and 32 are semi-pucca structures(Included CPR's). The details of type of constructions of the structures are summarized in the **Table 7-4.**

**Table 7-4: Type of Construction of Structures**

| Sl. No. | Type of Properties | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Kutcha | 19 |
| 2 | Semi-Pucca | 32 |
| 3 | Pucca | 128 |
| **Total** | | **179** |

*Source: Census Survey,2017*

### 7.6.5 PRIVATE PROPERTIES TO BE AFFECTED

It is revealed from social survey that in case of widening of the project road up to 60 meters, total number of private properties likely to be affected is estimated in number. These private properties are residential or commercial. It was found in the social survey that most of the structures along the road are commercial in nature (119). Only 23 of the affected structures are residential and 8 residential-cum-commercial structures were found. Details of private properties likely to be affected are shown in **Table 7-5.**

**Table 7-5: Type of Private Properties Likely to be affected**

| Sl. No. | Type of Properties | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Residential | 23 |
| 2 | Commercial | 119 |
| 3 | Residential+Commercial | 8 |
| **Total** | | **150** |

*Source: Census Survey,2017*

### 7.6.6 NATURE OF IMPACT

The details collected during survey reveals that in case of widening of the road up to 60 meters shall lead to either of the three impacts- livelihood loss, residence loss or both. In case of widening of the road up to 60 meters, livelihood of 55 households & residence of 275 livelihood of households shall be affected **(Table 7-6).**

Table 7-6: Nature of Impact

| Sl. No. | Type of Properties | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Residence loss | 31 |
| 2 | Livelihood loss | 119 |
| Total | | 150 |

*Source: Census Survey,2017*

### 7.6.7 RELIGIOUS PROPERTIES LIKELY TO BE AFFECTED ALONG THE ROAD

The impact on religious structures is generally considered as an area of concern due to its association with the religious sentiments of the people. The total number of religious and related properties likely to be affected due to project in case of widening upto 60 m is 7 structures. The structures include Temple,Church & Masjid as detailed in **Table 7-7.**

Table 7-7: Religious structures

| Sl. No. | Type of Religious Property | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Temples | 5 |
| 2 | Masjid | 1 |
| 3 | Church | 1 |
| Total | | 7 |

*Source: Census Survey,2017*

### 7.6.8 GOVERNMENT/COMMUNITY (CPR) PROPERTIES LIKELY TO BE AFFECTED ALONG THE ROAD

Collected data shows that there are 22 government properties that are likely to be affected due to the widening of the existing road within 60 meters. However, the total numbers of affected Community properties also include Statue and government properties (Bus stop) . The details of such properties are summarized in the **Table 7-8.** (Details of Government/Community).

Table 7-8: Type of Government Properties (CPR) likely to be affected

| Sl. No. | Type of Properties | No. of Structures within 60mtrs |
|---|---|---|
| | | Left |
| 1 | Government (Bus Stop) | 11 |
| 2 | Community (School/Colleges) | 11 |
| Total | | 22 |

*Source: Census Survey,2017*

### 7.6.9 SOCIAL PROFILE OF THE PAPS ALONG THE PROJECT ROAD

The purpose of our survey was to create a broad database of the affected properties as well as the project-affected persons (PAPs) in order to understand the social profile of the project-affected area. It helps to appraise the positive as well as negative change in the life style of the communities in the project influence area due to implementation of the project as an external intervention.

### 7.6.10 TOTAL AFFECTED HOUSEHOLDS

Due to loss of structures many people will be losing their properties/ livelihoods and will be economically affected. As per the census survey, 150 households are getting affected, constitutes 100 % owners. The details of affected households are shown in **Table 7-9.**

**Table 7-9: Number of Affected Households**

| Sl. No. | Ownership Status | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Owner (Titleholder/ Encroachers/ Squatters) | 150 |
| **Total** | | **150** |

*Source: Census Survey,2017*

### 7.6.11 TOTAL NUMBER OF PAPS ALONG THE PROJECT ROAD

At this stage of study, only those households whose structures are losing are included in the survey. In the proposed 60mtr ROW, 422 people from 150 households will be affected and in which 216 are male and 206 are female and out of 150 HH, 70 Household having no informations.

This figure does not include the affected persons of those households who were not available for survey, and the family members of the wage earners. At few locations, people were even reluctant in giving the details of their families. The detail of number of PAPs enumerated has been mentioned in **Table 7-10.**

**Table 7-10: Number of PAPs along the Project Road**

| Sl. No. | Category | No. of Structures within 60mtrs |
|---|---|---|
| | | Left |
| 1 | Male | 216 |
| 2 | Female | 206 |
| **Total** | | **422** |

*Source: Census Survey,2017*

### 7.6.12 RELIGIOUS CATEGORY OF PAHS ALONG THE PROJECT ROAD

Social customs and tradition play a major role in determining the socio- economic development as well as occupational pattern in the influence area, keeping this in mind an initial analysis has been conducted to understand the religious profile of the PAPs within the corridor of impact. Majority of the PAHs belong to Hindu population.

### 7.6.13 SOCIAL CATEGORY OF PAHS ALONG THE PROJECT ROAD

The data indicate that majority of PAHs belong to Backward caste & Other caste.

### 7.6.14 OCCUPATION PATTERN IN THE FAMILY ALONG THE PROJECT ROAD

The project road is dominated by families involved in business. In case of widening of the road up to 60 meters, out of total 150 affected households (11 in number) of them are engaged in Agriculture category. Only few (37 in number) fall in business for their livelihood. Percentage of people engaged as

a labour which constitues only 4 and 72 affected households having Closed/No informations during the survey.Table 7-11.

**Table 7-11: Occupation Pattern**

| Sl. No. | Occupation | No. of Structures within 60mtrs |
|---|---|---|
| 1 | Service | 4 |
| 2 | Business | 37 |
| 3 | Agriculture | 11 |
| 4 | Labour | 4 |
| 5 | Proffessional | 2 |
| 6 | Self-Employed | 16 |
| 7 | Small Traders | 4 |
| 8 | NA(No information/Closed) | 72 |
| **Total** | | **150** |

*Source: Census Survey, 2017*

### 7.6.15 VULNERABLE GROUPS ALONG THE PROJECT ROAD

The Social Impact Assessment identifies the vulnerable population in order to minimize the adverse impact and provide adequate mitigation measures. An assessment was made to bring out the vulnerable PAPs (SC, ST, Women-headed Households and households headed by physically handicapped persons). Their distribution on the stretch in terms of absolute numbers and percentage are given below. The data reveals that there are no households belong to vulnerable category.

### 7.6.16 SUMMARY PROJECT IMPACTS

As per findings of the census survey of affected land and non-land assets, the project impacts can be broadly classified as (i) impacts on private land, (ii) impacts on private structures (iii) impacts on livelihoods due to loss of private properties and (iv) loss of common property resources. From the analysis of impacts, it is noted 150 private structures will be affected due to the widening of project road. As per the survey, total 150 household comprising of 422 people will be affected in the project. The details of project impacts are presented in the **Table 7-12.**

**Table 7-12: Summary of Project Impacts**

| Sl. No. | Impacts | Number |
|---|---|---|
| 1 | Total number of Project Affected Persons (PAP's) | 422 |
| 2 | Total number of private structures affected families (Excluded CPR's) | 150 |
| 3 | Total number of CPRs affected (including Govt. properties) | 22 |
| 4 | Total number of Religious properties affected | 7 |

*Source: Census Survey,2017*

### 7.6.17 CONCLUSION

The Socio-Economic analysis of the project affected persons reveals their dependency on the project corridor. This dependency is either in the form of place for residence or for livelihood generation. Affected people shall be consulted at every stage of the project planning and implementation. Their worries and suggestions shall be taken into account and the negative impacts shall be mitigated.

## 7.7 PUBLIC INFORMATION AND CONSULTATIONS

### 7.7.1 INTRODUCTION

Public information and consultation is an important method of involving various stakeholders particularly, local community with reference to the proposed development initiatives. It provides a platform to participants to express their views, concerns and apprehensions that might affect them positively or negatively. Through participation and consultation stakeholders influence development initiatives, and decision making process. The effectiveness of participation and consultation is directly related to the degree of involvement by the likely project affected persons and the local community and integration of outcome of consultations wherever feasible in the proposed development initiatives. Detailed planning is required to ensure that likely project affected persons, local community, interested groups, non-governmental organizations, civil society organizations; local government, line departments, etc are consulted regularly, frequently and purposefully during different stages of the project including project preparation.

The purpose of consultations was to inform people about the project, take note of their issues, concerns and preferences, and allow them to make meaningful choices. Consultations were held during the project preparation which covered group consultations, public meetings, and individual meetings, etc. It ensured participation of potential project affected persons (PAPs), local community and other stakeholders. People in general were informed in advance, and allowed to participate in free and fair manner. Consultations provided meaningful contributions with regard to reducing adverse impacts, provision of bypass, safety, etc. Concerns, views and suggestions expressed by the participants during these consultations were integrated into the design aspects wherever feasible. The following sections provide description of the consultations.

### 7.7.2 STAKEHOLDER ANALYSIS

Analyses revealed that stakeholders are supportive and showed positive interest in the project and promised to ensure good support during execution of the project. The stakeholder analysis for the project is presented in Table 7-13.

**Table 7-13: Stakeholder's Analysis**

| Stakeholder's Analysis | | | | |
|---|---|---|---|---|
| **Stakeholder's Category** | **Relevant Stakeholder** | **Location** | **Interests, support & Opposition** | **Influence (H+M+L)#** |
| Intended Beneficiaries | Villagers | Project affected villages | Supportive | H |
| Adversely Affected Persons | PAPs commercial,residential | Project affected villages | Supportive | H |

# H-High, M-Midium & L-Low

### 7.7.3 COMMUNITY CONSULTATIONS

One of the prime objectives of the public information and consultations has been to involve local people in project planning. While undertaking the social screening survey and some technical surveys such as inventory of road side utilities and structures, census and socio-economic survey of PAPs, information dissemination focused on the proposed road improvements. PAPs were informed about

the proposed road improvement program, likely impacts on individual and common properties resources and resultants likely benefits. Later group of people were requested to gather at a common place for exchange of information. During these consultations brief description about the project, likely adverse impacts and positive impacts, employment generation, etc were discussed and initial opinion of people were solicited. Consultations were held at 3 locations –Raghavapuram, Jeelacheruvu& Chandupatla on a pre-decided date, time and venue in consultation with local people and government officials. These consultations provided suitable platform to people to express their concerns and also provide suggestions with regard to proposed improvements. Descriptions of consultations held at different locations are provided in the following section:-

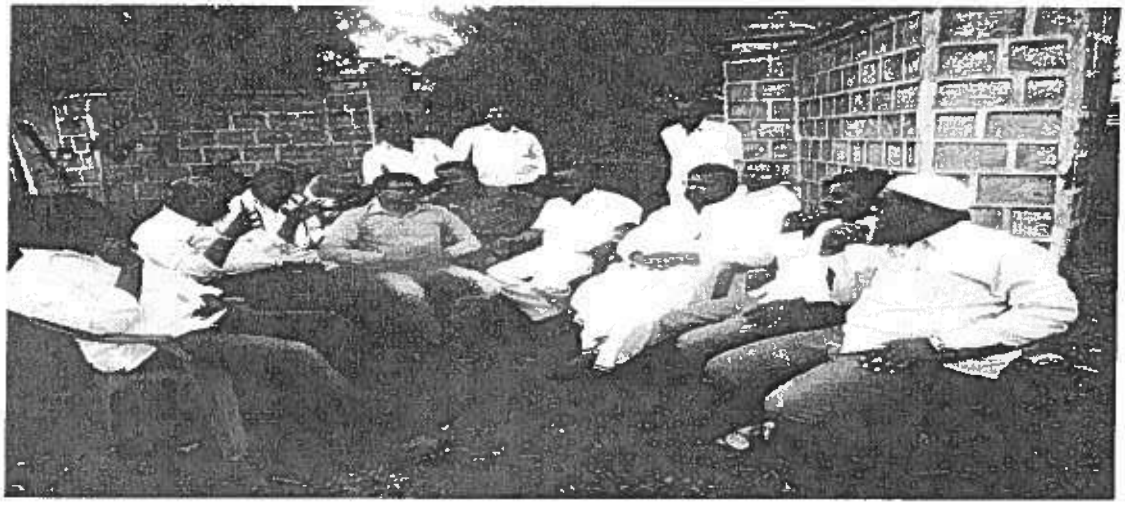
### 7.7.4 CONSULTATION WITH POTENTIALLY AFFECTED PAP'S

Public consultation is a continuous process and has been carried out at all stages throughout the project road. However, in order to document the issues raised by the potential PAPs, public consultations at this stage were conducted at all sensitive locations and with various focus groups by using structured formats. A large number of potentially affected persons (PAPs) expressed their views about the proposed project. All the consultations conducted were in focus groups such as Aganwadi workers, women, shop owners and truck operators. The authorities of the religious properties were also consulted to know the significance of the structure, its establishment details and to get an idea of the people's reaction if the structure is required to be demolished / shifted to some other place.

The general issues raised by the PAPs in most of these consultations were related to the compensation package, provision of safety measures (like providing speed breaker, proper signage etc.), employment generation schemes by the project authority to restore the livelihood of the affected households etc. The location wise list of participants in public consultation is given in **Annexure 7.1**. The location and group wise consultation details are detailed below:

Public Consultation at Chevella

| Place: Along the road | |
|---|---|
| DATE: 11/05/2017 | |
| Number of Participants:9 | Time: 5:51PM |



**Observations:-**

Chevella is a town in Rangareddy district of the Indian state of Telangana. It also a part of Hyderabad Metropolitan Development Authority. Chevella is located at 17.3067°N 78.1353°E. It has an average

elevation of 623 m (0.387 mi). Chevella is a large village located in Chevella of Rangareddy district, Andhra Pradesh with total 1559 families residing. The Chevella village has population of 7031 of which 3553 are males while 3478 are females as per Population Census 2011. In Chevella village population of children with age 0-6 is 894 which makes up 12.72 % of total population of village. Average Sex Ratio of Chevella village is 979 which is lower than Andhra Pradesh state average of 993. Child Sex Ratio for the Chevella as per census is 931, lower than Andhra Pradesh average of 939. Chevella village has higher literacy rate compared to Andhra Pradesh. In 2011, literacy rate of Chevella village was 72.46 % compared to 67.02 % of Andhra Pradesh. In Chevella Male literacy stands at 81.72 % while female literacy rate was 63.08 %. As per constitution of India and Panchyati Raaj Act, Chevella village is administrated by Sarpanch (Head of Village) who is elected representative of village.

**Issues discussed:-**

- Traffic flow during rush hours
- Provision of Flyover/Bypasses
- Widening of the road
- Compensation to affected people
- Employment opportunity during the implementation of project

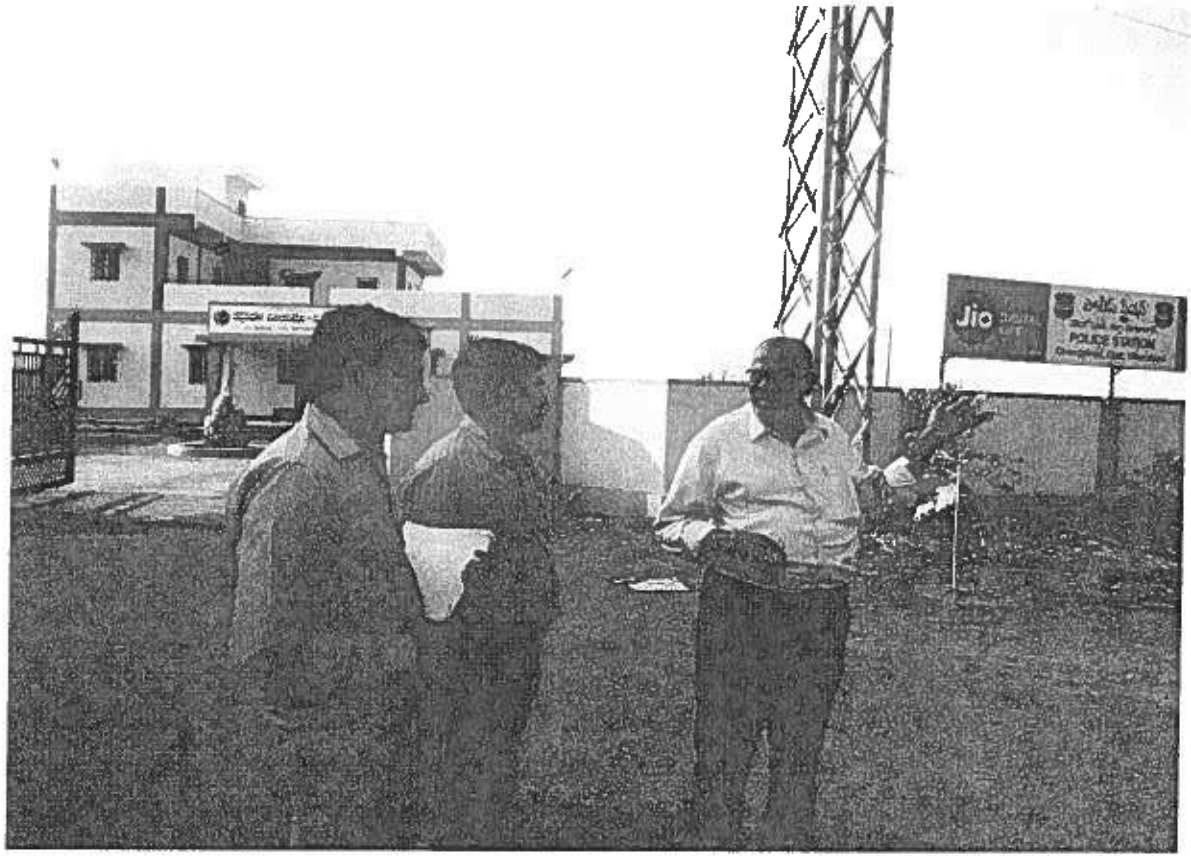
**Discussion and Suggestions:**

During the interaction it was found that the people were open in sharing their views with social expert and agreed for Bypass options. Compensation (House for house+Compensation) is another issue which is a cause of concern for the affected people. They suggested that implementation of the project should not be taking place before adequate compensation to PAPs at market rate is not availed.

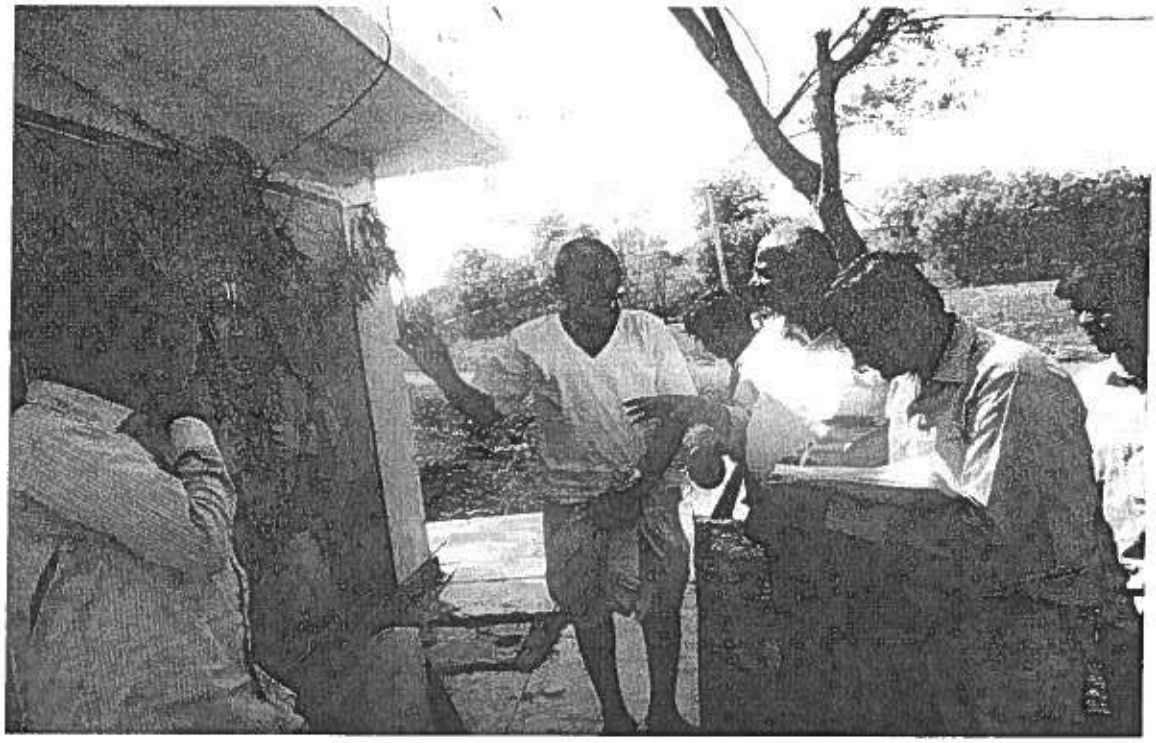
***Concluding Remarks:***

As per the observation of social scientist, widening of the existing road should be considered in this area since its impact on structures will be not very severe.

**Public Consultation with R & B Staff at end point of the proposed project**




Public Consultation with Priest (Temple) at Mirzaguda (Rangareddy Dist.)



Participants expressed their opinion, concern and suggestions in a free and frank manner. In general all stakeholders including likely project affected persons were in favour of the proposed project. However, participants expressed concerns with regard to compensation, provision of drainage, safety, provision of Flyover. People opined that proposed project will improve connectivity to various places and save time and money. Issues and concerns raised by participants were mostly common which includes compensation as per prevailing market rate, provision of drains, likelihood of increased number of accidents, provision of speed breakers, etc. Women were found concerned about the widening of the existing road, especially the high speed vehicles and likely accidents. They also felt that crossing to the other side of the road for various purposes including taking animals to the grazing land and accessibility to agricultural land is difficult.

## 7.8 IDENTIFIED CRITICAL STRETCH

### 7.8.1 INTRODUCTION

With the widening of the road, many locations with built-up areas will be adversely affected due to lack of adequate ROW, causing loss of private properties (both structures as well as land), loss of livelihood, loss of religious as well as community properties, and negative environmental impacts etc. Identification of these hotspots/ critical stretches, thus, during the design stage is very pertinent, which helps in minimising the loss with the incorporation of relative mitigating measures in the design. These locations need special concern and mitigation measures at the time of initial stage of the project.

### 7.8.2 CRITERIA OF IDENTIFICATION HOT SPOTS AND CRITICAL AREAS

The assessment of the social impact were made within 60 meters i.e. 30 meters each side from the centerline of the existing carriageway and the data was analyzed to identify the congested areas and the stretches, which requires special R&R consideration. The locations have been identified as critical areas due to following reasons:

- Impact on large number of properties, mostly commercial establishment
- Loss of livelihood
- Loss of habitation
- Loss of community interaction
- Loss of Social Capitals
- Loss of Community Assets
- Loss of Access to Facilities
- Sensitive and Religious Structures

### 7.8.3 CRITICAL AND CONGESTED LOCATIONS / HOT SPOTS IN THE PROJECT AREA

There are some locations where undesirable impacts of the project occur which can be easily distinguished due to their unique characteristics. These are termed as 'Hotspots' for religious places. Some of the Temples,Church & Masjid fall along the project corridor fall within the project influence area.

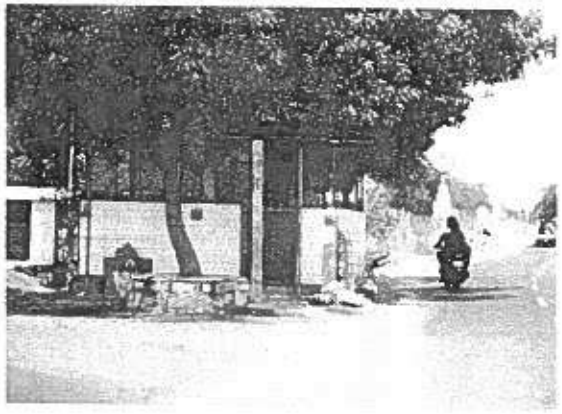
Critical locations/hot spots have been identified in respect of, impact on religious structures, density of population, concentration of vulnerable population and loss of livelihood support etc.

### 7.8.4 DESCRIPTION OF CRITICAL AREAS

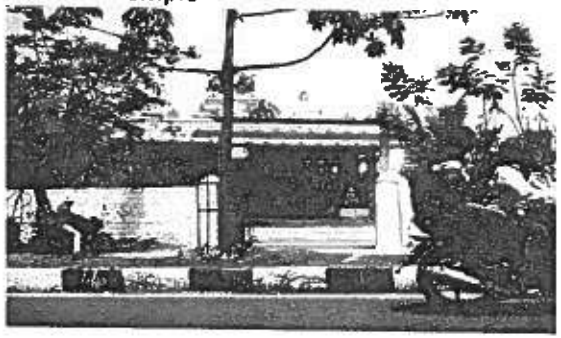
The critical area, identified at Gandipet & Aziz Nagar village, is presence within proposed ROW. The structure, which has been identified as critical area can be viewed in the picture below.

These are the religious structures (Church boundary wall) which could be adversely impacted in case of widening of the existing road.

**Place :- Gandipet**
**RoW - 60.0**
**Side - Left**
**Use - Temple**



**Place :- Gandipet**
**RoW - 60.0**
**Side - Right**
**Use - Temple**



**Place :- Himayat Nagar**
**RoW - 60.0**
**Side - Left**
**Use - Temple**


**Place :- Aziz Nagar**
**RoW - 60.0**
**Side - Right**
**Use - Masjid**

Place :- Chilukur
RoW - 60.0
Side - Left
Use - Temple

Place :- Mirzaguda
RoW - 60.0
Side - Right
Use - Temple

## 7.9 EFFORTS TO MINIMISE ADVERSE SOCIAL IMPACTS & MITIGATION MEASURES

### 7.9.1 INPUTS AT DIFFERENT STAGES FOR MINIMIZING RESETTLEMENT

Regarding resettlement and rehabilitation input, it may be mentioned here that from the very beginning of the project formation, social and environmental team worked hand to hand with engineering design group. These inputs in concrete terms were made available at the following stages:

a) ***Stage 1:*** Potential resettlement and rehabilitation issues were identified at the preliminary reconnaissance visit. Field Surveyors identified the villages and urban areas with inadequate road width and design team was provided this input.

b) ***Stage 2:*** Right of way was ascertained from NHAI and Revenue Department and where in doubt, actual measurements were made and data on land available for road widening . All land belongs to Community Land. The socio-economic and census surveys of the potentially project affected persons were initiated from the very beginning. A Social Assessment was done of the 100% potentially affected population within the likely corridor of impact (60 metres). The social assessment registered the household members and individuals within the potential corridor of impact, enumerated the sites and in fact gathered sufficient demographic and social information to determine whether they were to be categorized as vulnerable groups with special entitlements under the project as per Entitlement Matrix. Socio-economic survey provided the base line against which mitigation measures and support has been measured and survey included the needs and resources of different groups and individuals including women headed households and gender analysis.

c) ***Stage 3:*** R & R team working in the field, weighed up the alternatives alignment options proposed by the Survey and Engineering team and this field information were shared and discussed with engineering design team, so that they make such a plan, which could avoid or minimize adverse impact on large number of households. In response, the engineering team considered various options.

d) ***Stage 4:*** Local level consultation regarding the impact of widening of the road through the villages and towns was conducted and alternative suggestions offered by them were considered. Social and environmental inputs were provided at the feasibility stage and recommendations were made according to the findings of the social and environmental surveys.

e) ***Stage 5:*** Full coordination and cooperation between the Resettlement and Rehabilitation team and Engineering team results in:

a) Unnecessary displacement avoided by modifying the alignment

b) Fixing the speed in the built up areas including schools and hospitals as per local needs and problems of the people

c) Deciding the rural and urban road cross-sections based on field surveys and likely impact on the people

d) Evolving Community consensus on shifting the existing shrines and religious structures

Based on above analysis on social impacts, public consultation and field level observation, following measures are proposed to minimize the impact of following villages.

Table 7-14: Critical Issues and Mitigation

| Location | Identification | Public consultation | Photographs | Mitigation |
|---|---|---|---|---|
| Village: - Gandipet | Temple at this place is very closed to carriageway | Gandipet village is existing project road. There are only two important religious structure along the project road. Existing right of way is not feasilble for widening of road. During the field visit as a social expert observed that there are few structures which are coming in existing right of way (30 mtr either side). | Attached in Chapter 8 | After discussion with the design team it has been saved from the demolition and approved that improvement of road will be designed with in available ROW. |

## 7.10 RESETTLEMENT POLICY AND LEGAL FRAMEWORK

### 7.10.1 INTRODUCTION

The policy frame work and entitlements for the project are based on the national law The Right to Fair Compensation and Transference in Land Acquisition Rehabilitation and Resettlement Act,2013, (LARR 2013) its 2014 Ordinance.

**A. The Right to Fair Compensation and Transparence in Land Acquisition, Rehabilitation and Resettlement Act, 2013**

The Right to Fair Compensation and Transparence in Land Acquisition, Rehabilitation and Resettlement Act, 2013 has been effective from January1,2014 after receiving the assent of the President of Republic of India. This Act extends to the whole of India except the state of Jammu and Kashmir. The Act replaced the Land Acquisition Act, 1894. The Act has since late December 2014 been amended to make it more flexible and the description of the amendment is described below.

The aims and objectives of the Act include is to ensure, in consultation with institutions of local self-government and Gram Sabhas established under the Constitution of India, a humane, participative, informed and transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization with the least disturbance to the owners of the land and other affected families. It provides for compensation and resettlement assistance to the affected families whose land or other assets are affected by the project. A few of key features that are revised from the old Act include the recognition of non-title holders to compensations if they have lived in the area proposed to be acquired in the past three years as well as compensations for loss of livelihood.

Section 26 of the Act defines the method by which market value of the land shall be computed under the proposed law. Schedule I outlines the proposed minimum compensation based on a multiple of market value. Schedule II through VI outline the resettlement and rehabilitation entitlements to land owners and livelihood losers, which shall be in addition to the minimum compensation per Schedule I.

An Amendment Ordinance to the Act was promulgated on December 31, 2014. The Ordinance provides exemptions for five categories of projects from the certain requirements: (i) Defence; (ii) Rural infrastructure; (iii) Affordable housing; (iv) Industrial corridors; (v) Infrastructure projects including Public Private Partnership (PPP) projects where the central government owns the land. These 5 categories of projects are exempted from the requirement of consent of 80% of land owners to be obtained for private projects and that the consent of 70% of land owners be obtained for PPP projects as well as conducting the Social Impact Assessment through a notification.

### 7.10.2 RESETTLEMENT FRAMEWORK PRINCIPLES AND ENTITLEMENT MATRIX

Based on the above analysis of government provisions,the following key resettlement principles, definitions and Entitlement Matrix have been adopted for the Project.

**A. KEY RESETTLEMENT PRINCIPLES**

(i) land acquisition, and other involuntary resettlement impacts will be avoided or minimized exploring all viable alternative sub-project designs;

(ii) where unavoidable, time-bound resettlement plans (RAPs) will be prepared and APs will be assisted in improving or at least regaining their pre-program standard of living;

(iii) consultation with APs on compensation, disclosure of resettlement information to APs, and participation of APs in planning and implementing sub-projects will be ensured;

(iv) vulnerable and severely affected households will be provided special assistance;

(v) payment of compensation to APs including non-titled persons (e.g., informal dwellers/squatters, and encroachers) for acquired assets at replacement rates;

(vi) payment of compensation and resettlement assistance prior to the contractor taking physical acquisition of the land and prior to the commencement of any construction activities;

(vii) provision of income restoration and rehabilitation;

(viii) Establishment of appropriate grievance redress mechanisms.

## B. KEY WORKING DEFINITIONS

**Cut-off dates:** For Titled-Holders, the cut-off date will be the date of publication of preliminary notification for acquisition under Section 4(1) of the RFCT in LARR Act, 2013. For non-titleholders such as squatters, the cut-off date will be the start date of the project census survey as per the final detailed design or updated census survey during RP implementation.

**Vulnerable Affected Households:** Vulnerable Households are defined as affected families who are: (i) below the national poverty level; (ii) headed by women and below the average income of affected households; (iii) headed by disabled or elderly and below the average income of affected households; (iv) scheduled tribes and marginalized scheduled castes.

**Severely Affected Households:** Any household, who, as a result of the project loses 10% or more of its productive assets or physically displaced.

## C. ENTITLEMENTMATRIX

All persons affected by the project and meeting the cut-off date requirements will be entitled to a combination of compensation packages and resettlement assistance depending on the nature of ownership rights on lost assets and scope of the impacts:

a. Compensation for the loss of land ,crops/trees at their replacement cost;
b Compensation for structures (residential/ commercial) and other immovable assets at their replacement cost;
c. Assistance in lieu of the loss of business/ wage income and income restoration assistance;
d. Assistance for shifting and provision for the relocation site (if required), and
e. Rebuilding and/ or restoration of community resources/facilities
f. Additional Support to Vulnerable Families

An **Entitlement Matrix,** delineated in **Table 7.15** has been developed to summarize entitlements.

**Table 7-15: Entitlement Matrix**

All awards below shall be exempt from income tax, stamp duty and fees.

| | Type of Loss | Definition of Entitled Person | Compensation Policy | Responsible Agency |
|---|---|---|---|---|
| | **Land** | | | |
| 1.a | Loss of private land<br><br>- agricultural land,[1]<br>- homestead/ commercial land<br>- vacant plot | Legal titleholders/ traditional titleholders[2] | nd for land if available.[3] Compensation at replacement cost or as calculated under section 26 of LARR Act 2013 according to the landowner, the residual land is economically unviable, option to be compensated for entire parcel.<br>ne time 50,000 Resettlement Allowance as per LARR Act 2013 if family needs to physically relocate to different area<br>) days advance notice to relocate | IA/CSC will ensure sufficient provision of notice<br><br>NGO/Consultant will validate and verify AP list jointly with IA. |
| 1.b | Loss of rented private land and government land | Tenants, leaseholders and Sharecroppers (with lease documents) | ssistance for rental deposit or unexpired lease deducted from the land owner's compensation.<br>) days advance notice to harvest standing seasonal crops prior to damage, if notice cannot be given, compensation for share of crops will be provided (see entitlement No. 3.a). | NGO/Consultant will confirm tenants' eligibility<br><br>IA/ CSC will ensure provision of notice. |
| 1.c | Loss of Government land | Non-titled holders (i.e. Squatters[4], Encroachers[5]) | ompensation for assets lost at replacement cost (see EM 2.a). | IA/ CSC will ensure provision of |

[1] The RFCLARRA 2013 outlines that no irrigated multi-cropped land shall be acquired under this Act, expect in exceptional circumstances, as demonstrable last resort. Wherever such land is acquired, an equivalent area of cultivable land shall be developed for agricultural purposes or an amount equivalent to the value of land acquired shall be deposited with the appropriate Government for investment in agriculture for enhancing food security. Such costs must be reflected in the resettlement budget.

[2] Traditional land rights refer to households with customary rights to land, and shall be treated equivalent to titleholders

[3] During the preparation of the Resettlement Plan for the subproject road, the availability of land will be assessed and this option will be retained/dropped depending on this assessment

[4] Squatters are those who have no recognizable legal rights on the land they are occupying

| | Type of Loss | Definition of Entitled Person | Compensation Policy | Responsible Agency |
|---|---|---|---|---|
| | | | 0 days advance notice to shift<br>0 days advance notice to harvest standing seasonal crops prior to damage, if notice cannot given, compensation for share of crops will be provided (see entitlement No. 3.a). | notice.<br><br>NGO/Consultant will confirm affected household's eligibility |
| 1.d | Temporary loss of land | Legal titleholders | ent at market value for the period of occupation.<br>estoration of land to previous or better quality<br>ocation of construction camps will be fixed by contractors in consultation with Government and local community. | Contractor negotiates amount with landowner – supervised by CSC.<br><br>IA/CSC ensures compensation paid prior to take-over.<br><br>Contractor responsible for site restoration. |
| 2 | **Structures** | | | |
| 2.a | Loss of residential, commercial structures and other assets | Legal titleholders<br>Encroachers and squatters | If partially affected[6]: Replacement cost of the affected part or assets with right to salvage materials. If remainder of the structure is unviable, the owner has the option to claim compensation for entire structure (see below).<br><br>If **Residential/Commercial structure fully affected**: Replacement Cost of the structure | NGO/Consultant will confirm titleholder's eligibility<br><br>IA/ CSC will ensure provision of notice. |

[5] Encroachers are those who use land or build structures which are in whole or in part of an adjacent property to which they have no titles.

[6] External to the living/commercial areas (i.e. verandahs, stairs)

| | Type of Loss | Definition of Entitled Person | Compensation Policy | Responsible Agency |
|---|---|---|---|---|
| | | | If relocating outside RoW, Resettlement Allowance of Rs. 50,000 per family as per LARR Act 2013.[7]<br>Monthly Subsistence Allowance of Rs. 3,000 for one year (total Rs. 36,000) for families having to relocate their homesteads as per LARR Act 2013.[8]<br>Shifting allowance of 10% of replacement cost of structure up to a maximum of Rs 50,000, as per the LARR Act 2013<br>Right to salvage materials from structure and other assets with no deductions from replacement cost.<br>90 day notice to vacate structure. | |
| 2.b | Loss of residential/commercial structure and other assets | Tenants (without documentation) and leaseholders | eplacement cost of part/whole of structure – if latter has been constructed by the tenant/leaseholder with right to salvage material<br>ompensation for rental deposit or unexpired lease (only for AP with legitimate lease documentation). This will be deducted from the compensation amount of the structure owner.<br>ump-sum equivalent to two month lease to support search of alternative housing. | NGO/Consultant will confirm tenants' eligibility<br><br>IA/ CSC will ensure provision of notice. |

[7] Not cumulative if Resettlemen t Allowance has been given for loss of land (Entitlement 1.a)
[8] Households losing commercial structures are not eligible

| | Type of Loss | Definition of Entitled Person | Compensation Policy | Responsible Agency |
|---|---|---|---|---|
| 2.c | Loss and temporary impacts on common property resources | Titled and non-titled owners/communities | Replacement or restoration of the affected community facilities<br>Best efforts need to be made to avoid impacts on sensitive sites (i.e. religious, sacred). If these need to be relocated or rehabilitated additional level of consultation with community is required to ensure proper process | IA/ CSC will assess how to avoid sensitive sites<br><br>NGO/Consultant will conduct additional consultations |
| **3** | **Loss of crops and trees** | | | |
| 3.a | Loss of trees and crops | Legal titleholder/ tenant/lease-holder/share-cropper/non-titled AP | ) days advance notice to harvest standing seasonal crops prior to damage, fruits and timber<br>ompensation for standing crops (or share of crop for sharecroppers) based on an annual crop cycle at market value.<br>ompensation for trees based on timber value at market price, and compensation for perennial crops and fruit trees at annual net product market value multiplied by remaining productive years; to be determined in consultation with the Forest Department for timber trees and the Horticulture Department for other trees/crops. | NGO/Consultant will confirm affected household eligibility<br><br>IA/ CSC will ensure notice is provided. |
| **4** | **Loss of livelihood** | | | |
| 4.1 | Loss of livelihood income | Legal Titleholder/ tenant/leaseholder/non-titled holder of fully | ss of business income/wages: One time financial assistance based | NGO/Consultant will confirm affected |

| | Type of Loss | Definition of Entitled Person | Compensation Policy | Responsible Agency |
|---|---|---|---|---|
| | | affected commercial structure[9]<br><br>Employee of affected commercial structure.<br><br>Farmer/ agricultural worker of land acquired. | on three month income[10] or Rs. 25,000 as per RFCLARRA 2013, whichever is higher | household eligibility |
| 4.2 | Temporary disruption of livelihood | Legal titleholders, non-titled Ahs | ) days advance notice regarding construction activities, including duration and type of disruption.<br>onomic Disruption Grant of Rs. 3,000/week when commercial structure is partially affected and owner loses income to rebuild part of structure or because of construction activities.<br>ssistance[11] to mobile vendors/hawkers to temporarily shift for continued economic activity during construction activities. | IA/ CSC will ensure notice is provided. |
| 5 | **Special assistance to Vulnerable Households** | | | |
| 5.1 | Impacts on Vulnerable Households (VAHs) and Severely Affected Households (SAHs)[12] | Vulnerable Households<br>Severely Affected Households | 5. 50,000 for each physically displaced family[13].<br>rticipation of one member of household in Livelihood Improvement and Skills Development Training | NGO/Consultant to confirm VAH/SAH list<br><br>NGO/Consultant to conduct assessment of skills |

[9] When core commercial space is affected – when external sections of the structures such as verandahs, stairs, balcony are affected the owner will not be eligible to this entitlement.
[10] Based on income tax return
[11] Assistance will be provided in accommodating a temporary space for commercial activities during construction, dismantling and reassembling mobile structure and in physically relocating structure
[12] Severely Affected Households (SAHs): defined as losing 10% or more of their total productive assets and/or physical displacement
[13] Severely Affected Households (SAHs) and Vulnerable Households (VAHs) losing their homestead and having to physically relocate from affected area

| | Type of Loss | Definition of Entitled Person | Compensation Policy | Responsible Agency |
|---|---|---|---|---|
| | | | iority of employment under the project during construction and implementation for one family member to extent possible. | development |
| 6 | **Other losses** | | | |
| 6.1 | Any other loss not identified | | nanticipated involuntary impacts will be documented and mitigated | NGO/Consultant to identify other potential losses |

**Main feature of AP R&R Policy-2005**

The present GOAP R&R Policy 2005, apparently addresses R&R issues of water resources projects and the provision available under this policy do not adequately cover R&R issues associated with non-linear projects (including road sector). Based on the resettlement issues in the road sector project and the provisions of the R&R policy framework which was prepared for the first State Highway Project (APSHP), funded by the Bank and also the experience from the implementation of Resettlement Plan under the APSHP, following modifications are proposed in the state R&R policy so as to cover R&R issues of roads and highways projects.

**Table 7-16: Govt. of AP R&R Policy for Road Sector Projects**

| Sl. No. | Provisions under the present AP R&R Policy 2005 | Proposed modifications in AP R&R Policy 2005 |
|---|---|---|
| 1 | Para 1.3: '... provide succor to the assess less rural poor ... who have been displaced | Add "and / or accepted" after displaced |
| | Para 3.2: The definition of affected zone refers to water sector projects | Add one more parameter "(c). For linear projects area falling within the project corridor of impact" |
| 2 | Para 3.8: Project means the project(s) notified under this policy and displacing.<br><br>100 or more families en-mass in plain areas 25 or more families en-mass in tribal areas or in areas mentioned in Schedule V of the constitution of India from their lands and or houses. | Replace the definition of the project as: "Project means the project(s) notified under this policy and resulting in partial losses and/or displacing". Add one more parameter as "(c). For linear project displacement is not en mass but scattered". |
| 3 | Para 3.0: There is no mention under the policy of families with no legal title and non-agricultural families | Add the following definitions:<br><br>**Families with no legal titles** are the persons<br><br>Occupying government/other land for cultivation to earn their living. |

| Sl. No. | Provisions under the present AP R&R Policy 2005 | Proposed modifications in AP R&R Policy 2005 |
|---|---|---|
| | | Residing or carrying out economic activity in structures built within the affected zone / corridor of impact.<br><br>**Non-agricultural families:** means whose primary source of livelihood is from non-agricultural sources (like trading, business and manufacturing etc.) within the affected zone/corridor of impact. |
| 4 | Para 3.16: A Project Affected Family is defined as one whose more than 50% of land is required | Under Para 3.16 (b) replace 50% and add (d) families losing more than 25% of their residential/commercial structures. |
| 5 | Para 3.17: Project Displaced Family is defined as "means any family ..... dwelling house in the village in the affected ... dwelling house". | Revise the definition as follows:<br>"Project Displaced Family" means any family, who on account of acquisition of dwelling house and structures used for commercial purposes including business/trade in the affected zone for the purpose of the project, has been displaced from such dwellings and/or commercial structures. |
| 6 | The notification under section 4(i) of LA Act pertains to those whose lands/other immovable properties are acquired. | Add: under Chapter III, the following **Cut off date:** For the legal owners of the land and structures the date of land acquisition notification will be the cut off date. For squatters/encroachers the date of social survey will be the cut off date for R&R entitlements. |
| 7 | Para 5.4: Procedure to be followed for survey and census of PAFs and PDFs etc. | Revise para 5.4 (b) as follows:<br><br>"Project affected families..... agriculture land business/work place, employment ... or vocation.<br><br>Also add the following:<br><br>(e) The project affected persons who have un-officially occupied the land/ structures in the affected area. |
| 8 | Para 5.14: After completion.... In consultation with ... Project area is situated. | Revise para 5.14 as under:<br><br>After completion ... in consultation with Project Affected families, Project Displaced families and their |

| Sl. No. | Provisions under the present AP R&R Policy 2005 | Proposed modifications in AP R&R Policy 2005 |
|---|---|---|
| | | representatives, women, Chairpersons .. area.. is situated. |
| 9 | Para 5.18: Contents of Draft Scheme / Plan of R&R | Add the following:<br><br>n) The time schedule to extend R&R entitlements to project affected / displaced families. |

Land Acquisition Act, 1894

In India, compensation for land acquisition and resettlement assistance for project-affected people are governed by the Land Acquisition Act (1894), which has been amended from time to time.

The Act covers only legal titleholders and provides for (i) market value of the land; (ii) additional amount for trees, crops, houses or other immovable property; (iii) damage due to severing of land, residence, place of business.

Followings are the limitations of the LA Act:

- The Act does not include compensation for non-title holders;
- It provides compensation for acquired properties and structures only;
- It does not recognize loss of income due to the acquisition of commercial establishments and agricultural land;
- It does not provide economic rehabilitation to vulnerable categories.

**Table 7-17:** Entitlement Matrixes

| R&R BENEFITS UNDER GoAP RESETTLEMENT AND REHABILITATION POLICY, 2005 | | | | |
|---|---|---|---|---|
| Criteria of PAP | Type of Loss | ENTITLEMENTS | | |
| | | Assistance in relocation/rehabilitation | Assistance in economic rehabilitation | Compen-sation |
| **Project Displaced Family (PDF)** | | | | |
| Category 1 | PDF loosing own house | 1. House site to a maximum extent of 150 Sq mt in rural areas and 75 Sq Mt in urban areas<br><br>2.Under grant for transporting materials one time financial grant of Rs 5,000/- or as fixed by government from to time for transportation/shifting of building materials, belongings and cattle etc from the affected zone to resettlement zone. | -- | As per L.A. Act 1894. |

| R&R BENEFITS UNDER GoAP RESETTLEMENT AND REHABILITATION POLICY, 2005 | | | | |
|---|---|---|---|---|
| Criteria of PAP | Type of Loss | ENTITLEMENTS | | |
| | | Assistance in relocation/rehabilitation | Assistance in economic rehabilitation | Compen-sation |
| Category 2 | PDF under Below Poverty Level (BPL) loosing own house | 1.House site to a maximum extent of 150 Sq mt in rural areas and 75 Sq mt in urban areas<br><br>2.Under grant for transporting materials one time financial grant of Rs 5,000/- or as fixed by government from to time for transportation/shifting of building materials, belongings and cattle etc from the affected zone to resettlement zone. | One time financial assistance of Rs.40,000/- or as fixed by Government from time to time for house construction | As per L.A. Act 1894 |
| Category 3 | PDF having cattle at the time of acquiring his house | -- | Under grant for cattle shed one time financial assistance of Rs. 3000/- or as fixed by Govt from time to time for construction of cattle shed | -- |
| Category 4 | PDF comprising of rural artisan/ small trader and self employed person | -- | Under income generating scheme grant one time lump sum financial assistance of Rs 25,000/- or as fixed by government from time to time for construction of working shed/shop | -- |
| Project Affected Family (PAF) | | | | |
| Category 1 | PAF who becomes Small/Marginal/Landless after acquisition, in lieu of Acquired land | -- | -- | As per L.A. Act 1894. |
| Option I | | Land for land (equivalent amount or to a maximum extent of 2.5 Ha of Dry /1.25 Ha of Wet land) of Govt. Land available within the district-Waste/degraded or Agricultural land | **Waste/degraded**-One-time financial assistance for land development of Rs.10,000/- per hectare or as fixed by the government from time to time **Agricultural Land** – One-time financial assistance for land development of Rs.10,000/- | -- |

| R&R BENEFITS UNDER GoAP RESETTLEMENT AND REHABILITATION POLICY, 2005 | | | | |
|---|---|---|---|---|
| Criteria of PAP | Type of Loss | ENTITLEMENTS | | |
| | | Assistance in relocation/rehabilitation | Assistance in economic rehabilitation | Compen-sation |
| | | | per hectare and Rs 5,000/- for Agricultural Production or as fixed by the government from time to time | |
| Option II | PAF owning agricultural land who becomes Small farmer after acquisition, in lieu of Acquired land | -- | One time financial assistance equivalent to 375 days of minimum agricultural wages | -- |
| | PAF owning agricultural land who becomes marginal farmer after acquisition, in lieu of Acquired land | -- | One time financial assistance equivalent to 500 days of minimum agricultural wages | -- |
| | PAF owning agricultural land who becomes landless after acquisition, in lieu of Acquired land | -- | One time financial assistance equivalent to 750 days of minimum agricultural wages | -- |
| Category 2 | Scheduled tribe PAF who becomes Small/Marginal/Landless after acquisition, in lieu of Acquired land | Land for land (equivalent amount or to a maximum extent of 2.5 Ha of Dry /1.25 Ha of Wet land) of Govt. land or private land acquired with in the project benefited area | -- | -- |
| Category 3 | PAF belonging to agricultural labour/non-agricultural labour | -- | One time financial assistance equivalent to 625 days of minimum agricultural wages | -- |
| **Project Displaced and Affected Family** | | | | |
| Category 1 | PAF who is also a PDF | -- | One time subsistence allowance equivalent to 240 days of minimum agricultural | -- |

| R&R BENEFITS UNDER GoAP RESETTLEMENT AND REHABILITATION POLICY, 2005 | | | | |
|---|---|---|---|---|
| Criteria of PAP | Type of Loss | ENTITLEMENTS | | |
| | | Assistance in relocation/rehabilitation | Assistance in economic rehabilitation | Compen-sation |
| | | | wages | |
| Other Benefits to PAFs of Scheduled tribes (STs) | | | | |
| Category 1 | PAF of ST | Preference in allotment of land. Must be resettled close to their natural habitat of their choice to the extent possible | Financial assistance equivalent to 500 days minimum agricultural wages for loss of customary rights/usages of forest produce | -- |
| Category 2 | PAF of ST resettled outside the district or outside the tribal area | -- | 25% higher R&R benefits in monetary terms | |
| Category 3 | PAF of ST having fishing rights in the river/pond/dam | -- | Will be given the fishing rights in the reservoir | |

## 7.11 RESETTLEMENT BUDGET AND FINANCING

### 7.11.1 R&R COST

R&R budget includes cost of likely affected structures, assistance to APs as per the entitlement matrix and RAP implementation cost. Land acquisition will be required at the project road. The entitlement details are based on the applicable Land acts, the LARR (2013).

The main components, which will be taken into consideration for deciding the assistance/compensation packages to the affected households/persons, are listed below:

- Compensation for structures (residential/commercial) and other immovable assets at their replacement cost;
- Compensation for land
- Assistance in lieu of loss of business/wage income or any other source of livelihood;
- Assistance for shifting;
- Assistance for Income Restoration; and
- Cost for implementation of RAP.

Apart from this, 15 % of the total amount is allocated for any unforeseen event under the head of Contingency amount.

### 7.11.2 RELOCATION AND ENHANCEMENT OF COMMON PROPERTY RESOURCES (CPRS)

Common Property resources are such properties which are owned and maintained by the community. It includes both the religious as well as the community properties like temples, mosques, graveyard etc. As many as 22 such CPRs are likely to be impacted due to the widening of the road. It is believed that all of these structures might not be completely affected due to the road improvement and shall be saved (from any negative impact) during the implementation stage of the sub-project.

### 7.11.3 COST OF NGO'S INVOLVEMENT

The involvement of RAP implementing agency/NGOs is required to help in implementation of the project, especially when the compensation is distributed among the affected household. The lump sum budget includes salary of the key professionals, sub-professionals, office staff, field staff, vehicle cost, vehicle running cost, training and workshop expenses, office equipment expenses, rent of the office, stationery, overhead expenses and miscellaneous expenses etc for hiring NGO'S for implementing RAP is Rs. 2600000/- for this sub-project road, which may be revised, if required.

### 7.11.4 TOTAL R & R COST

2. R&R cost for the sub-project is calculated on the basis of entitlement framework. R&R budget **Rs 300.52 Crores** includes cost of likely affected structures, assistance to APs as per the entitlement matrix and RAP implementation cost. The cost estimates for various assistances are provided in

Table 7-18.

**Table 7-18: R&R Budget for the Subproject**

| Sl No | Particulars | Amount (Rs.) |
|---|---|---|
| A | **Compensation for Land Acquisition** | |
| 1 | #Compensation for Structure/Agriculture/barren land 37,50,000x4x 172.79 hectars | 2,59,18,50,000 |
| 2 | Value of the 150 structures x100000 | 1,50,00,000 |
| | **Total** | **2,60,68,50,000** |
| B | **R&R Entitlements** | |
| 3 | Subsistence Allowance Rs3000x12 months=36000 x150 PAFs | 54,00,000 |
| 4 | Vulnerable/BPL One-time Resettlement Allowance 50000x8 PAFs | 4,00,000 |
| | **Total** | **58,00,000** |
| C | **Religious** | |
| 5 | Temples/Church/Mazars 7x2,00,000 | 14,00,000 |
| | **Total** | **14,00,000** |
| D | **Others Services** | |
| 6 | N.G.O Service Charges | 20,00,000 |
| 7 | Administrative Cost | 15,00,000 |
| 8 | M & E consultant Lump sum | 10,00,000 |
| 9 | HIV/AIDS awareness | 5,00,000 |
| | **Total** | **50,00,000** |
| | **A+B+C+D** | **2,61,32,50,000** |
| 10 | Contingency 15% | 39,19,87,500 |
| 11 | **Grand Total** | **3,00,52,37,500** |

*Source :- http://registration.ap.gov.in/UnitRate

### 7.11.5 CONCLUSION

The social impact assessment has tried to focus on the potential impacts due to the proposed project and to propose mitigation measures through an appropriate RAP for the project. Proposed development under National Highway Roads will help in improving the condition of the road.

- The alignment widening would try to avoid schools, places of worships, public utilities and other common resources.
- An amicable solution with regard to shifting of religious structures (if required) are explored in consultation with community leaders, religious leaders and other prominent persons in the local area.
- It is ensured that the likely affected common properties used by local people are suitably rehabilitated before the start of civil construction work and budgetary provision for the same are made in the project estimates.

With the above approach construction and operation the project will be socially feasible.

**ANNEXURE: 10.1 (LARR,2013)**

**Summary of 'The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013'**

1. The Right to Fair Compensation and Transparence in Land Acquisition, Rehabilitation and Resettlement Act, 2013 has been effective from January 1, 2014 after receiving the assent of the President of Republic of India. This Act extends to the whole of India except the state of Jammu and Kashmir. The Act replaced the Land Acquisition Act, 1894.

2. The aims and objectives of the Act include: (i) to ensure, in consultation with institutions of local self-government and Gram Sabhas established under the Constitution of India, a humane, participative, informed and transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization with the least disturbance to the owners of the land and other affected families; (ii) provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or are affected by such acquisition; (iii) make adequate provisions for such affected persons for their rehabilitation and resettlement; (iv) ensure that the cumulative outcome of compulsory acquisition should be that affected persons become partners in development leading to an improvement in their post- acquisition social and economic status and for matters connected therewith or incidental thereto.

3. Section 27 of the Act defines the method by which market value of the land shall be computed under the proposed law. Schedule I outlines the proposed minimum compensation based on a multiple of market value. Schedule II through VI outline the resettlement and rehabilitation entitlements to land owners and livelihood losers, which shall be in addition to the minimum compensation per Schedule I.

4. Preparation of Social Impact Assessment Study under section 4 (1): it is obligatory for the appropriate Government intends to acquire land for a public purpose to carry out a Social Impact Assessment study in consultation with concern Panchayat, Municipality or Municipal Corporation, as the case may be, at village level or ward level in the affected area. The Social Impact Assessment study report shall be made available to the public in the manner prescribed under section 6.

5. **Notification under Section 11 *(1)*:** Whenever, it appears to the appropriate Government that land in any area is required or likely to be required for any public purpose, a notification to

that effect along with details of the land to be acquired in rural and urban shall be published in the official Gazette; in two daily newspapers circulating in the locality of such area of which one shall be in the regional language; in the local language in the *Ponchayat*, Municipality or Municipal Corporation, as the case may be and in the officers of the District Collector, The Sub-divisional Magistrate and the *Tehsil;* uploaded on the website of the appropriate Government; in the affected areas.

6. **Hearing of Objection under section 15** ***(1)***: any person interested in any land which has been notified under sub-section (1) of section II, as being required or likely to be required for a public purpose, may within sixty days from the date of the publication of the preliminary notification makes his/her objection, if any, to the collector in writing and shall be heard by the collector or by any person authorized by him/her in this behalf or by an Advocate. After hearing all such objections and after making such further inquiry, if any, as he/she thinks necessary, either make a report in respect of the land which has been notified under sub-section (1) of Section II, Or make different reports in respect of different parcels of such land, to the appropriate Government, containing his/her recommendations on the objections, together with the records of the proceedings held by him/her along with a separate report giving therein the approximate cost of land acquisition, particulars as to the number of affected families likely to be resettled, for the decision of that Government.

7. **Publication of declaration and summary of Rehabilitation and Resettlement under section 19** ***(1)***: when the appropriate Government is satisfied, after considering the report, if any, made under sub-section (2) of section 15, that any particular land is needed for a public purpose, a declaration shall be made to that effect, along with a declaration of an area identified as the "resettlement area" for the purpose of rehabilitation and resettlement of the affected families. It is obligatory for the State to publish declaration in the official Gazette; in two daily newspapers circulating in the locality of such area of which one shall be in the regional language; in the local language in the *Panchayat*, Municipality or Municipal Corporation, as the case may be and in the officers of the District Collector, The Sub-divisional Magistrate and the *Tehsil;* uploaded on the website of the appropriate Government; in the affected areas.

8. After declaration the Collector shall take order for acquisition. The Collector then causes the land to be marked out, measured and planned. The Collector then causes public notice to be given at convenient places on or near the land to be taken, stating the intention of the Government to take possession of the land, and that claims to compensation may be made.

9. **Enquiry and Land Acquisition award by Collector under section 23:** on the day so fixed, or any other day to which the enquiry has been adjourned, the Collectors shall proceed to enquire into the objections (if any) which any person interested has stated pursuant to a notice given under section 21, to the measurements made under section 20, and into the value of the land at the date of the publication of the notification, and into the respective interest of the persons claiming the compensation and rehabilitation and resettlement, shall make an award under his/her hand of:

(i) The true area of the land;
(ii) The compensation as determined under section 27 along with Rehabilitation and

Resettlement award as determined under section 31 and which in his/her opinion should be allowed for the land, and;

(iii) The apportionment of the said compensation among all the persons known or believed to be interested in the land, of whom, or of whose claims, he has information, whether or not they have respectively appeared before him.

10. **Period within which an Award shall be made:** under section 25, it is obligatory for the Collectors to make an Award within a period of twelve months from the date of publication of the declaration under section 19 and if no Award is made within the period, the entire proceedings for the acquisition of the land shall lapse.

11. **Determination of market value of land by Collector under section 26 (1):** the Collector shall adopt the following criteria's in assessing and determining the market value of the land, namely:

(i) the market value, if any, specified in the Indian Stamp Act, 1899 for the registration of sale deeds or agreements to sell, as the case may be, in the area, where the land is situated; or

(ii) the average sale price for similar type of land situated in the nearest village or nearest vicinity area; or

(iii) consented amount of compensation as agreed upon under sub-section (2) of section 2 in case of acquisition of lands for private companies or for public private partnership projects. Wherever is higher.

12. **Determination of amount of Compensation under section 26:** the Collector having determined the market value of the land to be acquired shall calculated the total amount of compensation to be paid to the land owner (whose land has been acquired) by including all assets attached to the land.

13. **Determination of value of things attached to land or building under section 29 (1):** the Collector in determining the market value of the building and other immovable property or assets attached to the land or building which are to be acquired, use the services of a competent engineer or any other specialist in the relevant field, as may be considered necessary by him/her. Under section 29 (2), the Collector for the purpose of determining the value of trees and plants attached to the land acquired, use the services of experienced persons in the field of agriculture. In the same manner, the Collector under section 29 (3), for the purpose of assessing the value of standing crops damaged during the process of land acquisition, may use the services of experience persons in the field of agriculture.

14. **Rehabilitation and Resettlement Award for affected families by Collector under section 31 (1) of section V:** the Collector shall pass Rehabilitation and Resettlement Awards for each affected family in terms of the entitlements provided in the second schedule. As per section 31 (1), the Rehabilitation and Resettlement Award shall include all the following, namely;

(i) rehabilitation and resettlement amount payable to the family;

(ii) bank account number of the person to which the rehabilitation and resettlement award amount is to be transferred;

(iii) particulars of house site and house to be allotted, in case of displaced families;

(iv) particulars of the land allotted to the displaced families;

(v) particulars of one time subsistence allowance and transportation allowance in case of displaced families;

(vi) particulars of payment for cattle shades and petty shops;

(vii) particulars of one time amount to artisans and small traders;

(viii) details of mandatory employment to be provided to the members of the affected families;

(ix) particulars of any fishing rights that may be involved;

(x) particulars of annuity and other entitlements to be provided;

(xi) particulars of special provisions for the scheduled cast and the scheduled tribes to be provided.

15. **Special powers in case of urgency to acquire land in certain cases under section 40 (1):** in case of urgency, whenever the appropriate Government so directs, the Collector, though no such award has been made, may, on the expiration of thirty days from the publication of the notice mentioned in section 21, take possession of any land needed for a public purpose and such land shall thereupon vest absolutely in the Government, free all encumbrances.

16. **Special Provision for Scheduled Caste and Scheduled Tribes under section 41 (1):** as far as possible, no acquisition of land shall be made in the Scheduled Areas. As per section 41 (2), where such acquisition does take place it shall be done only as a demonstrable last resort. As per section 41 (3), in case of land acquisition in Scheduled Area, the prior consent of the concern *Gram Sabha* or the *Panchayats* or the autonomous District Councils shall be obtained.

17. In case of a project involving land acquisition on behalf of a Requiring Body which involves involuntary displacement of the Scheduled Cast or the Scheduled Tribes families, a Development Plan shall be prepared (section 41 [4]). As per section 41 (5), the Development Plan shall also contain a program for development of alternate fuel, fodder and non-timber forest produce resources on non-forest lands within a period of five years.

18. In case of land being acquired from members of Scheduled Cast or the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families initially as first installment and the rest shall be paid after taking over of the possession of the land. The affected families of the Scheduled Tribes shall be resettled preferably in the same Scheduled Area in a compact block so that they can retain their ethnic, linguistic and culture identity.

19. Under section 42 (1), all benefits including the reservation benefits available to Scheduled Cast and the Scheduled Tribes in the affected areas shall continue in the resettlement area.

**ANNEXURE :-6.1 (LIST OF OWNERSHIP DETAILS)**

| Sl. No. (Structure) | District | Village / Hamlet | 1. Residential 2. Commercial 3.Govt. 4.Religious 5. Community 6. Other | Distance from PCL | Length along the road | Width perpendicular to the Road | No of Floor | 1. Katcha 2. Semi-pucca 3. Pucca 4. Thatched 5. Wooden/ Kiosk | Name of Owners/ Head of the Household /Interested person (in case of Govt./Religious/ Community specify its usage and name department/ care taker) | Type of Family | Religion Group | Social Stratification | Literacy Level | Number of Family Members | | Occupation Primary | Monthly Income |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 1. Joint 2. Nuclear 3. Extend. | 1. Hindu 2. Muslim 3. Sikh 4. Christian 5. Other | 1. SC 2. ST 3. OBC 4. Gen | 1. Illiterate 2 Primary 3. 10th 4. 12th 5. Graduate 6. Above | Male | Female | 1. Service 2. Business 3. Agriculture 4. Labour 5. Professional 6. Rural Artisan 7. Small Trader 8. Self Employed 9. Unemployed | |
| LHS | Rangareddy | Gondipet | Commercial | 14 | 2.4 | 8 | 1 | Semi Pucca | EST 8 Resturent (B.Wall) | | | | | | | | |
| L | Rang | Aziz | Commercial | 7 | 80 | 70 | 1 | Pucca | Rose Engine | | | | | | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HS | ared dy | Nagar | | | | | | | India Limited (B.Wall) | | | | | | | | | |
| LHS | Rang ared dy | Aziz Nagar | Residential | 13 | 12 | 5 | 1 | Pucca | Anil S Rao | Nuclear | Hindu | Gen | Above | 5 | 7 | Self Employeed | 1000000 |
| LHS | Rang ared dy | Aziz Nagar | Commercial | 13 | 50 | 8 | 1 | Pucca | Yadhi Reddy | Nuclear | Hindu | OC | Illiterate | 1 | 1 | Business | 2000 |
| LHS | Rang ared dy | Aziz Nagar | Commercial | 10 | 80 | 70 | 1 | Pucca | Venkatesh | Joint | Hindu | SC | 10th | 6 | 3 | Agriculture | 10000 |
| LHS | Rang ared dy | Aziz Nagar | Commercial | 10 | 80 | 70 | 1 | Pucca | Malla Reddy | Nuclear | Hindu | SC | illitrate | 2 | 2 | Professional | 10000 |
| LHS | Rang ared dy | Himayath Nagar | Commercial | 10 | 50 | 8 | 1 | Pucca | P.Davender Yadav | Joint | Hindu | Gen | Above | 8 | 4 | Business | 25000 |
| LHS | Rang ared dy | Himayath Nagar | Commercial | 14 | 60 | 7 | 1 | Pucca | Mahender | Nuclear | Hindu | SC | Graduate | 4 | 3 | Agriculture | 10000 |
| LHS | Rang ared dy | Himayath Nagar | Commercial | 14 | 12 | 15 | 1 | Pucca | Closed | | | | | | | | |
| LHS | Rang ared dy | Himayath Nagar | Commercial | 16 | 25 | 6.2 | 1 | Pucca | Nanda Bakery | Joint | Hindu | OC | OBC | 2 | 1 | Agriculture | 5000 |
| LHS | Rang ared dy | Himayath Nagar | Commercial | 25 | 29 | 6 | 1 | Pucca | Krishna Reddy | Joint | Hindu | OBC | 10th | 6 | 4 | Agriculture | 5000 |
| LHS | Rang ared dy | Himayath Nagar | Commercial | 20 | 10 | 4 | 3 | Pucca | Tareez Food Court | | | | | | | | |
| L | Rang | Himayat | Commercial | 12 | 50 | 4 | 1 | Pucca | Ram Vilas | Joi | Hin | Gen | 10t | 3 | 3 | Small | 500 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HS | ared dy | h Nagar | | | | | | | | nt | du | | h | | | Treade r | 0 |
| LHS | Rang ared dy | Himayat h Nagar | Commercial | 10 | 50 | 3 | 1 | Pucca | Dhinesh | Joi nt | Hin du | Gen | Abo ve | 3 | 3 | Busine ss | 500 0 |
| LHS | Rang ared dy | Himayat h Nagar | Commercial | 14 | 60 | 100 | 1 | Pucca | Nanda Farms | | | | | | | | |
| LHS | Rang ared dy | Himayat h Nagar | Commercial | 25 | 3 | 2 | 1 | Pucca | Bala Ji Weigh Brigde | | | | | | | | |
| LHS | Rang ared dy | Himayat h Nagar | Commercial | 21 | 14 | 15 | 1 | Pucca | Bagicha (B.Wall) | | | | | | | | |
| LHS | Rang ared dy | Yenka Palli | Commercial | 12 | 35 | 40 | 1 | Pucca | Centenary Memorial (B.Wall) | | | | | | | | |
| LHS | Rang ared dy | Himayat h Nagar | Commercial | 13 | 10 | 10 | 2 | Semi Pucca | Anwar Ali | Joi nt | Mu slim | Gen | 12t h | 3 | 2 | Busine ss | 250 00 |
| LHS | Rang ared dy | Chillkur | Commercial | 12 | 11 | 2 | 1 | Pucca | Ashok Engg. Motor Works | | | | | | | | |
| LHS | Rang ared dy | Chillkur | Commercial | 16 | 9 | 5 | 1 | Pucca | Vaishnavi timbers | | | | | | | | |
| LHS | Rang ared dy | Chillkur | Commercial | 12 | 10 | 7 | 1 | Pucca | Sita Ramananju (B.Wall) | Joi nt | Hin du | Gen | 10t h | 2 | 3 | Self Empol yeed | 500 0 |
| LHS | Rang ared dy | Chillkur | Commercial | 12 | 11 | 8 | 1 | Pucca | Surya Vathi (B.Wall) | | | | | | | | |
| L | Rang | Chillkur | Commercial | 14 | 9 | 7 | 1 | Pucca | Srivari | | | | | | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HS | ared dy | | | | | | | | Pharmecy | | | | | | | | | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 17 | 32 | 6 | 1 | Pucca | Abil chery | | | | | | | | | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 17 | 20 | 8 | 1 | Pucca | Asif and Thofiq (B.Wall) | | | | | | | | | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 17 | 15 | 7 | 1 | Pucca | No Information (B.Wall) | | | | | | | | | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 22 | 10 | 4 | 1 | Semi Pucca | Highway Dhaba | | | | | | | | | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 18 | 17 | 4 | 1 | Semi Pucca | Venkatesher Rao (B.Wall) | | | | | | | | | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 16 | 15 | 12 | 2 | Semi Pucca | Syed Ahmedduin | Joint | Muslim | Gen | Above | 8 | 6 | Business | 25000 | |
| LHS | Rang ared dy | Kanker Mavidi | Commercial | 16 | 9 | 18 | 2 | Pucca | Ajaruddin | Joint | Muslim | Gen | Above | 5 | 4 | Business | 20000 | |
| RHS | Rang ared dy | Gandap aaly | Commercial | 16 | 7 | 8 | 1 | Pucca | Closed (B.Wall) | | | | | | | | | |
| RHS | Rang ared dy | Aziz Nagar | Residential cum Commercial | 13 | 100 | 150 | 1 | Semi Pucca | Arshia Quadri | Joint | Muslim | Gen | Graduate | 5 | 6 | House wife | | |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 14 | 7 | 10 | 1 | Pucca | New Royal service Center | | | | | | | | | |
| R | Rang | Aziz | Commercial | 20 | 16 | 45 | 1 | Pucca | Closed | | | | | | | | | |

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| H S | ared dy | Nagar | | | | | | | | | | | | | | | |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 20 | 4 | 5 | 1 | Pucca | Raj Reddy | Joi nt | Hin du | OC | 12t h | 3 | 1 | Busine ss | 300 00 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 22 | 12 | 15 | 1 | Pucca | Md. Numman | Joi nt | Mu slim | Gen | Gra dua te | 6 | 4 | Busine ss | 400 00 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 22 | 12 | 20 | 1 | Pucca | Farooq Cottage(B.Wal l) | | | | | | | | |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 25 | 12 | 10 | 1 | Pucca | Ganesh Yadav | Joi nt | Hin du | OBC | 10t h | 7 | 5 | Busine ss | 250 00 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 25 | 12 | 10 | 1 | Pucca | M. A. Qayyum | Joi nt | Mu slim | Gen | 12t h | | | Self Empol yeed | 200 00 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 25 | 12 | 10 | 1 | Pucca | Swaranlatha B. anjum Reddy | Joi nt | Hin du | OC | 10t h | 2 | | Busine ss | 300 000 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 25 | 8 | 8 | 1 | Pucca | Abdul Aaziz | Joi nt | Mu slim | OC | Pri mar y | 4 | 2 | Self Empol yeed | 180 00 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 18 | 4 | 3 | 1 | katch a | Balu Nath Reddy | Joi nt | Hin du | OBC | 7th | 3 | 3 | Self Empol yeed | 500 0 |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 8 | 2 | 3 | 1 | katch a | Closed | | | | | | | | |
| R H S | Rang ared dy | Aziz Nagar | Commercial | 16 | 12 | 10 | 1 | Pucca | No Information | | | | | | | | |
| R | Rang | Aziz | Commercial | 17 | 10 | 7 | 1 | Pucca | Hano Prasad | Joi | Hin | OBC | 6th | 2 | 2 | Self | 600 |

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| HS | ared dy | Nagar | | | | | | | | nt | du | | | | | Empol yeed | 0 |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 20 | 5 | 3 | 1 | Pucca | Closed | | | | | | | | |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 16 | 8 | 3 | 1 | katch a | No Information | | | | | | | | |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 17 | 9 | 8 | 1 | katch a | Rama Rao | | | | | | | | |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 18 | 4 | 3 | 1 | katch a | Estate closed | | | | | | | | |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 14 | 18 | 18 | 3 | Pucca | Maruthi Showroom | | | | | | | | |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 20 | 18 | 8 | 1 | Pucca | K. Krishna Yodgiri | Joi nt | Hin du | BC | 12t h | 3 | 2 | Busine ss | 300 000 |
| RHS | Rang ared dy | Aziz Nagar | Commercial | 18 | 14 | 7 | 1 | Pucca | No Information | | | | | | | | |
| RHS | Rang ared dy | Himayat h Nagar | Commercial | 16 | 10 | 12 | 1 | Pucca | Sai Nursing Farm (B.Wall) | | | | | | | | |
| RHS | Rang ared dy | Himayat h Nagar | Commercial | 12 | 12 | 10 | 1 | Pucca | Sunshine dhaba | Joi nt | Hin du | OBC | Gra dua te | 5 | 4 | Busine ss | 100 000 |
| RHS | Rang ared dy | Himayat h Nagar | Commercial | 15 | 3 | 4 | 1 | Pucca | Sudha | | | | | | | | |
| R | Rang | Himayat | Commercial | 20 | 15 | 45 | 1 | katch | Anand | | | | | | | | |

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| H S | ared dy | h Nagar | | | | | | a | Nursery | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 15 | 16 | 18 | 1 | Semi Pucca | Under Construction (B.Wall) | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 12 | 18 | 20 | 1 | Pucca | No Information | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 13 | 12 | 16 | 1 | Pucca | Amzath | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 12 | 18 | 20 | 1 | Pucca | HP Petrol Pump | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 12 | 10 | 15 | 1 | Pucca | Babu Jagjiwan Rao | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 12 | 14 | 18 | 1 | Semi Pucca | Madhu Welding shop | | | | | | | | | |
| R H S | Rang ared dy | Himayat h Nagar | Commercial | 14 | 200 | 200 | 1 | Semi Pucca | Bhagwadi Garden | | | | | | | | | |
| R H S | Rang ared dy | Chibel | Commercial | 16 | 100 | 60 | 1 | Semi Pucca | Sri Cement | | | | | | | | | |
| R H S | Rang ared dy | Chibel | Commercial | 10 | 24 | 10 | 1 | Pucca | Darshin Reddy | Joint | Hindu | OBC | 10th | 2 | 3 | Self Employeed | 7500 | |
| R H S | Rang ared dy | Chibel | Commercial | 11 | 12 | 10 | 1 | Pucca | Closed | | | | | | | | | |
| R | Rang | Kanker | Commercial | 17 | 5 | 7 | 1 | Pucca | Closed | | | | | | | | | |

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| HS | ared dy | Mavidi | | | | | | | | | | | | | | | |
| RHS | Rangared dy | Kanker Mavidi | Commercial | 10 | 8 | 5 | 1 | Pucca | Ram Reddy (B.Wall) | Joint | Hindu | OBC | 8th | 3 | 2 | Self Employeed | 6500 |
| RHS | Rangared dy | Kanker Mavidi | Commercial | 25 | 3 | 5 | 1 | Pucca | RAS Poly | | | | | | | | |
| RHS | Rangared dy | Kanker Mavidi | Commercial | 12 | 15 | 6 | 1 | Pucca | Joshana Central | | | | | | | | |
| RHS | Rangared dy | Kanker Mavidi | Commercial | 10 | 50 | 100 | 1 | Pucca | Satyanarayan | Joint | Hindu | Gen | Illitrate | 2 | 3 | Business | 7500 |
| LHS | Rangared dy | Indira Reddy Nagar | Commercial | 10 | 35 | 40 | 1 | Semi Pucca | Garden (B.Wall) | | | | | | | | |
| LHS | Rangared dy | Indira Reddy Nagar | Residential | 15 | 4 | 4 | 1 | Semi Pucca | Narsimhaulu | Joint | Hindu | OC | Primary | 1 | 1 | Agriculture | 4000 |
| LHS | Rangared dy | Indira Reddy Nagar | Commercial | 16 | 5 | 4 | 1 | Semi Pucca | Narsimhaulu | Joint | Hindu | OC | Primary | 1 | 1 | Agriculture | 4000 |
| LHS | Rangared dy | Indira Reddy Nagar | Commercial | 27 | 5 | 3 | 1 | Semi Pucca | G. Shivalingam | Joint | Hindu | BC | Illiterate | 2 | 2 | Business | 6000 |
| LHS | Rangared dy | Indira Reddy Nagar | Commercial | 12 | 6 | 12 | 1 | Semi Pucca | Madina Fresh Chicken Center | Joint | Hindu | BC | 5th | 2 | 3 | Business | 5000 |
| LHS | Rangared dy | Indira Reddy Nagar | Residential cum Commercial | 17 | 9 | 4 | 1 | Pucca | Pentiah Goud | Joint | Hindu | BC | 10th | 3 | 3 | Business | 15000 |
| L | Rang | Indira | Residential | 17 | 12 | 15 | 1 | Pucca | Gadamiri | Joi | Hin | BC | 10t | 3 | 3 | Busine | 100 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HS | ared dy | Reddy Nagar | cum Commercial | | | | | | pantiah Goud | nt | du | | h | | | ss | 00 |
| LHS | Rang ared dy | Indira Reddy Nagar | Commercial | 16 | 7 | 12 | 1 | Pucca | Sidhlori Pentiah Goud | Joi nt | Hin du | BC | 10th | 1 | 3 | Busine ss | 150 00 |
| LHS | Rang ared dy | Indira Reddy Nagar | Residential | 23 | 4 | 10 | 1 | Semi Pucca | Shivaramulu | Joi nt | Hin du | BC | 10th | 2 | 2 | Agricul ture | 400 0 |
| LHS | Rang ared dy | Indira Reddy Nagar | Residential | 23 | 5 | 7 | 1 | Semi Pucca | V. Venkaiah | Joi nt | Hin du | BC | Illite rate | 3 | 1 | Service | 350 0 |
| LHS | Rang ared dy | Indira Reddy Nagar | Residential | 23 | 8 | 12 | 1 | Pucca | A. Rama Kristiah | Joi nt | Hin du | BC | Pri mar y | 1 | 1 | Profes sional | 800 0 |
| LHS | Rang ared dy | Indira Reddy Nagar | Residential | 15 | 5 | 10 | 1 | Pucca | Uma Patti | Joi nt | Hin du | BC | Pri mar y | 3 | 1 | Service | 100 00 |
| LHS | Rang ared dy | Indira Reddy Nagar | Residential | 12 | 4 | 10 | 1 | Pucca | Venu | Joi nt | Hin du | BC | 10th | 2 | 3 | Labour | 450 0 |
| LHS | Rang ared dy | Kathipa dy Pali | Commercial | 20 | 12 | 4 | 1 | Pucca | Gowdown | | | | | | | | |
| LHS | Rang ared dy | Kathipa dy Pali | Commercial | 12 | 2 | 2 | 1 | Semi Pucca | Closed | | | | | | | | |
| LHS | Rang ared dy | Kathipa dy Pali | Commercial | 16 | 3 | 3 | 1 | Pucca | Closed | | | | | | | | |
| LHS | Rang ared dy | Tolkata | Commercial | 14 | 3 | 11 | 1 | Pucca | Sajid Begsaheb (B.wall) | Nul ear | Mu slim | OBC | 5th | 2 | 2 | Busine ss | |
| L | Rang | Tolkata | Commercial | 18 | 14 | 12 | 1 | Pucca | Sajid | Nul | Mu | OBC | 5th | 2 | 2 | Busine | 550 |

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| HS | ared dy | | | | | | | | Begsaheb | ear | slim | | | | | ss | 0 |
| LHS | Rang ared dy | Tolkata | Residential cum Commercial | 18 | 11 | 7 | 1 | Pucca | Suresh K. | Joi nt | Hin du | BC | Illite rate | 2 | 4 | Busine ss | 300 00 |
| LHS | Rang ared dy | Tolkata | Residential cum Commercial | 18 | 10. 2 | 8 | 1 | Pucca | Anusaya | Joi nt | Hin du | BC | illite rate | 4 | 3 | Busine ss | 900 0 |
| LHS | Rang ared dy | Tolkata | Residential cum Commercial | 20 | 10 | 14 | 1 | Pucca | Shushila Madhav | Joi nt | Hin du | BC | Illite rate | 1 | 1 | Busine ss | 750 00 |
| LHS | Rang ared dy | Tolkata | Residential | 25 | 15 | 12 | 1 | Pucca | Sabari | Joi nt | Hin du | BC | Illite rate | 2 | 1 | Labour | 600 0 |
| LHS | Rang ared dy | Tolkata | Residential | 28 | 9.8 | 6 | 1 | Pucca | Satya Goud | Joi nt | Hin du | BC | Illite rate | 2 | 1 | Agricul ture | 200 0 |
| LHS | Rang ared dy | Tolkata | Residential | 16 | 6.7 | 5 | 1 | Pucca | Closed | | | | | | | | |
| LHS | Rang ared dy | Tolkata | Commercial | 19 | 9.4 | 7 | 1 | Pucca | Kuri Kistamma | Joi nt | Hin du | BC | Illite rate | 1 | 2 | Agricul ture | 550 0 |
| LHS | Rang ared dy | Indira Reddy Nagar | Residential cum Commercial | 14 | 3 | 3 | 1 | Pucca | Shekhar | Joi nt | Hin du | BC | Illite rate | 2 | 2 | Busine ss | 450 0 |
| LHS | Rang ared dy | Khanapu r | Residential | 16 | 8 | 10 | 1 | Pucca | Bala Krishnan | Joi nt | Hin du | OBC | 10t h | 3 | 3 | Busine ss | 650 0 |
| LHS | Rang ared dy | Khanapu r | Commercial | 16 | 6 | 4 | 1 | Pucca | Closed | | | | | | | | |
| L | Rang | Khanapu | Residential | 15 | 7 | 10 | 1 | Pucca | Aloori | Joi | Hin | OBC | 8th | 2 | 3 | Self | 500 |

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| HS | ared dy | r | | | | | | | Narayan | nt | du | | | | | Empol yeed | 0 |
| LHS | Rang ared dy | Khanapu r | Residential | 13 | 8 | 10 | 1 | Pucca | Laxmi | Joi nt | Hin du | BC | Illite rate | 4 | 1 | Agricul ture | 650 0 |
| LHS | Rang ared dy | Chittan Palli | Commercial | 18 | 3.5 | 7 | 1 | Pucca | Ramulu | Joi nt | Hin du | OBC | Illite rate | 3 | 3 | Busine ss | 100 00 |
| LHS | Rang ared dy | Chittan Palli | Commercial | 18 | 18 | 7 | 1 | Pucca | Closed | | | | | | | | |
| LHS | Rang ared dy | Chittan Palli | Commercial | 18 | 8 | 4 | 1 | katch a | Ramulu | Joi nt | Hin du | OBC | 5th | 2 | 2 | Busine ss | 750 0 |
| LHS | Rang ared dy | Chittan Palli | Commercial | 8 | 7 | 4 | 1 | katch a | Shop Closed | | | | | | | | |
| LHS | Rang ared dy | Chittan Palli | Commercial | 8 | 5 | 5 | 1 | katch a | Shop Closed | | | | | | | | |
| LHS | Rang ared dy | Kandla Palli | Commercial | 8 | 2 | 2 | 1 | katch a | Saddhar | Joi nt | Mu slim | OC | Abo ve | 3 | 3 | Busine ss | 750 0 |
| LHS | Rang ared dy | Mirth Pur | Commercial | 14 | 12 | 7 | 1 | Semi Pucca | Sajid Jillami | Joi nt | Mu slim | OC | Illite rate | 2 | 3 | Busine ss | 100 00 |
| LHS | Rang ared dy | Tolkata | Residential | 20 | 9.4 | 10 | 1 | Semi Pucca | Ellama | Ext en d | Hin du | OBC | Illite rate | 1 | 1 | Labour | 850 0 |
| LHS | Rang ared dy | Tolkata | Residential | 16 | 9 | 9 | 1 | Pucca | Md Jahnagir | Joi nt | Mu slim | Gen | Pri mar y | 2 | 3 | Busine ss | 900 0 |
| L | Rang | Tolkata | Residential | 16 | 16 | 14 | 1 | Pucca | Ram | Joi | Hin | OBC | Pri | 2 | 3 | Busine | 900 |

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| HS | ared dy | | cum Commercial | | | | | | Chandrain | nt | du | | mar y | | | ss | 0 |
| LHS | Rang ared dy | Tolkata | Commercial | 13 | 24 | | 1 | Pucca | Nuzen | | | | | | | | |
| LHS | Rang ared dy | Tolkata | Residential | 18 | 18 | 18 | 1 | Semi Pucca | Closed | | | | | | | | |
| LHS | Rang ared dy | Malja Puran | Residential | 16 | 8 | 6 | 1 | Pucca | Laxmi Peddy | Joi nt | Hin du | OBC | 6th | 3 | 2 | Self Empol yeed | 650 0 |
| LHS | Rang ared dy | Damak Giddvilly | Commercial | 13 | 40 | 100 | 1 | Semi Pucca | Savera | | | | | | | | |
| LHS | Rang ared dy | Chintan patti | Commercial | 10 | 14 | | 1 | Semi Pucca | Dharani cotton mill | | | | | | | | |
| LHS | Rang ared dy | Kankima mmilli | Residential | 15 | 8 | 4 | 1 | Pucca | MD Abdul Rasool | Joi nt | Mu slim | Gen | Abo ve | 3 | 3 | Service | 250 00 |
| LHS | Rang ared dy | Kankima mmilli | Residential | 15 | 8 | 4 | 1 | Pucca | Bijender Giri | Joi nt | Hin du | Gen | Abo ve | 3 | 3 | Service | 250 01 |
| RHS | Rang ared dy | Kathipa dy Pali | Commercial | 14 | 15 0 | 100 | 1 | Pucca | Trance Green | | | | Abo ve | 1 | 1 | Busine ss | 150 000 |
| RHS | Rang ared dy | Kathipa dy Pali | Commercial | 13 | 20 | 18 | 1 | Pucca | Shiv Shankar Rao | Joi nt | Hin du | Gen | Abo ve | 2 | 2 | Busine ss | 200 00 |
| RHS | Rang ared dy | Kathipa dy Pali | Commercial | 16 | 14 | 17 | 1 | Pucca | Shiv Shankar Rao | | | | | | | | |
| R | Rang | Kathipa | Commercial | 16 | 17 | 20 | 1 | Pucca | Shiv Shankar | | | | | | | | |

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| H S | ared dy | dy Pali | | | | | | | Rao | | | | | | | | |
| R H S | Rang ared dy | Tolkata | Commercial | 16 | 1.5 | 11 | 1 | Pucca | M Sayeeduddin | Joi nt | Mu slim | Christ ian | 10t h | 5 | 11 | Agricul ture | 550 0 |
| L H S | Rang ared dy | Tolkata | Commercial | 19 | 5 | 3 | 1 | Semi Pucca | Salim | Joi nt | Mu slim | Christ ian | Gra dua te | 3 | 2 | Busine ss | 650 0 |
| R H S | Rang ared dy | Tolkata | Commercial | 18 | 10 | 5 | 1 | Pucca | Sameena Godown | | | | | | | | |
| R H S | Rang ared dy | Tolkata | Commercial | 8 | 11 | 6 | 1 | katch a | Narahari | Joi nt | Hin du | OBC | Illite rate | 4 | 1 | Busine ss | 600 0 |
| R H S | Rang ared dy | Tolkata | Commercial | 19 | 12 | 18 | 1 | Pucca | Shangrilla | | | | | | | | |
| R H S | Rang ared dy | Mudimu lle | Commercial | 14 | 9 | 6 | 1 | Semi Pucca | Farm House | | | | | | | | |
| R H S | Rang ared dy | Mudimu lle | Commercial | 14 | 9 | 6 | 1 | Semi Pucca | Farm House | | | | | | | | |
| R H S | Rang ared dy | Malkapu ra | Residential | 16 | 5 | 12 | 1 | Semi Pucca | Lingacherry | | | | | | | | |
| L H S | Rang ared dy | Malkapu ra | Commercial | 14 | 5 | 5 | 1 | Pucca | Farm house Locked | | | | | | | | |
| R H S | Rang ared dy | Chevella | Commercial | 10 | 10 | 100 | 1 | Pucca | Emcor PCT Room | | | | | | | | |
| R | Rang | Damara | Commercial | 13 | 2 | 2 | 1 | Semi | Suresh | | | | | | | | |

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| HS | ared dy | Giddu | | | | | | Pucca | | | | | | | | | |
| LHS | Rang ared dy | Damara Giddu | Commercial | 12 | 3 | 2 | 1 | Pucca | Closed | | | | | | | | |
| RHS | Rang ared dy | Khanapur | Commercial | 10 | 2 | 3 | 1 | katcha | Raju | Joint | Hindu | OBC | Primary | 2 | 4 | Business | 10000 |
| RHS | Rang ared dy | Khanapur | Residential | 14 | 9 | 8 | 1 | Semi Pucca | Raju | Joint | Hindu | Gen | 7th | 2 | 3 | Self Employeed | 7500 |
| RHS | Rang ared dy | Khanapur | Residential | 14 | 5 | 12 | 1 | Semi Pucca | Raju | | | | | | | | |
| RHS | Rang ared dy | Khanapur | Commercial | 16 | 5 | 10 | 1 | Pucca | Amrit Fakran | Joint | Hindu | SC | Primary | 1 | 3 | Self Employeed | 5500 |
| RHS | Rang ared dy | Khanapur | Residential | 12 | 14 | 13 | 1 | Pucca | Lakmachari | Joint | Hindu | OBC | Primary | 2 | 3 | Self Employeed | 4500 |
| RHS | Rang ared dy | Khanapur | Commercial | 8 | 2.5 | 5 | 1 | katcha | Bharathi Ladies Tailor | Joint | Hindu | OBC | 10th | 2 | 4 | Small Treader | 5500 |
| RHS | Rang ared dy | Khanapur | Commercial | 10 | 2 | 3 | 1 | katcha | Srisailam | Joint | Hindu | SC | Illiterate | 1 | 4 | Small Treader | 10000 |
| RHS | Rang ared dy | Khanapur | Commercial | 7 | 5 | 45 | 1 | katcha | G Mallesh | Joint | Hindu | SC | Primary | 2 | 2 | Small Treader | 11000 |
| RHS | Rang ared dy | Khanapur | Commercial | 5 | 2 | 2 | 1 | Pucca | G. Ramulu | Joint | Hindu | Gen | 6th | 2 | 2 | Self Employeed | 5500 |
| R | Rang | Indira | Commercial | 5 | 3 | 5.5 | 1 | Pucca | P. Ashok | Joi | Hin | Gen | 5th | 2 | 2 | Self | 550 |

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| HS | ared dy | Reddy Nagar | | | | | | | | nt | du | | | | | Empol yeed | 0 |
| RHS | Rang ared dy | Indira Reddy Nagar | Commercial | 18 | 16 | 15 | 1 | Pucca | Closed | | | | | | | | |
| RHS | Rang ared dy | Indira Reddy Nagar | Commercial | 14 | 15 | 10 | 1 | Pucca | Closed | | | | | | | | |
| RHS | Rang ared dy | Chintan patti | Commercial | 14 | 4 | 5 | 1 | Pucca | Rejender Reddy | Joi nt | Hin du | OC | 10t h | 3 | 1 | Busine ss | 550 0 |
| RHS | Rang ared dy | Chintan patti | Commercial | 12 | 4 | 5 | 1 | katch a | KGN Puncher | | | | | | | | |
| RHS | Rang ared dy | Chintan patti | Commercial | 12 | 3 | 5 | 1 | katch a | Ramulu | Joi nt | Hin du | OBC | Illite rate | 2 | 3 | Self Empol yeed | 450 0 |

## ANNEXURE 6.2 (RELIGIOUS STRUCTURES)

| Sl. No. (Structure) | District | Village / Hamlet | 1. Residential 2. Commercial 3.Govt. 4.Religious 5. Community 6. Other | Distance from PCL | Length along the road | Width perpendicular to the Road | No of Floor | 1. Katcha 2. Semi-pucca 3. Pucca 4. Thatched 5. Wooden/ Kiosk | Name of Owners/ Head of the Household /Interested person (in case of Govt./Religious/ Community specify its usage and name department/ care taker) |
|---|---|---|---|---|---|---|---|---|---|
| LHS | Rangareddy | Gondipet | Religious | 8 | 4 | 4 | 1 | Semi Pucca | Temple (B.Wall) |
| LHS | Rangareddy | Himayath Nagar | Religious | 10 | 100 | 300 | 1 | Pucca | Holy Spirit Center (B.wall) |
| RHS | Rangareddy | Gandapaaly | Religious | 13 | 30 | 50 | 1 | Pucca | Shivaalum Temple (B.Wall) |
| LHS | Rangareddy | Aziz Nagar | Religious | 13 | 50 | 30 | 1 | Pucca | Masjid-e-Qamer (B.Wall) |
| RHS | Rangareddy | KankerMavidi | Religious | 20 | 10 | 5 | 1 | Pucca | Ayappa |
| LHS | Rangareddy | Chittan Paddy | Religious | 8,5 | 2 | 2 | 1 | Pucca | Temple |
| RHS | Rangareddy | Mirzaguda | Religious | 22 | 4 | 4 | 1 | Pucca | Hanuman temple |

## ANNEXURE 6.3 (GOVERNMENT PROPERTY)

| Sl. No. (Structure) | District | Village / Hamlet | 1. Residential 2. Commercial 3.Govt. 4.Religious 5. Community 6. Other | Distance from PCL | Length along the road | Width perpendicular to the Road | No of Floor | 1. Katcha 2. Semi-pucca 3. Pucca 4. Thatched 5. Wooden/ Kiosk | Name of Owners/ Head of the Household /Interested person (in case of Govt./Religious/ Community specify its usage and name department/ care taker) |
|---|---|---|---|---|---|---|---|---|---|
| RHS | Rangareddy | Kankermavidi | Govt | 15 | 17.3 | 3 | 1 | Pucca | Kankamoudi Bus stop |
| LHS | Rangareddy | Indra Nagar Reddy | Govt | 18 | 8 | 2 | 1 | Pucca | Power Station karnataka |
| LHS | Rangareddy | Chittan Palli | Govt | 10 | 6 | 5 | 1 | Katcha | Bus Stop |
| LHS | Rangareddy | Kandlapally | Govt | 7 | 3 | 2 | 1 | Katcha | Kandapalli Bus Stop |
| RHS | Rangareddy | Tholakatta | Govt | 6.5 | 6.1 | 3.5 | 1 | Pucca | Thol Kutta Bus Stop |

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|---|---|---|---|---|---|---|---|---|---|
| RHS | Rangareddy | Mudimulle | Govt | 16 | 8 | 6 | 1 | Pucca | Kaudada Bus Stand |
| RHS | Rangareddy | Damara Giddu | Govt | 16 | 8 | 6 | 1 | Pucca | Damara Giddu Bus Stop |
| RHS | Rangareddy | Mirzaguda | Govt | 12 | 3 | 3 | 1 | Pucca | Mirzaguda Bus Stand |
| RHS | Rangareddy | Indra Nagar | Govt | 12 | 7 | 3 | 1 | Pucca | Bus Stand |
| RHS | VKB | Chenamongal | Govt. | 18.5 | 30 | 20 | 1 | Pucca | Changmoute Police Station |
| LHS | VKB | Chenamongal | Govt. | 19.5 | 30 | 40 | 1 | Pucca | Police Station |

**ANNEXURE 6.3 (COMMUNITY PROPERTY)**

| Sl. No. (Structure) | District | Village / Hamlet | 1. Residential 2. Commercial 3.Govt. 4.Religious 5. Community 6. Other | Distance from PCL | Length along the road | Width perpendicular to the Road | No of Floor | 1. Katcha 2. Semi-pucca 3. Pucca 4. Thatched 5. Wooden/ Kiosk | Name of Owners/ Head of the Household /Interested person (in case of Govt./Religious/ Community specify its usage and name department/ care taker) |
|---|---|---|---|---|---|---|---|---|---|
| LHS | Rangareddy | Aziz Nagar | Community | 10 | 100 | 200 | 1 | Pucca | VRK Women Medical Collage |
| LHS | Rangareddy | Aziz Nagar | Community | 10 | 100 | 200 | 1 | Pucca | VRK Women Tech Collage |
| RHS | Rangareddy | Chibel | Community | 16 | 100 | 80 | 1 | Semi Pucca | Sujata Arts & Residential School (B.Wall) |
| RHS | Rangareddy | Chibel | Community | 10 | 18 | 25 | 1 | Pucca | Hi Point College of Engineering. (B.Wall) |
| RHS | Rangareddy | Chibel | Community | 10 | 6 | 2 | 1 | Pucca | Ayan Institute Of Medical Science |
| RHS | Rangareddy | KankerMavidi | Community | 11 | 8 | 6 | 1 | Pucca | AIMS College(B.Wall) |
| RH | Rangaredd | Tholakatta | Communit | 15 | 60 | 40 | 1 | Pucca | KNR Concept High School |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S | y | | y | | | | | | |
| RHS | Rangareddy | Tholakatta | Community | 18 | 24 | 25 | 1 | Pucca | Golden Function Hall |
| RHS | Rangareddy | Chevella | Community | 17 | 18 | 10 | 1 | Pucca | Sl Kabeeb College |
| LHS | Rangareddy | Kathireddy Palli | Community | 17 | 1 | 1 | 1 | Pucca | Chatrapati Shivaji Statue |
| RHS | Rangareddy | Chittan palli | Community | 9 | 4 | 4 | 1 | Pucca | Indera Reddy statue |

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# CHAPTER 8 - PRELIMINARY COST ESTIMATES

## Hyderabad - Manneguda Road

# CHAPTER 8. PRELIMINARY COST ESTIMATE

## 8.1 GENERAL

Cost estimation is an important aspect for the feasibility study as it provides vital input to the economic and financial evaluation of the project. The cost estimates have been prepared for the project corridor separately for widening the existing road to a four lane carriageway including strengthening of the existing pavement, strengthening / widening of existing bridge structures, construction of new bridges, rehabilitation and reconstruction/widening of cross drainage structures, longitudinal drains, junction improvements, road furniture, Bus Bays, Truck Lay bye, toll plazas etc.

The cost estimates have been prepared to cover the cost of the project road from Hyderabad (ORR) design Ch 14.000 to design Ch. 60.391 at Manneguda for a length of 46.391 Kms.

## 8.2 METHODOLOGY

Estimation of Preliminary cost, a primary pre-requisite for Economic and Financial evaluation, has been carried out. The process involved in the preliminary cost estimation has been described in this chapter.

### 8.2.1 Basic Rates

The rate analysis has been carried out on the basis of STANDARD DATA BOOK for analysis of unit rates (First revision) MoRT&H and adopting Standard Schedule of Rates provided by Government of Andhra Pradesh (I&CAD Department) for the year 2018-19, Board of Chief Engineers. The basic rates for each construction items are analyzed on the basis of material study, the prices of construction materials collected from various sources and on the anticipated distance between source and the site of work. For items where rates are not available, the rates are adopted as per previous experience of the consultant / Market.

### 8.2.2 Summary of Adopted Rates

Summary of rates for major construction items are presented in Table 8-1.

**Table 8-1. Summary of Rates for major construction items**

| Sl. No. | Description | Unit | Rate in Rs. |
|---|---|---|---|
| 1 | Sub-grade | cum | 440.50 |
| 2 | GSB | cum | 1735.65 |
| 3 | WMM | cum | 2224.17 |
| 4 | Primer coat | Sq.m | 47.00 |
| 5 | Tack coat with 0.20kg/ sqm | Sq.m | 9.00 |
| 6 | DBM | cum | 6792.05 |
| 7 | BC (Grading-I) | cum | 7967.57 |
| 8 | PCC M15 | cum | 4974.15 |
| 9 | RCC M35 | cum | 5879.89 |
| 10 | HYSD Bars | MT | 66139.00 |

### 8.2.3 Quantification of Items

The quantification of most of the items that are commonly occurring is calculated based on the typical cross sections for entire length of the project. The quantification of bridges and structures are based on the structure drawings. For other project facilities, quantification has been carried out based on the actual site requirement.

The construction items covered in cost estimates are:

**For Road works:-** Site Clearance, Earthwork in New Embankment, Sub-Base and Base Courses, Bituminous works for Main carriage way, Major and Minor junctions and Bus bay

**For Structures:** - Cross Drainage works, Minor Bridges, Major Bridges and VUP

**For Other Facilities:** - Traffic signs, Road Marking and Other Appurtenances, Drainage and Protective works, Electrical works, Toll Plaza, etc.

### 8.2.4 Cost of Strengthening / Widening of Carriageway

Estimates have been worked out on the basis of typical cross section as per the difference in levels for Embankment in new/widening stretches. Some of the adopted rates are as per the prevailing rates for similar works in region by other agencies and consultant's experience in the surrounding area.

### 8.2.5 Bridges, Culverts & Other Structures

The rates of the structures were worked out as per rate analysis. The costs of Structures are derived for individual items as per the drawings and for individual structures.

### 8.2.6 Repairs to Bridges & Culverts

A study of the existing Bridges and Culverts has been carried out to ascertain the structure to be retained or reconstructed and the cost of the Repairs, Rehabilitation, and up-gradation is worked out by experienced bridge engineers and re-habilitation experts. The cost thus arrived is included in the cost estimate for bridges and structures.

### 8.2.7 Junction Improvements and other miscellaneous works

Rates for composite items such as junction improvement, Bus bays, Truck Lay byes and Toll Plazas are derived on the basis of typical designs.

## 8.3 ABSTRACT COST

Abstract of estimated costs for improvement of roads, bridges, culverts are presented in Table 8-2.

Table 8-2. Abstract of Cost Estimates for Improvement of Hyderabad–Manneguda Section Road

ABSTRACT OF COST ESTIMATE FOR (Hyderabad (ORR) - Manneguda (Ex. km 14+000 to Ex. km 60+000))

| BILL NO. | BILL NAME | Total Amount in Rs | Total Amount in Cr. | Total Amount in % |
|---|---|---|---|---|
| | CIVIL CONSTRUCTION COST | | | |
| 1 | Site Clearance and Dismantling | 2,36,98,663 | 2.37 | 0.30% |
| 2 | Earth Work | 1,59,41,45,515 | 159.41 | 20.05% |
| 3 | Granular Sub-Base and Base Courses | 1,31,18,38,537 | 131.18 | 16.50% |
| 4 | Bituminious Works | - | - | 0.00% |
| 4A | Flexible Pavement | 1,15,44,90,350 | 115.45 | 14.52% |
| 4B | Rigid Pavement | - | - | 0.00% |
| 5 | CULVERTS | | - | 0.00% |
| 5A | Box Culvert | 32,80,54,462 | 32.81 | 4.13% |
| 5B | Pipe Culvert | 1,59,83,333 | 1.60 | 0.20% |
| 6 | BRIDGES | | - | 0.00% |
| 6A | Repair & Rehabilitation of Structures | - | - | 0.00% |
| 6B | Major Bridges | - | - | 0.00% |
| 6C | Minor Bridges | 2,08,90,972 | 7.09 | 0.89% |
| 6D | VUP | 1,33,84,78,232 | 133.85 | 16.83% |
| 6E | PUP/LVUP | 65,80,86,138 | 65.81 | 8.28% |
| 6F | CUP | - | - | 0.00% |
| 6G | ROB | - | - | 0.00% |
| 6H | Flyover and Overpass | - | - | 0.00% |
| 7 | Drainage, Protective Works & Other Services | 69,51,18,685 | 69.51 | 8.74% |
| 8 | Junctions | 3,34,60,757 | 3.35 | 0.42% |
| 9 | Traffic Signs, Road Marking, and Other Appurtenances | 30,52,75,001 | 30.53 | 3.84% |
| 10 | Miscellaneous | 8,47,19,255 | 8.47 | 1.07% |
| 11 | Maintenance of Road during construction | - | - | 0.00% |
| 12 | Toll Plaza Construction (Inc. Road works, Structure Lane, Toll Plaza Equipments, Crane Highway Patrol) | 23,39,03,996 | 23.39 | 2.94% |
| 13 | ATMS, Highway Rest Mini and Toilet Blocks | 10,26,32,072 | 10.26 | 1.29% |
| | TOTAL CIVIL COST (YR: 2018-2019) | 7,95,07,71,958 | 795.08 | |
| | TOTAL CIVIL COST + GST - 12% | 8,90,48,64,593 | 890.49 | |
| | Civil Cost per Km (Length of Project Highway-46.391 kms) | 19.20 | | |
| | TOTAL PROJECT COST (As per ministry circular dated 9th May, 2018, for HAM project 14% of Civil Cost) | 10,15,15,45,636 | 1,015.15 | |
| | (i) LA & R&R Cost | 88,54,00,000 | 88.54 | |
| | (ii) Diversion of Forest Land | 25,00,00,000 | 25.00 | |
| | (iii) Utility shifting , Electrical and other preconstrucion activities | 27,88,00,000 | 27.88 | |
| | (iv) Contingencies @ 1% of Civil Cost, as per Circular dated 9th May, 2018 | 8,90,48,646 | 8.90 | |
| | TOTAL CAPITAL COST | 11,65,47,94,282 | 1,165.48 | |
| | Total Capital Cost per Km | 25.12 | | |

# CHAPTER 9 - ECONOMIC ANALYSIS

## Hyderabad - Manneguda Road

# CHAPTER 9 ECONOMIC ANALYSIS

## 9.1 GENERAL

This Chapter summarizes the Economic Analysis for recommendations of improvements and developments of the existing road.

## 9.2 ECONOMIC ANALYSIS

The Construction of roads brings about a variety of benefits that are enjoyed practically by all sectors of the economy. Scarcity of resources and competing demands from various sectors are the important features of a developing economy. It therefore becomes extremely necessary to allocate the scarce resources in the most beneficial manner. In view of the above, it is necessary to ensure that the projects selected for investment are thoroughly evaluated to determine the economic and social benefits offered by the project and the ease with which the project can be implemented. Highway economic analysis is a technique wherein the cost and benefits of a scheme are quantified over a selected time horizon and evaluated by a common yardstick.

The economic analysis involves comparison of project costs and benefits under the "with" and "without" project conditions and determining the Economic Internal Rate of Return (EIRR) of the project using discounted cash flow technique. This show the returns, which the society could expect from the proposed investment during the project life, i.e. analysis period.

The project is further subjected to sensitivity analysis by assessing the effects of adverse changes in the key variables on the base EIRR. In this, project cost the worst scenario of increased by 15 percent and benefits are reduced by 15 percent. In addition, the combined effect of these changes is also assessed. This helps to gauge the economic strength of the project to withstand future risks and uncertainties.

### 9.2.1 Basic Approach of Economic Analysis

The main motto to carry out economic feasibility is to maximize the return on investment by determining appropriate improvement proposals that lead to minimum total transport costs. Economic evaluation is carried out based on incremental costs and benefits comparing the total net benefits in "Do Minimum" situation and "With Project" situation. The term "Do Minimum" is defined as the base strategy for economic analysis i.e. without project situation. The term "With Project" is defined as Rehabilitation and Upgrading to 4-Lane with paved shoulder Configuration of the project road.

## 9.3 MODEL USED

Economic analysis was carried out using HDM-4 model. HDM-4 model is a highway design and maintenance program for analyzing the total costs of alternative improvements and maintenance strategies.

### 9.2.2 Overview of HDM-IV

The Highway Design and Maintenance Standards Model (HDM-III), developed by the World Bank, has been used for over two decades to combine technical and economic appraisals of road projects, to prepare road investment programmes and to analyze road network strategies. The International Study of Highway Development and Management (ISOHDM) has been carried out to extend the

scope of the HDM-III model, and to provide a harmonized systems approach to road management, with adaptable and user-friendly software tools. This has produced the Highway Development and Management Tool (HDM-4). The scope of HDM-4 has been broadened considerably beyond traditional project appraisals, to provide a powerful system for the analysis of road management and investment alternatives. Emphasis was placed on collating existing knowledge, rather than undertaking extensive new empirical studies, although some limited data collection was undertaken. Wherever possible, creative new approaches were developed for applying up-to date knowledge to the technical problems and management needs of different countries.

### 9.2.3 Objectives of the HDM-4 Development

The various versions of the models have been widely used in a number of countries, and have been instrumental in justifying increased road maintenance and rehabilitation budgets. These models have been used to investigate the economic viability of road projects in over 100 countries and to optimize economic benefits to road users under different levels of expenditures. As such, they provide advanced road investment analysis tools with broad-based applicability in diverse climates and conditions. However, it was recognized that there was a need for a fundamental redevelopment of the various models to incorporate a wider range of pavements and conditions of use, and to reflect modern computing practice and expectations.

The technical relationships contained in RTIM3 and HDM-III models were 10 years old by 1995. Although much of the road deterioration models were still relevant, there was a need to incorporate the results of the extensive research that had been undertaken around the world in the intervening period. In the case of vehicle operating costs, it was recognized that vehicle technology has improved dramatically since 1980 as a result of which typical vehicle operating costs could be significantly less than those predicted by RTIM3 and HDM-III models. It was therefore necessary to update the technical relationships to reflect the present conditions. Whilst most applications of the various models have been utilized in developing countries, in recent years many industrialized countries have begun to make use of these models. This has resulted in the need for additional capabilities to be included, such as models for:

- Traffic congestion effects
- Cold climate effects
- A wider range of pavement types and structures
- Road safety
- Environmental effects (energy consumption, traffic noise and vehicle emissions)

### 9.2.4 The Role of HDM-4 in Highway Management

When considering the applications of HDM-4, it is necessary to look at the highway management process in terms of the following functions:

- Planning
- Programming
- Preparation
- Operations

Each of these functions is carried out as a sequence of activities known as the management cycle

**Planning**

Planning involves the analysis of the road system as a whole, typically requiring the preparation of medium to long term, or strategic, estimates of expenditure for road development and preservation under various budget and economic scenarios. Predictions may be made on road network conditions under a variety of funding levels in terms of key indicators together with forecasts of required expenditure under defined budget heads. The Physical highway system is usually characterized at the planning stage by

- Characteristics of the road network
  Grouped in various categories and defined by parameters such as:
  - Road class or hierarchy
  - Traffic flow/loading/congestion
  - Pavement types
  - Pavement condition
- Length of road in each category
- Characteristics of the vehicle fleet which uses the road network

The results of the planning exercise are of most interest to senior policy makers in the roads sector, both political and professional. A planning unit will often undertake this work.

**Programming**

Programming involves the preparation of multi-year roadwork and expenditure programmes in which sections of the network likely to require maintenance, improvement or new construction, are selected and analyzed under budget constraints. It is a tactical planning exercise. Ideally, cost-benefit analysis should be undertaken to determine the economic feasibility of each set of works. The physical road network is considered at the programming stage on a link-by-link basis, with each link characterized by homogeneous sections defined in terms of physical attributes. The programming activity produces estimates of expenditure in each year, under defined budget heads, for different types of roadwork and for each road section. Budgets are typically constrained, and a key aspect of programming is to priorities the road works in order to find the best use of the constrained budget. Typical applications are the preparation of a budget for an annual or a rolling multi-year work programme for a road network or sub-network. Managerial-level professionals within a road organization normally undertake programming activities, perhaps within a planning or a maintenance department.

**Preparation**

This is the short-term planning stage where road schemes are packaged for implementation. At this stage, designs are refined and prepared in more detail; bills of quantities and detailed costing are made, together with work instructions and contract documents. Detailed specifications and costing are likely to be drawn up, and detailed cost-benefit analysis may be carried out to confirm the feasibility of the final scheme. Works on adjacent road sections may be combined into packages of a size that is cost-effective for execution. Typical preparation activities are the detailed design of:

- Pavement improvement scheme
- Road improvement works

For example, construction along a new alignment, road widening, pavement reconstruction, etc. Normally for these activities, budgets will have been already approved. Preparation activities are normally undertaken by middle to junior professional staff and technicians within a design or implementation department of a road organization, and by contracts and procurement staff.

Operations

These activities cover the on-going operation of an organization. Decisions about the management of operations are made typically on a daily or weekly basis, including the scheduling of work to be carried out, monitoring in terms of man power, equipment and materials, the recording of work completed, and use of this information for further monitoring and control. Activities are normally focused on individual sections or sub-sections of a road, with measurements often being made at a relatively detailed level. Operations are normally managed by sub-professional staff, including works supervisors, technicians, clerks of works, and others. As the management process moves from Planning through to operations, it will be seen that changes occur to the data required. The data detail starts as a coarse summary but progressively moves towards a detailed level.

### 9.2.5 Various costs considered:

The costs considered comprise agency costs and road user costs as listed below:

- ✓ Society Costs
  1) Agency Costs
  2) Road Users Costs
- Agency costs
  - Construction Costs
  - Operation and maintenance Costs
- Road User Costs
  - Vehicle Operating Costs
  - Travel Time Costs
  - Congestion Costs

The agency costs comprise the costs of road construction, Operation and maintenance. Road user's costs comprise vehicle operating costs grouped into time and distance dependent costs. Road congestion costs imply increased vehicle operating costs as a result of increased travel time and consumption of fuel and lubricants, etc.

Road users experience different costs in "with project" and "without project" conditions. The benefits to road users are constituted by the savings in costs. Increasing traffic volumes as a result of the project implies more vehicle kilometers and hence more vehicles operating costs and, possibly showing more saving in with project conditions viz. benefits as result of the project. All costs for the economic analysis are given in economic terms thus ignoring transfers in the form of taxes and duties.

**Methodology**

The main aim is to carry out economic viability. Economic evaluation is carried out based on improvement costs & benefits comprising the total net benefits in "Do minimum" situation with "With Project "situation. The term "Do minimum" is defined as the base strategy for economic analysis i.e. without project situation. The term "With Project" is defined as Rehabilitation and Upgrading to 4-lane with paved shoulders configuration.

### 9.2.6 Inputs to the Model

| | |
|---|---|
| Analysis period | 17 years |
| Discount rate | 12 % |
| Construction Period | 2 years |
| Design life | 17 years |
| Standard Conversion factor | 0.85 |

### 9.2.7 Base year Traffic by Composition and Growth rates

The AADT values of base year (2013-14), its composition and growth rates have been adopted from Chapter 5 of this report

### 9.2.8 Project Cost

The project cost includes construction cost, routine maintenance cost during construction period, social and environmental cost (land acquisition, structure acquisition, R & R, environmental cost.

The construction cost includes cost of Rehabilitation and Upgrading to 4-Lane with Paved shoulders configuration. Economic cost has been worked out by converting the financial cost using standards conversion factor of 0.85.

### 9.2.9 Results of Economic Appraisal

Economic Internal Rate of Return (EIRR) for 30 years for the project for the Flexible Pavement option is given in the Table 9-1.

**Table 9-1 Results of Economic Appraisal**

| Total Length (km) | EIRR (%) |
|---|---|
| 36.791 | 29.12 |

# CHAPTER 10 – FINANCIAL ANALYSIS

## Hyderabad - Manneguda Road

# CHAPTER 10 FINANCIAL ANALYSIS

## 10.1 General

The project was also analyzed on Hybrid Annuity Model for PPP projects. Hence, the project financials have been worked out as per the Model Concession Agreement for PPP in Hybrid Annuity Projects issued in November 2015 by Government of India.

## 10.2 Key assumptions

The main assumptions made for undertaking the financial analysis are as follows:

- **Project Cost:** The EPC/civil cost of the project has been considered as Rs. 890.49 crore
- **Period of Analysis:** The construction period for the project has been assumed as 30 months. Total concession period including construction period is considered as 17.5 years (2.5 Years Construction Period + 15 Years Operation Period)
- **Project Phasing:** The development phasing for the Project has been considered is given in **Table 10-1** below.

**Table 10-1: Development Phasing Considered for the Project**

| | 2020 | 2021 | 2022 |
|---|---|---|---|
| Construction Phasing | 40% | 40% | 20% |

- **Depreciation Rate** is taken as below:

| | |
|---|---|
| For Tax calculation | Amortization of the project cost CBDT Circular 9 of 2014 dated 23 April 2014 |
| For Booking Purpose | Amortization of the Project Cost (intangible assets) as per Schedule II to the 2013 Companies Act |

- **A Debt-Equity** ratio of 70:30 has been assumed.
- **An inflation factor** of 5% (and hence, price index multiple of $(1.05)^n$, where 'n' is number of years from appointed date, is considered. This factor is used to ascertain year on year escalation in O&M Costs*.
- **Bid variable** for the project is considered to be the **Bid Project Cost** and **O&M Cost** (for first year) as determined by various bidders at the time of bidding.
- 40% of **Bid Project Cost** as bid by the Concessionaire adjusted to price index multiple will be payable to the Concessionaire by the Authority in five equal installments during construction period. Remaining 60% of the same will be payable over next 15 years of operation period along with applicable interest and O&M support.
- An interest component is considered to be payable to the concessionaire at the rate of **Bank Rate plus 3%** on outstanding balance of the Completion Cost after payment of annuity every six

months till the end of concession period. Such interest amount is payable along with every biannual installment of annuity payment as per the provisions of Model Concession Agreement.

- **Taxation:** Tax cost has also been considered to get a picture of the net earnings estimated to accrue to the project. The tax rates have been taken as given in **Table 10-2**.

**Table 10-2: Tax Rates Considered for the Project**

| Details | Corporate Tax Rate | MAT Rate |
|---|---|---|
| Base Tax Rate | 30.00% | 18.50% |
| Surcharge | 12.00% | 12.00% |
| Education cess | 3.00% | 3.00% |
| Effective Rate | 34.61% | 21.34% |

While estimating the tax liability, whichever is higher of Corporate Tax or MAT, has been considered.

## 10.3 Total Project Cost (Calculated)

***These assumptions taken as per MORT&H Circular dated 10th August 2016***
The Total Project Cost is calculated in **Table 10-3**.

**Table 10-3: Total Project Cost of the Project**

| Sl. No. | Particulars | Amount (in INR Crores) |
|---|---|---|
| 1 | Civil Construction cost | 890.5 |
| 2 | Escalation | 8.9 |
| 3 | Contingency expenses @ 1% Total civil cost | 44.5 |
| 4 | **Total EPC cost (1+@+3)** | 943.9 |
| 5 | IDC | 23.9 |
| 6 | IC/Pre-Operative Expenses | 9.4 |
| 7 | Financing Charges @1% of debt | 7.6 |
| 8 | **Centages over EPC Cost (5+6+&)** | 41.0 |
| | **Total Project Cost (4+8)** | 984.9 |

## 10.4 Completion Cost

Based on the provisions as provided in provisions in MCA for Hybrid Annuity Framework, the Completion Cost of the project is given in Table 4.1

The Bid Variable Is the Bid Project Cost and the O&M Cost. For a project to be financially viable the Equity IRR should be a minimum of 15% and the project IRR should be greater than weighted average cost of capital (WACC).

The Completion Cost as defined above is linked with the Bid Project Cost. It is important to understand the difference between the terms "Bid Project Cost" and "Total Project Cost". To understand Bid Project Cost, we should focus at the Bidding Parameters of the Hybrid Annuity model:

a. The Bidding parameter consists of two parameters:
    i. Bid Project Cost (BPC) and
    ii. O &M payment for the 1st year (refer Appendix-IB of RFP).

Bids would be evaluated on the basis of the lowest assessed Bid Price (the "Bid Price"). The Bid Price shall be summation of (a) Net Present Value (NPV) of Bid Project Cost during the Concession Period and (b) NPV of O&M cost (the "O&M Cost") during the O&M Period, required by a Bidder for implementing the Project and shall be paid as per the provisions of Article 23 of the Concession Agreement.

The Bidding Variables have been set as following in order to achieve the same. Simulations have been carried out in order to achieve the minimum NPV of Bid Project Cost and O&M Cost.

| Bid Variable | (in INR Crores) |
|---|---|
| Bid Project Cost | 1187.8 |
| First year O&M Cost | 40.000 |

A bidder can play with the above two parameters and still get the same NPV.

iii. A bidder can quote a higher BPC and a lower first year O&M quote (and vice-a-versa): In this case he will get more upfront money as construction support. However, the bidder will get lower O& M Payments

iv. There are no constraints defined in the MCA on these bidding parameters. Someone can quote a higher BPC and Zero O&M quote for the first year also.

v. There is one clause in RFP which says in the event, the Bid Project Cost of the Lowest Bidder is lower by more than 10% with respect to the Estimated Project Cost, the Concessionaire shall submit an Additional Performance Security (the "Additional Performance Security" as per the provision of the Concession Agreement. The

Additional Performance Security shall be determined @ 10% of the difference in the Estimated Project Cost and the Bid Project Cost.

vi. If O&M payment is higher that means it's a deferred payment in future date which is linked with the price index.

vii. Further to clarify the query, Bid Project Cost specified herein represents the amount due and payable by the Authority to the Concessionaire and may be less than, equal to, or more than the Estimated Project Cost".

Based on these assumptions above, the completion cost is calculated as per provisions of MCA for Hybrid Annuity Model Clause 23.6 of MCA defines "Completion Cost" as the summation of A, B, C, D, E, and F below:

A. 20% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 20% Physical Progress.

B. Another 20% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 40% Physical Progress.

C. Another 20% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 60% Physical Progress.

D. Another 15% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 75% Physical Progress.

E. Another 15% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the date of report confirming 90% Physical Progress.

F. Another 10% of the Bid Project Cost adjusted for the Price Index Multiple as applicable on the Reference Index Date preceding the COD.

The value of completion cost determined this way is

**Table 10-4: Completion Cost of the Project**

| Completion Cost Calculation | | | |
|---|---|---|---|
| | **Project part** | **Price index** | **Completion cost** |
| A | 20% | 210 | 249.9 |
| B | 20% | 215 | 255.8 |
| C | 20% | 220 | 261.8 |
| D | 15% | 224 | 199.7 |

| | | | |
|---|---|---|---|
| E | 15% | 228 | 203.0 |
| F | 10% | 230 | 136.8 |
| | **Total** | | **1306.94** |

## 10.5 Financial Indicators

Based on the above stated inputs, the exercise of financial analysis has been carried out for the proposed project. The indicators estimated in the process are:

**(Post-Tax) Project - Internal Rate of Return (P-IRR)**

IRR indicates the return a project will generate over a period of time. It is that rate of discount, which makes the Net Present Value equal to zero. Internal Rate of Return on Project is the return on the total project cash flows.

**(Post-Tax) Equity - Internal Rate of Return (E-IRR)**

IRR indicates the return a project will generate over a period of time. It is that rate of discount, which makes the Net Present Value equal to zero. Internal Rate of Return on Equity (E-IRR) is the return that accrues on the equity investment. The return for viability depends upon the expectation from the investment and accounts for taxes, interest, loan repayment, etc.

### 10.5 Conclusion

The result of financial analysis for Hybrid Annuity Model is provided in Table Below:

**Table 10-5: Result of Financial Analysis**

| Sl. No. | Particulars | Result |
|---|---|---|
| 1 | Concession Period in Years | 17 |
| 2 | Construction Period in Years | 2.5 |
| 3 | Bid Project Cost in INR Crore | 1187.8 |
| 4 | O&M Cost in INR Crore (for first Year) | 40.000 |
| 5 | Project EIRR | 5.10% |
| 6 | Equity EIRR | 23.42% |
| 7 | Project NPV (for both BPC and O&M) in INR Crore | 1297.25 |

**The results are obtained after carrying out simulations (varying the bid project cost and the first year O&M quote)*

*#It may be noted that any variation in the above mentioned assumptions or the structure of the project, the results may vary significantly.*

**ANNEXURE 1 – Revenue for the Concessionaire (Operation Period: 15 years)**

*All figures in Rs. Crores

| | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annuity | 2.12 | 4.32 | 6.75 | 9.89 | 13.03 | 16.65 | 20.42 | 24.58 | 29.60 | 35.33 | 42.09 | 50.10 | 59.75 | 71.30 | 85.19 |
| Interest | 76.47 | 76.15 | 75.62 | 74.81 | 73.69 | 72.25 | 70.44 | 68.26 | 65.62 | 62.46 | 58.69 | 54.20 | 48.86 | 42.48 | 34.86 |
| O&M Payments | 48.12 | 50.52 | 53.06 | 55.71 | 58.49 | 61.42 | 64.50 | 67.72 | 71.11 | 74.66 | 78.41 | 82.33 | 86.44 | 90.77 | 95.32 |
| Sum Total | 126.70 | 130.99 | 135.43 | 140.41 | 145.22 | 150.31 | 155.35 | 160.56 | 166.33 | 172.45 | 179.18 | 186.63 | 195.06 | 204.54 | 215.37 |

**Total Payouts by the authority over the concession period:**

| | |
|---|---|
| Construction Support | 521.74 |
| Annuity | 471.12 |
| Interest | 954.84 |
| O&M Payments | 1038.57 |
| **Sum Total** | **2986.28** |

**Annuity Payment Schedule:**

Annuity payment in 30 biannual installments as per the following proportions:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.10% | 0.17% | 0.24% | 0.31% | 0.38% | 0.48% | 0.58% | 0.68% | 0.78% | 0.88% | 1.00% | 1.12% | 1.24% | 1.36% | 1.48% |

| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.65% | 1.80% | 1.97% | 2.15% | 2.35% | 2.56% | 2.80% | 3.05% | 3.33% | 3.64% | 3.97% | 4.34% | 4.74% | 5.20% | 5.65% |

# ROAD INVENTORY

FEEDBACK INFRA

Name of Highway:

Section: Hyderabad-Bapatla

| From Km | To Km | Terrain | Land use | | Name of Village/ Town | Formation Width (m) | CARRIAGEWAY | | | SHOULDER | | | Embankment Height (m) Depth of Cutting (m) | | Details of Cross Roads | | | Cross | | Road Intersections (Type & Details) | Structures | Encroachment Width of Row & Encroachment | Bridges | Existing Utilities Services (Electric Poles, Water Pipes, Telephone & Telegraph) | Land Use along the Corridor | Remarks | PHOTOS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Left | Right | | | Type | Width (m) | Condition | Type | Width (m) | Condition | Height | Depth | Provided (Nos) | Need (Nos) | Average Size Width (m) | Designated as | Status | | | | | | | | | |
| 23+100 | 23+200 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 23+200 | 23+400 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 23+400 | 23+600 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 23+600 | 23+800 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 23+800 | 24+000 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 24+000 | 24+200 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 24+200 | 24+400 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 24+400 | 24+600 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 24+600 | 24+800 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 24+800 | 25+000 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 25+000 | 25+200 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 25+200 | 25+400 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 25+400 | 25+600 | Plain | Water | Water | | | | | | | | | | | | | | | | | | | | | | | |
| 25+600 | 25+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 25+800 | 26+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 26+000 | 26+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 26+200 | 26+400 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 26+400 | 26+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 26+600 | 26+800 | Plain | Agricultural | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 26+800 | 27+000 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 27+000 | 27+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 27+200 | 27+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 27+400 | 27+600 | Plain | Agricultural | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 27+600 | 27+800 | Plain | Agricultural | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 27+800 | 28+000 | Plain | Agricultural | Agricultural | Kolli Cheruvu | | | | | | | | | | | | | | | | | | | | | | |
| 28+000 | 28+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 28+200 | 28+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 28+400 | 28+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 28+600 | 28+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 28+800 | 29+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 29+000 | 29+200 | Plain | Built up | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 29+200 | 29+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 29+400 | 29+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 29+600 | 29+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 29+800 | 30+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 30+000 | 30+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 30+200 | 30+400 | Plain | Agricultural | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 30+400 | 30+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 30+600 | 30+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 30+800 | 31+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 31+000 | 31+200 | Plain | Built up | Built up | Agricultural system | | | | | | | | | | | | | | | | | | | | | | |
| 31+200 | 31+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 31+400 | 31+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 31+600 | 31+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 31+800 | 32+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 32+000 | 32+200 | Plain | Built up | Built up | | | | | | | | | | | | | | | | | | | | | | | |
| 32+200 | 32+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 32+400 | 32+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 32+600 | 32+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 32+800 | 33+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 33+000 | 33+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 33+200 | 33+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 33+400 | 33+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 33+600 | 33+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 33+800 | 34+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 34+000 | 34+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 34+200 | 34+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 34+400 | 34+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 34+600 | 34+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 34+800 | 35+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 35+000 | 35+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 35+200 | 35+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 35+400 | 35+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 35+600 | 35+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 35+800 | 36+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 36+000 | 36+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 36+200 | 36+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 36+400 | 36+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 36+600 | 36+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 36+800 | 37+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 37+000 | 37+200 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 37+200 | 37+400 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 37+400 | 37+600 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 37+600 | 37+800 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |
| 37+800 | 38+000 | Plain | Agricultural | Agricultural | | | | | | | | | | | | | | | | | | | | | | | |

## Consultancy Services for PPP Techno-Economic Feasibility Study and Transaction Advisor for 12 State Roads in the State of Andhra Pradesh, India

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Making Infrastructure Happen

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (N/F/P/Blocked) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 23+200 | 23+400 | ER | Fair | 60-70 | F | 12% | | | | | | | | |
| 23+400 | 23+600 | ER | Fair | 60-70 | F | 15% | | | | 1(10) | | | | |
| 23+600 | 23+800 | ER | Fair | 60-70 | F | 12% | | | | | | | | |
| 23+800 | 24+000 | ER | Fair | 60-70 | F | 15% | 12% | 1(0.2) | | | | | | |
| 24+000 | 24+200 | ER | Fair | 60-70 | F | 8% | 12% | | | 6(10) | | | | 4 Lane |
| 24+200 | 24+400 | ER | Fair | 60-70 | P | 15+15% | | | M+W | | | | | |
| 24+400 | 24+600 | ER | Fair | 60-70 | P | 20+20% | | | M+W | | | | | |
| 24+600 | 24+800 | ER | Fair | 60-70 | P | 8+10% | | | M+W | 4(2)+15(20) | | | | |
| 24+800 | 25+000 | ER | Fair | 60-70 | F | 2+2% | | | | | | | | 4 Lane |
| 25+000 | 25+200 | ER | Fair | 60-70 | F | 20+15 | 25+20 | | | 4(20) | | | | 4 Lane |
| 25+200 | 25+400 | ER | Fair | 60-70 | F | 5+4 | 8+8 | | | | | | | 4 Lane |
| 25+400 | 25+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 25+600 | 25+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 25+800 | 26+000 | ER | Fair | 60-70 | G | | | | | | | | | |

PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Infrastructure Happen

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Rural Side Drain (NE/PF/F)*** | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 26+000 | 26+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 26+200 | 26+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 26+400 | 26+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 26+600 | 26+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 26+800 | 27+000 | ER | Fair | 60-70 | G | | | | | | | | | PH-383, 384 Good condition road |
| 27+000 | 27+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 27+200 | 27+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 27+400 | 27+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 27+600 | 27+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 27+800 | 28+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 28+000 | 28+200 | ER | Fair | 60-70 | F | 30 | 25.0 | | M | 2(15) | | | | |
| 28+200 | 28+400 | ER | Fair | 60-70 | F | 30 | 20.0 | | M | 1(20) | | | | |
| 28+400 | 28+600 | ER | Fair | 60-70 | F | 20 | 30.0 | | M | | | | | |
| 28+600 | 28+800 | ER | Fair | 60-70 | F | 12 | 25.0 | | M | 1(20) | | | | |

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PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (VP/P/F/G) | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 28+800 | 29+000 | ER | Fair | 60-70 | F | 15 | 20.0 | | M | | | | | |
| 29+000 | 29+200 | ER | Fair | 60-70 | P | 20 | 20.0 | | | 2(15) | | | | |
| 29+200 | 29+400 | ER | Fair | 60-70 | P | 30 | 20.0 | 3(5) | | 4(20) | | | | |
| 29+400 | 29+600 | ER | Fair | 60-70 | P | 30 | 20.0 | | M | | | | | |
| 29+600 | 29+800 | ER | Fair | 60-70 | P | 25 | 30.0 | | S | | | | | PH- 381, 382 Major crack |
| 29+800 | 30+000 | ER | Fair | 60-70 | P | 15 | 10.0 | | S | | | | | |
| 30+000 | 30+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 30+200 | 30+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 30+400 | 30+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 30+600 | 30+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 30+800 | 31+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 31+000 | 31+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 31+200 | 31+400 | ER | Fair | 60-70 | G | | | | | 1(5) | | | | |
| 31+400 | 31+600 | ER | Fair | 60-70 | G | | | | | | | | | |

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

# PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Infrastructure Happen

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/Pavee) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 31+600 | 31+800 | ER | Fair | 60-70 | F | | 5.0 | | | | | | | |
| 31+800 | 32+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 32+000 | 32+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 32+200 | 32+400 | ER | Fair | 60-70 | G | 12 | 10.0 | | M | | | | | |
| 32+400 | 32+600 | ER | Fair | 60-70 | P | 12 | 15.0 | 3(3) | S | | | | | |
| 32+600 | 32+800 | ER | Fair | 60-70 | P | 5 | 12.0 | 2(0.3) | M | | | | | |
| 32+800 | 33+000 | ER | Fair | 60-70 | P | 5 | 8.0 | 2(0.2) | M | | | | | |
| 33+000 | 33+200 | ER | Fair | 60-70 | F | 5 | 18.0 | | | | | | | |
| 33+200 | 33+400 | ER | Fair | 60-70 | F | 4 | 15.0 | | M | | | | | |
| 33+400 | 33+600 | ER | Fair | 60-70 | F | 4 | 20.0 | 1(0.2) | M | | | | | |
| 33+600 | 33+800 | ER | Fair | 60-70 | F | 3 | 15.0 | | | | | | | |
| 33+800 | 34+000 | ER | Fair | 60-70 | F | 4 | 10.0 | | M | | | | | |
| 34+000 | 34+200 | ER | Fair | 60-70 | F | 2 | 10.0 | | M | | | | | |
| 34+200 | 34+400 | ER | Fair | 60-70 | F | 2 | 8.0 | | M | | | | | |

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PAVEMENT CONDITION SURVEY

FEEDBACK INFRA
Making Infrastructure Happen

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PE/Poor) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 34+400 | 34+600 | ER | Fair | 60-70 | F | | 6.0 | | | | | | | |
| 34+600 | 34+800 | ER | Fair | 60-70 | F | | 5.0 | 1(0.2) | | | | | | |
| 34+800 | 35+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 35+000 | 35+200 | ER | Fair | 60-70 | G | | | 1(0.1) | | | | | | |
| 35+200 | 35+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 35+400 | 35+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 35+600 | 35+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 35+800 | 36+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 36+000 | 36+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 36+200 | 36+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 36+400 | 36+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 36+600 | 36+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 36+800 | 37+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 37+000 | 37+200 | ER | Fair | 60-70 | G | | | | | | | | | Road condition is good |

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Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

## PAVEMENT CONDITION SURVEY

SHEET No

FEEDBACK INFRAA
Making Infrastructure Happenen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/F)**** | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 37+200 | 37+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 37+400 | 37+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 37+600 | 37+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 37+800 | 38+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 38+000 | 38+200 | ER | Fair | 60-70 | G | | | | | | | | | road condition is good |
| 38+200 | 38+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 38+400 | 38+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 38+600 | 38+800 | ER | Fair | 60-70 | G | | | | | | | | | |
| 38+800 | 39+000 | ER | Fair | 60-70 | G | | | | | | | | | |
| 39+000 | 39+200 | ER | Fair | 60-70 | G | 12 | 8.0 | 2(0.3) | | | | | | |
| 39+200 | 39+400 | ER | Fair | 60-70 | G | 8 | 15.0 | | M | | | | | |
| 39+400 | 39+600 | ER | Fair | 60-70 | G | 10 | 10.0 | | | | | | | |
| 39+600 | 39+800 | ER | Fair | 60-70 | G | 5 | 10.0 | 1(0.3) | | | | | | |
| 39+800 | 40+000 | ER | Fair | 60-70 | G | 25 | 20.0 | 3 | | | | | | Major crack |

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/F)**** | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 40+000 | 40+200 | ER | Fair | 60-70 | F | 15 | 10.0 | | | | | | | |
| 40+200 | 40+400 | ER | Fair | 60-70 | F | 15+20 | 8+15 | 4(5) | M | | | | | 4 Lane road |
| 40+400 | 40+600 | ER | Fair | 40-50 | F | 15+15 | 10+10 | 3(21) | M | | | | | |
| 40+600 | 40+800 | ER | Fair | 40-50 | VP | 20+20 | 15+15 | 1(5) | | | | | | PH-286 |
| 40+800 | 41+000 | ER | Fair | 40-50 | VP | 10 | 15+10 | 5+4 | | | | | | |
| 41+000 | 41+200 | ER | Fair | 40-50 | VP | 15+15 | 10+8 | 3(25)+1(1) | M | | | | | |
| 41+200 | 41+400 | ER | Fair | 40-50 | VP | 20+20 | 10+10 | 3(10)+3(5) | S | | | | | Potholing, 378, 379 |
| 41+400 | 41+600 | ER | Fair | 40-50 | VP | 15+15 | 7+7 | 3(8) | | | | | | |
| 41+600 | 41+800 | ER | Fair | 40-50 | VP | 25+25 | 10+10 | 5(5) | M | | | | | |
| 41+800 | 42+000 | ER | Fair | 40-50 | VP | 20+20 | 8+8 | 5(8)+6(15) | M | | | | | |
| 42+000 | 42+200 | ER | Fair | 40-50 | VP | 15+20 | 10+15 | 3(4) | | | | | | 4 Lane road |
| 42+200 | 42+400 | ER | Fair | 40-50 | VP | 20+20 | 15+15 | 3(5)+2(2) | | | | | | |
| 42+400 | 42+600 | ER | Fair | 40-50 | VP | 25+20 | 10+10 | 4(8)+4(3) | | | | | | |

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PAVEMENT CONDITION SURVEY

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

FEEDBACK INFRAA
Making Infrastructure Happen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (N/U/P/F) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 42+600 | 42+800 | ER | Fair | 40-50 | VP | 10+15 | 15+15 | 4(3)+3(2) | M | | | | | Ph-376, 377 Potholing, ravelling |
| 42+800 | 43+000 | ER | Fair | 40-50 | VP | 4+4 | 10+10 | 3(3)+2(3) | M | | | | | 4 lane road |
| 43+000 | 43+200 | ER | Fair | 40-50 | F | 10 | 15 0 | 2(0 3) | | | | | | |
| 43+200 | 43+400 | ER | Fair | 60-70 | F | 10 | 10 0 | | M | | | | | |
| 43+400 | 43+600 | ER | Fair | 60-70 | F | 15 | 35.0 | | M | | | | | |
| 43+600 | 43+800 | ER | Fair | 60-70 | F | 10 | 15.0 | | | | | | | |
| 43+800 | 44+000 | ER | Fair | 60-70 | F | 10 | 20 0 | | M | | | | | |
| 44+000 | 44+200 | ER | Fair | 60-70 | P | 10 | 15.0 | | M | | | | | |
| 44+200 | 44+400 | ER | Fair | 60-70 | VP | 20 | 25 0 | 4(5) | S | | | | | Major crack Ph-372, 375 |
| 44+400 | 44+600 | ER | Fair | 60-70 | P | 12 | 20.0 | 4(8) | M | | | | | |
| 44+600 | 44+800 | ER | Fair | 60-70 | P | 12 | 18 0 | 3(10) | M | | | | | |
| 44+800 | 45+000 | ER | Fair | 60-70 | P | 15 | 15.0 | 2(5) | | | | | | |
| 45+000 | 45+200 | ER | Fair | 60-70 | F | 22 | 20 0 | | M | | | | | |
| 45+200 | 45+400 | ER | Fair | 60-70 | F | 15 | 20 0 | | M | | | | | |

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PAVEMENT CONDITION SURVEY

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

FEEDBACK INFRA
Making Infrastructure Happen

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (Y/N/Partial) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 45+400 | 45+600 | ER | Fair | 60-70 | F | 10 | 5.0 | 3(0.3) | | | | | | |
| 45+600 | 45+800 | ER | Fair | 60-70 | F | 10 | 6.0 | | | | | | | |
| 45+800 | 46+000 | ER | Fair | 60-70 | F | 2 | 8.0 | | | | | | | |
| 46+000 | 46+200 | ER | Fair | 60-70 | F | 5 | 15.0 | | M | | | | | |
| 46+200 | 46+400 | ER | Fair | 60-70 | F | 2 | 10.0 | | | | | | | |
| 46+400 | 46+600 | ER | Fair | 60-70 | F | | 15.0 | | | | | | | |
| 46+600 | 46+800 | ER | Fair | 60-70 | F | 15 | 15.0 | | | | | | | |
| 46+800 | 47+000 | ER | Fair | 60-70 | P | 25 | 10.0 | 2(2) | M | 16(10) | | | | |
| 47+000 | 47+200 | ER | Fair | 60-70 | VP | 23 | 15.0 | 2(1) | M | 4(15) | | | | Major Crack ph-371 |
| 47+200 | 47+400 | ER | Fair | 60-70 | VP | 20 | 10.0 | | M | 3(10) | | | | |
| 47+400 | 47+600 | ER | Fair | 60-70 | VP | 25 | 20.0 | 3(10) | M | | | | | |
| 47+600 | 47+800 | ER | Fair | 60-70 | P | 20 | 15.0 | | | | | | | |
| 47+800 | 48+000 | ER | Fair | 60-70 | P | 10 | 30.0 | 1(0.1) | M | | | | | |
| 48+000 | 48+200 | ER | Fair | 50-60 | P | 12 | 40.0 | | M | | | | | Ph- 368, 369 Ravelling |

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

# PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Infrastructure Happenen

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PE/P)**** | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 48+200 | 48+400 | ER | Fair | 50-60 | P | 10 | 20.0 | 2(0.5) | M | | | | | |
| 48+400 | 48+600 | ER | Fair | 50-60 | P | 20 | 13.0 | 1(0.3) | M | | | | | |
| 48+600 | 48+800 | ER | Fair | 50-60 | P | 15-Jan | 10.0 | 5(2) | M | | | | | |
| 48+800 | 49+000 | ER | Fair | 50-60 | P | 10 | 8.0 | 1(2) | | | | | | |
| 49+000 | 49+200 | ER | Fair | 60-70 | P | 25 | 20.0 | 1(0.2) | M | | | | | |
| 49+200 | 49+400 | ER | Fair | 60-70 | P | 20 | 12.0 | | M | | | | | |
| 49+400 | 49+600 | ER | Fair | 60-70 | P | 8 | 20.0 | | | | | | | |
| 49+600 | 49+800 | ER | Fair | 60-70 | P | 5 | 20.0 | | | | | | | |
| 49+800 | 50+000 | ER | Fair | 60-70 | P | 5 | 10.0 | | | | | | | |
| 50+000 | 50+200 | ER | Fair | 60-70 | P | 25% | 10% | 3(2) | | | | | | |
| 50+200 | 50+400 | ER | Fair | 60-70 | P | 20% | 10% | 3(2) | | | | | | |
| 50+400 | 50+600 | ER | Fair | 60-70 | P | 25% | 10% | 12 | S | | | | | |
| 50+600 | 50+800 | ER | Fair | 60-70 | P | 4% | 4% | 1(0.2) | | | | | | |
| 50+800 | 51+000 | ER | Fair | 60-70 | P | 15% | 10% | | | | | | | Major crack 366, 367 |

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PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.13
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (V/U/P/F) | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 51+000 | 51+200 | ER | Fair | 60-70 | F | | 8% | | | | | | | |
| 51+200 | 51+400 | ER | Fair | 60-70 | F | | 5% | | | | | | | |
| 51+400 | 51+600 | ER | Fair | 60-70 | P | 15% | | 3[4] | M | | | | | |
| 51+600 | 51+800 | ER | Fair | 60-70 | P | 10% | 8% | 1[0.2] | | | | | | |
| 51+800 | 52+000 | ER | Fair | 60-70 | P | 10% | 5% | | | 2[15] | | | | |
| 52+000 | 52+200 | ER | Fair | 60-70 | P | 20% | 10% | | M | 50 | | | | Ph- 364, 365 Major crack, ravelling, rutting |
| 52+200 | 52+400 | ER | Fair | 60-70 | P | 20% | 10% | | M | 20 | | | | |
| 52+400 | 52+600 | ER | Fair | 60-70 | P | 20% | 25% | | | | | | | |
| 52+600 | 52+800 | ER | Fair | 60-70 | P | 20% | 20% | | M | | | | | RHS Ravelling, PH-362, 363 |
| 52+800 | 53+000 | ER | Fair | 60-70 | P | 20% | 20% | | M | | | | | RHS Ravelling |
| 53+000 | 53+200 | ER | Fair | 60-70 | F | 12% | 3% | | M | 3(15) | | | | |
| 53+200 | 53+400 | ER | Fair | 60-70 | F | 10% | 4% | | | 3(20) | | | | |
| 53+400 | 53+600 | ER | Fair | 60-70 | F | 6% | 2% | | | 1(10) | | | | |
| 53+600 | 53+800 | ER | Fair | 60-70 | F | 5% | 8% | | | 2(15) | | | | |

# PAVEMENT CONDITION SURVEY

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :
SHEET NO

FEEDBACK INFRA
Making Infrastructure Happen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (Y/E/PF/P)**** | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 53+800 | 54+000 | ER | Fair | 60-70 | F | 5% | 4% | | M | 1(12) | | | | |
| 54+000 | 54+200 | ER | Fair | 60-70 | P | 12% | 5% | | | 4(12) | | | | |
| 54+200 | 54+400 | ER | Fair | 60-70 | P | 10% | 5% | | | 4(10) | | | | |
| 54+400 | 54+600 | ER | Fair | 60-70 | P | 10% | 8% | 2(3) | | 2(15) | | | | |
| 54+600 | 54+800 | ER | Fair | 60-70 | P | 5% | 8% | 4(10) | M | | | | | |
| 54+800 | 55+000 | ER | Fair | 60-70 | P | 8% | 5% | 4(2) | M | | | | | PH-360, 361 |
| 55+000 | 55+200 | ER | Fair | 60-70 | G | | | | | | | | | |
| 55+200 | 55+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 55+400 | 55+600 | ER | Fair | 60-70 | G | | | | | | | | | |
| 55+600 | 55+800 | ER | Fair | 60-70 | F | | | | | | | | | |
| 55+800 | 56+000 | ER | Fair | 60-70 | P | 5% | 3% | | | 3(15) | | | | |
| 56+000 | 56+200 | ER | Fair | 60-70 | P | 15% | 5% | | | 4(25) | | | | |
| 56+200 | 56+400 | ER | Fair | 60-70 | P | 10% | 4% | | | 3(20) | | | | |
| 56+400 | 56+600 | ER | Fair | 60-70 | P | 20% | 4% | | | 4(30) | | | | POTHOLLING SECTION |

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PAVEMENT CONDITION SURVEY

FEEDBACK INFRA
Making Highway Journeys Happenen

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (VE/E/F/P/VP)**** | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 56+600 | 56+800 | ER | Fair | 60-70 | P | 20% | 5% | 2(2) | M | 8(25) | | | | |
| 56+800 | 57+000 | ER | Fair | 60-70 | P | 5% | 30% | | | 1(10) | | | | RAVELLING. POTHOLLING PH-358. |
| 57+000 | 57+200 | ER | Fair | 60-70 | P | 8% | 10% | | | | | | | |
| 57+200 | 57+400 | ER | Fair | 60-70 | P | 8% | 10% | | | | | | | |
| 57+400 | 57+600 | ER | Fair | 60-70 | P | 5% | 30% | | | | | | | Ravelling.356 |
| 57+600 | 57+800 | ER | Fair | 60-70 | P | 5% | 15% | 1(2) | | | | | | Ravelling.357 |
| 57+800 | 58+000 | ER | Fair | 60-70 | P | 8% | 3% | 1(1) | M | | | | | Ph-355 |
| 58+000 | 58+200 | ER | Fair | 60-70 | G | 2% | 2% | | | | | | | |
| 58+200 | 58+400 | ER | Fair | 60-70 | G | | | | | | | | | |
| 58+400 | 58+600 | ER | Fair | 60-70 | G | | | | | | | | | PH-353 Good condition |
| 58+600 | 58+800 | ER | Fair | 60-70 | F | 8% | 3% | | | | | | | |
| 58+800 | 59+000 | ER | Fair | 60-70 | F | 5% | 3% | | | | | | | |
| 59+000 | 59+200 | ER | Fair | 60-70 | | | | | | | | | | Road is good condition. |
| 59+200 | 59+400 | ER | Fair | 60-70 | F | | | | | | | | | |

Date :
Name of Engineer :
Direction :
Weather :

# PAVEMENT CONDITION SURVEY

Hyderabad - Birjapur Road No.12

SHEET NO

FEEDBACK INFRAA
Making Infrastructure Happen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (N.E/PF/F)*** | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |
| 59+400 | 59+600 | ER | Fair | 60-70 | F | | | | | | | | | |
| 59+600 | 59+800 | ER | Fair | 60-70 | F | | | | | | | | | |
| 59+800 | 60+000 | ER | Fair | 60-70 | F | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

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PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Higher Structure Happen

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (VG/P/F/Poor) | Remarks |
| 23+000 | 23+200 | ER | Foir | 60-70 | F | 10% | | | | | | | | |

PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA

Date :
Name of Engineer :
Direction :
Weather :

Hyderabad - Bijapur Road No.12

Sheet No :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Modereate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/F)**** | Remarks |
| 23+000 | 23+200 | ER | Fair | (blank) | F | 10% | | | | | | | | |

FEEDBACK INFRA

PAVEMENT CONDITION SURVEY

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (N/P/E/)**** | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/V/P) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)* | | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | | |

Date :
Name of Engineer :
Direction :
Weather :

Hyderabad - Bijapur (Road No.42

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Working for better tomorrow

SHEET No

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Modereate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/F)**** | Remarks |
| 23+000 | 23+200 | ER | Fair | (Nt-70) | F | 10% | | | | | | | | |

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PE/P) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | | |

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.42
Weather :

## PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Infrastructure Happen

SHEET No

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Raveling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/F)**** | Remarks |
| 23+000 | 23+200 | ER | Foir | 60-70 | F | 10% | | | | | | | | |

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PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Infrastructure Happen

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NF/P/F)*** | Remarks |
| 23+000 | 23+200 | ER | Fair | (40-70 | F | 10% | | | | | | | | |

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

# PAVEMENT CONDITION SURVEY

SHEET NO

FEEDBACK INFRAA
Making Infrastructure Happen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Modereate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NF/PF/F)**** | Remarks |
| 23+000 | 23+200 | ER | Foir | 60-70 | F | 10% | | | | | | | | |

308

307

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (V.E/P/F/P) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m²" | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m²" | | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | | |

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

PAVEMENT CONDITION SURVEY

FEEDBACK INFRAA
Making Infrastructure Happen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (NE/PF/F)**** | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Foir | 60-70 | F | 10% | | | | | | | | |

310

309

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Making ... Happenen

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

SHEET NO

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (YES/NO) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | | | | |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |

PAVEMENT CONDITION SURVEY

Date :
Name of Engineer :
Direction : Hyderabad - Bijapur Road No.12
Weather :

FEEDBACK INFRAA
Making Infrastructure Happen

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (N/E/PK/P)**** | Remarks |
| 23+000 | 23+200 | ER | Foir | 60-70 | F | 10% | | | | | | | | |

312

PAVEMENT CONDITION SURVEY

FEEDBACK INFRA

Date :
Name of Engineer :
Direction : Hyderabad - Birjapur Road No.12
Weather :

| CHAINAGE | | Shoulder | | Riding Quality | | Pavement Condition | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FROM (KM) | TO (KM) | Composition | Condition (Fair/Poor/Failed) | Speed (Km/Hr) | Quality (G/F/P/VP) | Cracking (%) | Ravelling (%) | Potholing (No. and % 100 m)** | Rut (None/Moderate/ Severe) | Patching (No. and % 100 m)** | Pavement Edge Drop (cm) | Embankment Condition (Good/Fair/Poor) | Road Side Drain (N/F/P) | Remarks |
| 23+000 | 23+200 | ER | Fair | 60-70 | F | 10% | | | | | | | | |

## INVENTORY AND CONDITION SURVEY FOR CULVERTS (LENGTH <6.0 M)

**PROJECT: Hyderabad - Bijapur Road (from 23/6 to 60/0)**

DATE:

| Sl. No. | Culvert No. | Existing Chainage | Type of Structures (Pipe / Slab / Box / Arch) | Thickness of slab | Skew Angle | Span Outer-outer | Span Arrangement (No of Piers / spans x span / Pipe dia) | Width of Culvert | Clear Carriage way | Average Vertical Clearance: EL to HR Top | HR to HR Top | SS Bottom to HR Top | HR Bottom to HR Top | Type of flow | Condition of various Issues of Culvert (G / F / P / VP): Slab / Pipe / Box / Arch | Side structure | Head wall | Wing wall | Retaining wall | Parapet / Handrail | Adequacy of Waterway | Flow Direction | Observations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Km | | m | Degrees | m | m | m | m | m | m | m | m | m | | | | | | | | | |
| 1 | 2 | 3 | 4 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 1 | | 17.500 | Pipe | | | | 1 x 0.6 | 10.4 | 10.0 | 1.2 | | | 0.60 | Rapid | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | 18.340 | Pipe | | | | 2 x 0.6 | 10.5 | 10.5 | 2.0 | | | 0.60 | Rapid | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | 19.660 | Slab+Pier | 0.35 | | | 4 x 2.0 | 23.8 | 15.6 | 1.5 | | 0.95 | 0.90 | Rapid | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | 20.100 | Slab | 0.30 | | | 1 x 5.0 | 29.0 | 25.1 | 1.2 | | 0.95 | 0.90 | Rapid | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | 21.300 | Pipe | | | | 1 x 0.6 | 11.8 | 10.0 | 1.2 | | | 0.60 | Rapid | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | 22.300 | Pipe+Slab | | | | 1 x 1.2 | 22.7 | 13.6 | 1.8 | | | 0.60 | Rapid | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | 25.210 | Pipe | | | | 1 x 0.8 | 22.5 | 21.5 | 1.6 | | 1.1 | 0.60 | Urban Drain | Pipe | | Silt | | | Silt | V | L-P | • Dense Vegetation Growth on Both side<br>• LHS Partially Silting<br>• Inlet Partially Choked |
| | | | | | | | | | | | | | | | F | | F | | | F | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | 25.900 | Pipe | | | | 1 x 0.35 | 12.0 | 11.0 | 1.5 | | 1.0 | 0.50 | Rapid | Pipe | | Silt | | | Silt | V | P - L | • Retaining Wall, Silting<br>• Dense Vegetation Growth on Both side<br>• Retaining wall damaged |
| | | | | | | | | | | | | | | | F | | F | | | F | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | 27.890 | Pipe | | | | 2 x 0.6 | 22.1 | 21.1 | 1.9 | | 1.2 | 0.75 | Urban Drain | Pipe | | Silt | | | Silt | V | L-P | • LHS Partially Silting<br>• Vegetation Growth on Both side<br>• Encroachment Development Exposed |
| | | | | | | | | | | | | | | | F | | F | | | F | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | 28.980 | Slab | 0.25 | | 1 x 3 | 1 x 3 | 11.5 | 10.5 | 2.0 | | 0.75 | 0.40 | Rapid | Slab | Silt | | | Silt | Silt | V | L-P | • Vegetation Growth on Both side<br>• Encroachment Development Exposed<br>• Retaining Wall, Silting |
| | | | | | | | | | | | | | | | F | | | | F | F | | | |
| | | | | | | | | | | | | | | | Slab | Silt | | | Silt | Silt | | | • Vegetation Growth on Both side<br>• Encroachment Development Exposed<br>• Retaining Wall, Silting |

M/s Pearlite Infrastructure Pvt.Ltd

**INVENTORY AND CONDITION SURVEY FOR CULVERTS (LENGTH <6.0 M)**

**PROJECT: Hyderabad - Bijapur Road (from 23/6 to 60/0)**

**DATE:**

| Sl. No. | Culvert No. | Existing Chainage | Type of Structures (Pipe / Slab / Box / Arch) | Thickness of Slab | Skew Angle | Span Quantity | Span Arrangement (No. of Pipe / Width of Box / Span of Arch) | Width of Culvert | Clear Carriage way | Average Vertical Clearance: GL to HR Top | Average Vertical Clearance: WL to HR Top | Average Vertical Clearance: HR Bottom to HR Top | Average Vertical Clearance: HR Bottom to HR Top | Type of flow | Condition of various features of Culvert (GOOD / FAIR / BAD): Slab / Pipe Barrel | Side Wall/Kerb | Head wall | Wing wall | Return wall | Parapet / Handrail | Adequacy of Waterway | Flow Direction | Observations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Km | | m | Degrees | nos | m | m | m | m | m | m | m | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 11 | | 29.780 | Slab | 0.38 | | 1 x 3.8 | 1 x 3 | 12.6 | 11.0 | 2.6 | | 0.8 | 0.50 | Flow | Rec | S | | | F | F | Y | L-R | |
| | | | | | | | | | | | | | | | F | | | | | | | | |
| 12 | | 31.300 | Pipe | | | 1 x 0.9 | 12.6 | 11.0 | 1.6 | | 0.9 | 0.50 | Flow | Pipe | | SSM | | | SSM | Y | L-R | * Vegetation Growth on Bothside<br>* Bothside Partially Silting. |
| | | | | | | | | | | | | | | | F | | F | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | | 32.100 | Slab | 0.30 | | 1 x 3 | 1 x 2.23 | 11.7 | 10.7 | 1.7 | | 0.9 | 0.50 | Flow | Slab | SSM | | | SSM | SSM | Y | L-R | * Vegetation Growth on Bothside.<br>* Superstructure Reinforcement Exposed<br>* Bothside Partially Silting. |
| | | | | | | | | | | | | | | | Rec | F | | | F | F | | | |
| | | | | | | | | | | | | | | | F | | | | | | | | |
| 14 | | 32.500 | Pipe | | | 1 x 0.45 | 12.2 | 11.5 | 1.0 | | 0.2 | 0.50 | Flow | Pipe | | SSM | | | SSM | N | R-L | * Vegetation Growth on Bothside.<br>* Bothside partially silting |
| | | | | | | | | | | | | | | | - | F | | | F | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | 34.900 | Slab | 0.50 | | 1 x 5 | 1 x 4.5 | 12.0 | 11.0 | 2.1 | | 1.0 | 0.50 | Flow | Slab | SSM | | | SSM | SSM | Y | L-R | * Vegetation Growth on Bothside.<br>* Superstructure Reinforcement Exposed<br>* Bothside Partially Silting. |
| | | | | | | | | | | | | | | | Rec | F | | | F | F | | | |
| | | | | | | | | | | | | | | | F | | | | | | | | |
| 16 | | 41.300 | Pipe | 1.00 | 45 | | 1 x 3.0 | 11.5 | 10.5 | 1.5 | | | 0.50 | Flow | Pipe | | SSM | | | SSM | | | |
| | | | | | | | | | | | | | | | - | | - | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | | 45.700 | Pipe | | | 2 x 0.45 | 12.2 | 11.2 | 1.3 | | 0.5 | 0.50 | Flow | Pipe | | SSM | | | SSM | N | R-L | * Vegetation Growth on Bothside.<br>* Bothside Partially Silting |
| | | | | | | | | | | | | | | | F | | F | | F | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | 47.400 | Pipe | | | 2 x 0.45 | 12.6 | 11.6 | 1.3 | - | 0.9 | 0.50 | Flow | Pipe | | SSM | | | SSM | N | L-R | * Vegetation Growth on Bothside<br>* Bothside Partially Silting.<br>* RHS Parapet Damaged |
| | | | | | | | | | | | | | | | F | | F | | F | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | 48.700 | Slab | 0.45 | | 1 x 4.5 | 1 x 4 | 12.0 | 11.0 | 2.6 | - | 0.9 | 0.45 | Flow | Slab | SSM | | | SSM | SSM | Y | R-L | * Vegetation Growth on Bothside.<br>* Bothside Partially Silting. |
| | | | | | | | | | | | | | | | Rec | F | | | F | F | | | |
| | | | | | | | | | | | | | | | F | | | | | | | | |
| 20 | | 49.900 | Slab | 0.45 | | 1 x 4.5 | 1 x 4 | 12.0 | 11.0 | 2.6 | | 0.9 | 0.50 | Flow | Slab | Slab | | | SSM | SSM | Y | R-L | * Vegetation Growth on Bothside.<br>* Superstructure Reinforcement Exposed |
| | | | | | | | | | | | | | | | Rec | F | | | F | F | | | |
| | | | | | | | | | | | | | | | F | | | | | | | | |
| 21 | | 50.300 | Pipe | | | 2 x 0.45 | 12.0 | 11.0 | - | | - | - | Flow | Pipe | | SSM | | | SSM | N | L-R | * Bothside Partially Silted<br>* Dense Vegetation Growth on Bothside. |
| | | | | | | | | | | | | | | | F | | F | | F | | | | |

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315

**INVENTORY AND CONDITION SURVEY FOR CULVERTS (LENGTH <6.0 M)**

**PROJECT: Hyderabad - Bijapur Road (from 23/6 to 60/0)**

**DATE:**

| Sl. No. | Culvert No. | Existing Chainage | Type of Structure ( Pipe / Slab / Box / Arch) | Thickness of slab | Skew Angle | Span Clear-ance | Span Arrangement (No of Pipes / span = Span / Pipe dia) | Width of Culvert | Clear Carriage way | Average Vertical Clearance: BL to HR Top | WL to HR Top | Bottom to HR Top | HR Bottom to HR Top | Type of floor | Condition of various features of Culvert: Inlet / Barrel: Slope / Pipe / Box Apron | Inlet / Barrel: Side structure | Inlet / Barrel: Head wall | Inlet / Barrel: Wing wall | Outlet / Barrel: Return wall | Outlet / Barrel: Parapet / Railing | Adequacy of Waterway | Flow Direction | Observation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Km | | m | Degrees | m | no. | m | m | m | m | m | m | m | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | 53.050 | Pipe | | | | 2 x 0.45 | 12.0 | 11.0 | 1.3 | | 0.9 | 0.89 | Hard | Pipe | | SSM | | | SSM | | | |
| | | | | | | | | | | | | | | | F | | F | | | F | Y | G - E | Vegetation Growth on Berm side<br>LHS Parapet Damaged |
| 23 | | 55.550 | Slab | 0.30 | | 1 x 2.5 | 1 x 3 | 12.0 | 11.0 | 1.3 | | 0.7 | 0.49 | Hard | Slab | SSM | | | CSM | SSM | | | |
| | | | | | | | | | | | | | | | Apr | F | | | F | F | Y | E-R | Vegetation Growth on Berm side<br>Berm side Parapet Damaged<br>Berm side Pakka Stone |
| 24 | | 56.440 | Slab | 0.50 | | 1 x 2.25 | 1 x 2.25 | 12.0 | 11.0 | 1.8 | | 0.9 | 0.58 | Hard | Slab | SSM | | | CSM | SSM | | | |
| | | | | | | | | | | | | | | | Apr | F | | | F | F | Y | E-R | Berm side Pakka Stone<br>Superstructure Reinforcement Exposed |
| 25 | | 56.850 | Pipe | | | | 2 x 0.9 | 12.0 | 11.0 | 2.1 | | 1.5 | 0.58 | Hard | Pipe | | SSM | | | SSM | | | |
| | | | | | | | | | | | | | | | F | | F | | | F | Y | E-R | Berm side Parapet Damaged<br>Vegetation Growth on Berm side |
| 26 | Spl | 57.250 | Pipe | | | | 1 x 0.6 | 12.0 | 11.0 | 2.0 | | 1.4 | 0.48 | Hard | Pipe | | SSM | | | SSM | | | |
| | | | | | | | | | | | | | | | F | | F | | | F | Y | G - E | Vegetation Growth on Berm side.<br>Berm side Pakka Stone |
| 27 | | 58.950 | Slab | 0.30 | | 1 x 2 | 1 x 2.5 | 12.0 | 11.0 | 1.5 | | 0.8 | 0.45 | Hard | Pipe | | SSM | | | SSM | | | |
| | | | | | | | | | | | | | | | F | | F | | | F | Y | E-R | Vegetation Growth on Berm side.<br>Berm side Pakka Stone |
| 28 | | 59.300 | Pipe | | | | 2 x 1 | 12.0 | 11.0 | 2.1 | | 1.0 | 0.58 | Hard | Pipe | | SSM | | | SSM | | | |
| | | | | | | | | | | | | | | | F | | F | | | F | Y | E-R | Vegetation Growth on Berm side<br>Berm side Pakka Stone |
| 29 | | 59.900 | Slab | 0.30 | | 1 x 3 | 1 x 3 | 12.0 | 11.0 | 2.1 | | 0.8 | 0.49 | Hard | Slab | SSM | | | CSM | SSM | | | |
| | | | | | | | | | | | | | | | Apr | F | | | F | F | Y | E-R | Berm side Pakka Stone<br>Vegetation Growth on Berm side |

## Origin - Destination Matrix for Car @ km 57.000 ( Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | 30 | 612 | 221 | 5 | 216 | 35 | | | | 5 | | | | | | 5 | 35 | | 15 | | | | 1179 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | 5 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | 5 |
| 6 | | | | | | | | 15 | 60 | | | 5 | | | | | | | | | | | | | | | | 5 | | 85 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 8 | 15 | | | | | 10 | | | | | | | | | | | | | | | | | | | | | | | | 25 |
| 9 | 637 | | 20 | | | 35 | | | | | | | | | | | | | | | | | | | | | | | | 692 |
| 10 | 587 | | 5 | | | 20 | | | | | | | | | | | | | | | | | | | | | | | | 612 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 421 | | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | 431 |
| 13 | 55 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 55 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 20 |
| 17 | | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | 5 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 24 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | 206 | | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | 211 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 29 | 10 | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | 15 |
| Total | 1966 | 0 | 40 | 0 | 0 | 65 | 0 | 45 | 687 | 226 | 5 | 221 | 35 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 5 | 35 | 0 | 15 | 0 | 5 | 0 | 3355 |

## Origin - Destination Matrix for Mini Bus @ km 57.000 ( Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | 12 | | | | | | | | | | | | | | | | | | | | | 12 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 8 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12 |
| 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12 |
| 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| Total | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 |

Origin - Destination Matrix for Bus @ km 37.000 ( Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | | | | | | | | 72 | 61 | | 29 | 2 | | | 2 | | | | | | | 2 | | | 2 | | | | 172 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | 2 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 9 | 61 | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | 66 |
| 10 | 91 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 91 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 52 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 52 |
| 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| Total | 233 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 74 | 61 | 0 | 29 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 410 |

Origin - Destination Matrix for LMV @ km 57.000 ( Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | 52 | | 10 | 21 | | 10 | | | | | | | | | 10 | | | | | | 103 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | | | 10 | | | 21 | | 10 | | | | | | | | | | | | | | | 41 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 8 | 63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 63 |
| 9 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 21 |
| 10 | 63 | | | | | | | | | | | | 10 | | | | | | | | | | | | | | | | | 73 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 42 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 42 |
| 13 | | | | | | | | | | 31 | | | | | | | | | | | | | | | | | | | | 31 |
| 14 | 10 | | | | | | | | | 21 | | | | | | | | | | | | | | | | | | | | 31 |
| 15 | 10 | | | | | | | | | 21 | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 23 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 21 |
| 24 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| Total | 240 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 135 | 0 | 10 | 52 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 467 |

Origin - Destination Matrix for LCV @ km 57.000 (Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | 7 | | 15 | 7 | | 7 | | | | | | | | | | | | | | | | | | 36 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | 7 | | | | | | | | | | | | | | | | | | | | | | 7 |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 8 | | | | | | 15 | | | | | | | | | | | | | | | | | | | | | | | | 15 |
| 9 | 178 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 178 |
| 10 | 163 | | | | | 37 | | | | | | | | | | | | | | | | | | | | | | | | 200 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 74 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 74 |
| 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 23 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 7 |
| 24 | 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 15 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | 37 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 37 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| Total | 474 | 0 | 0 | 0 | 0 | 52 | 7 | 7 | 15 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 569 |

Origin - Destination Matrix for 2A Trucks @ km 57.000 ( Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | 30 | 62 | 39 | | 64 | 12 | | 2 | | | | | | | | | 5 | 2 | 5 | | | | 221 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | 2 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | 7 | 12 | 15 | | 5 | | | | | | | | | | | | | | | | | | 39 |
| 7 | | | | | | | | 12 | 17 | 15 | | 2 | | | | | | | | | | | | | | | | | | 46 |
| 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 9 | 37 | | | | | 2 | 5 | | | | | | | | | | | | | | | | | | | | | | | 44 |
| 10 | 42 | | | | | 2 | 5 | | | | | | | | | | 5 | | | | | | | | | | | | | 54 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 30 | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | 32 |
| 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 12 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | | | | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | 2 |
| 29 | | | | | | | | | | | | | | | | | | | 5 | | | | | | | | | | | 5 |
| Total | 123 | 0 | 0 | 0 | 0 | 4 | 10 | 55 | 91 | 69 | 0 | 71 | 12 | 0 | 2 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 5 | 2 | 5 | 0 | 0 | 0 | 459 |

Origin - Destination Matrix for 3A Trucks @ km 57.000 ( Hyderabad - Bijapur Road)

| O \ D | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | | | | | 5 | | 20 | 41 | 66 | | 209 | 5 | | | | | | | | | | 5 | 46 | 5 | 31 | | | | 438 |
| 2 | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | 5 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | 10 | 5 | 5 | | 10 | 5 | | | | | | | | | | | 5 | | | | | | 40 |
| 7 | | | | | | | | 10 | 5 | 10 | | 10 | | | | | | | | | | | | | | | | | | 35 |
| 8 | 10 | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | 15 |
| 9 | 36 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 36 |
| 10 | 46 | | | | | | | | | | | 5 | | | | | | | | | | | | | | 10 | | | | 61 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 13 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | 5 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | 5 |
| 23 | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | 5 |
| 24 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 26 | 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 29 | | | | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | 5 |
| Total | 137 | 0 | 0 | 0 | 0 | 5 | 0 | 40 | 61 | 81 | 0 | 249 | 10 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 51 | 5 | 41 | 0 | 0 | 0 | 690 |

Y

| D / O | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | 55 | 12 | | 127 | | | | | | | | | | | 6 | 55 | 6 | 24 | | | | 285 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6 | | | | | | | | | | 6 | | | | | | | | | | | | | | | | | | | | 6 |
| 7 | | | | | | | | 6 | | | | 6 | | | | | | | | | | | | | | | | | | 12 |
| 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 9 | 85 | | | | | | | | | | | | | | | | | | | | 36 | 12 | | | | | | | | 133 |
| 10 | 91 | | | | | 6 | | | | | | | | | | | | | | | 12 | | | | | | | | 6 | 115 |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 12 | 85 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 85 |
| 13 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6 |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | 6 | | | | | | 6 |
| 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 24 | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 18 |
| 26 | 6 | | | | | | | | | | | 6 | | | | | | | | | | | | | | | | | | 0 |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | 6 | | | | 18 |
| 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 29 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| Total | 291 | 0 | 0 | 0 | 0 | 6 | 0 | 6 | 55 | 18 | 0 | 139 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 12 | 6 | 61 | 6 | 30 | 0 | 0 | 6 | 684 |

## Projected Traffic Volume for Mostlikely Growth Scenario

Location : km 32.000

| Year | Tollable Vehicles | | | | | | | | | | | Tollable Vehicles | Tollable PCU | 3w Goods | 3W Pass | 2W | Tractor | Tractor Trailer | Non-Motorised Traffic | | | Toll exempted Vehicles | | | | | Non-tollable Vehicles | Non-tollable PCU | Total Vehicles | Total PCU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Car / Jeep / Van (private) | Car / Jeep / (Taxi) | Car / Jeep (Local) | Bus | | LMV | LCV (4 Tyres) | LCV (6 Tyres) | 2 Axle | 3 Axle | MAV (4 to 6 Axles) | MAV (More than 6 Axles) | | | | | | | Cycle | Cycle rickshaw | Animal drawn | Car | Mini Bus | Bus | LCV | Truck | | | | |
| | | | | Mini bus | Std. Bus | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2014-15 | 2635 | 254 | 42 | 23 | 548 | 474 | 122 | 268 | 187 | 352 | 317 | 0 | 5218 | 8691 | 121 | 196 | 2464 | 10 | 9 | 9 | 0 | 0 | 20 | 13 | 1 | 19 | 4 | 2837 | 1664 | 8055 | 10355 |
| 2015-16 | 2856 | 275 | 46 | 25 | 586 | 501 | 129 | 283 | 191 | 375 | 330 | 0 | 5596 | 9273 | 131 | 180 | 2659 | 10 | 9 | 9 | 0 | 0 | 20 | 14 | 1 | 19 | 4 | 3067 | 1793 | 8663 | 11066 |
| 2016-17 | 3094 | 298 | 49 | 26 | 626 | 530 | 136 | 300 | 195 | 399 | 350 | 0 | 6003 | 9897 | 142 | 195 | 2860 | 10 | 9 | 9 | 0 | 0 | 21 | 15 | 1 | 20 | 4 | 3316 | 1932 | 9319 | 11829 |
| 2017-18 | 3352 | 323 | 53 | 28 | 666 | 561 | 144 | 317 | 199 | 425 | 370 | 0 | 6444 | 10565 | 154 | 211 | 3130 | 11 | 10 | 9 | 0 | 0 | 21 | 15 | 1 | 20 | 4 | 3585 | 2083 | 10026 | 12646 |
| 2018-19 | 3632 | 350 | 58 | 30 | 714 | 593 | 153 | 335 | 204 | 452 | 392 | 0 | 6911 | 11280 | 167 | 229 | 3390 | 11 | 10 | 8 | 0 | 0 | 22 | 15 | 1 | 21 | 4 | 3877 | 2246 | 10788 | 13626 |
| 2019-20 | 3935 | 379 | 63 | 32 | 763 | 627 | 161 | 354 | 208 | 481 | 415 | 0 | 7418 | 12047 | 181 | 245 | 3672 | 11 | 10 | 8 | 0 | 0 | 22 | 16 | 1 | 21 | 5 | 4193 | 2423 | 11611 | 14470 |
| 2020-21 | 4208 | 405 | 67 | 34 | 806 | 657 | 169 | 371 | 212 | 507 | 434 | 0 | 7867 | 12722 | 193 | 255 | 3885 | 11 | 10 | 7 | 0 | 0 | 23 | 16 | 1 | 21 | 5 | 4487 | 2567 | 12354 | 15309 |
| 2021-22 | 4496 | 433 | 72 | 36 | 851 | 686 | 177 | 389 | 218 | 533 | 455 | 0 | 8345 | 13437 | 206 | 263 | 4216 | 11 | 10 | 8 | 0 | 0 | 23 | 16 | 1 | 22 | 5 | 4803 | 2762 | 13146 | 16199 |
| 2022-23 | 4808 | 463 | 77 | 38 | 899 | 721 | 185 | 408 | 220 | 561 | 477 | 0 | 8853 | 14195 | 220 | 303 | 4515 | 12 | 11 | 7 | 0 | 0 | 23 | 16 | 1 | 23 | 5 | 5138 | 2949 | 13991 | 17184 |
| 2023-24 | 5137 | 495 | 82 | 40 | 950 | 755 | 194 | 427 | 224 | 591 | 499 | 0 | 9392 | 14997 | 230 | 324 | 4843 | 12 | 11 | 7 | 0 | 0 | 24 | 17 | 1 | 23 | 5 | 5500 | 3150 | 14892 | 18407 |
| 2024-25 | 5491 | 529 | 87 | 42 | 1003 | 791 | 203 | 447 | 228 | 622 | 523 | 0 | 9965 | 15847 | 252 | 346 | 5196 | 12 | 11 | 7 | 0 | 0 | 25 | 17 | 1 | 23 | 5 | 5887 | 3365 | 15852 | 19212 |
| 2025-26 | 5791 | 559 | 92 | 44 | 1047 | 821 | 211 | 464 | 231 | 648 | 543 | 0 | 10452 | 16564 | 266 | 360 | 5400 | 12 | 11 | 7 | 0 | 0 | 25 | 17 | 1 | 24 | 5 | 6235 | 3558 | 16886 | 20122 |
| 2026-27 | 6106 | 589 | 97 | 46 | 1094 | 853 | 219 | 482 | 234 | 676 | 563 | 0 | 10952 | 17315 | 280 | 385 | 5835 | 12 | 11 | 7 | 0 | 0 | 25 | 18 | 1 | 24 | 5 | 6604 | 3762 | 17565 | 21027 |
| 2027-28 | 6443 | 621 | 103 | 48 | 1143 | 886 | 228 | 501 | 238 | 704 | 585 | 0 | 11498 | 18102 | 295 | 405 | 6128 | 13 | 12 | 7 | 0 | 0 | 26 | 18 | 1 | 25 | 5 | 6995 | 3978 | 18492 | 22090 |
| 2028-29 | 6795 | 655 | 108 | 50 | 1193 | 920 | 237 | 520 | 241 | 734 | 607 | 0 | 12060 | 18926 | 312 | 424 | 6562 | 13 | 12 | 7 | 0 | 0 | 26 | 18 | 1 | 25 | 5 | 7409 | 4207 | 19478 | 23133 |
| 2029-30 | 7167 | 691 | 114 | 52 | 1246 | 955 | 246 | 540 | 245 | 765 | 630 | 0 | 12651 | 19788 | 329 | 451 | 6959 | 13 | 12 | 7 | 0 | 0 | 27 | 19 | 1 | 26 | 6 | 7849 | 4450 | 20500 | 24238 |
| 2030-31 | 7460 | 719 | 119 | 54 | 1287 | 984 | 253 | 557 | 247 | 792 | 649 | 0 | 13119 | 20472 | 342 | 470 | 7304 | 14 | 12 | 7 | 0 | 0 | 27 | 19 | 1 | 26 | 6 | 8228 | 4658 | 21347 | 25130 |
| 2031-32 | 7765 | 748 | 124 | 56 | 1329 | 1014 | 261 | 573 | 248 | 819 | 668 | 0 | 13604 | 21181 | 356 | 488 | 7667 | 14 | 12 | 7 | 0 | 0 | 28 | 20 | 1 | 27 | 6 | 8626 | 4876 | 22230 | 26057 |
| 2032-33 | 8082 | 779 | 129 | 58 | 1373 | 1044 | 269 | 591 | 250 | 847 | 688 | 0 | 14108 | 21915 | 371 | 509 | 8048 | 14 | 13 | 6 | 0 | 0 | 29 | 20 | 1 | 27 | 6 | 9043 | 5104 | 23151 | 27019 |
| 2033-34 | 8412 | 811 | 134 | 60 | 1418 | 1076 | 277 | 608 | 251 | 876 | 709 | 0 | 14631 | 22675 | 386 | 530 | 8447 | 14 | 13 | 6 | 0 | 0 | 29 | 20 | 1 | 28 | 6 | 9480 | 5344 | 24181 | 28019 |
| 2034-35 | 8756 | 844 | 139 | 62 | 1465 | 1108 | 285 | 627 | 253 | 906 | 730 | 0 | 15174 | 23463 | 402 | 551 | 8867 | 15 | 13 | 6 | 0 | 0 | 30 | 21 | 1 | 28 | 6 | 9939 | 5595 | 25113 | 29058 |
| 2035-36 | 9113 | 878 | 145 | 64 | 1513 | 1142 | 294 | 646 | 255 | 937 | 752 | 0 | 15738 | 24280 | 418 | 573 | 9307 | 15 | 14 | 6 | 0 | 0 | 31 | 22 | 1 | 29 | 6 | 10421 | 5858 | 26158 | 30138 |
| 2036-37 | 9486 | 914 | 151 | 66 | 1563 | 1176 | 303 | 665 | 257 | 969 | 775 | 0 | 16323 | 25126 | 435 | 597 | 9769 | 15 | 14 | 6 | 0 | 0 | 31 | 22 | 1 | 29 | 6 | 10926 | 6134 | 27240 | 31268 |
| 2037-38 | 9873 | 951 | 157 | 68 | 1614 | 1212 | 312 | 685 | 258 | 1002 | 798 | 0 | 16930 | 26003 | 453 | 622 | 10254 | 16 | 14 | 6 | 0 | 0 | 31 | 22 | 1 | 30 | 6 | 11455 | 6423 | 28385 | 32426 |
| 2038-39 | 10275 | 990 | 163 | 70 | 1667 | 1249 | 321 | 706 | 260 | 1037 | 822 | 0 | 17561 | 26911 | 471 | 647 | 10763 | 16 | 14 | 6 | 0 | 0 | 32 | 22 | 1 | 31 | 6 | 12010 | 6725 | 29571 | 33636 |
| 2039-40 | 10696 | 1031 | 170 | 72 | 1722 | 1286 | 331 | 727 | 262 | 1072 | 846 | 0 | 18215 | 27853 | 491 | 673 | 11298 | 16 | 15 | 6 | 0 | 0 | 33 | 23 | 1 | 31 | 7 | 12592 | 7042 | 30808 | 34895 |
| 2040-41 | 11133 | 1073 | 177 | 75 | 1778 | 1325 | 341 | 749 | 263 | 1109 | 872 | 0 | 18905 | 28829 | 511 | 701 | 11859 | 17 | 15 | 6 | 0 | 0 | 33 | 23 | 1 | 32 | 7 | 13203 | 7375 | 32098 | 36204 |
| 2041-42 | 11586 | 1117 | 184 | 77 | 1837 | 1365 | 351 | 772 | 265 | 1147 | 898 | 0 | 19600 | 29839 | 532 | 730 | 12447 | 17 | 15 | 6 | 0 | 0 | 34 | 24 | 1 | 32 | 7 | 13844 | 7723 | 33444 | 37552 |
| 2042-43 | 12061 | 1162 | 192 | 80 | 1897 | 1406 | 362 | 795 | 267 | 1186 | 925 | 0 | 20313 | 30887 | 553 | 759 | 13065 | 17 | 16 | 5 | 0 | 0 | 35 | 24 | 1 | 33 | 7 | 14516 | 8088 | 34648 | 38975 |
| 2043-44 | 12554 | 1210 | 200 | 82 | 1959 | 1449 | 373 | 819 | 269 | 1227 | 962 | 0 | 21093 | 31972 | 576 | 790 | 13714 | 17 | 16 | 5 | 0 | 0 | 35 | 25 | 1 | 34 | 7 | 15221 | 8470 | 36314 | 40442 |
| 2044-45 | 13067 | 1258 | 208 | 85 | 2024 | 1493 | 384 | 844 | 270 | 1269 | 991 | 0 | 21983 | 33096 | 599 | 823 | 14365 | 18 | 16 | 5 | 0 | 0 | 36 | 25 | 1 | 34 | 7 | 15960 | 8871 | 37643 | 41969 |
| 2045-46 | 13601 | 1311 | 216 | 88 | 2090 | 1538 | 395 | 870 | 272 | 1312 | 1010 | 0 | 22703 | 34264 | 624 | 856 | 15110 | 18 | 17 | 5 | 0 | 0 | 37 | 26 | 1 | 35 | 7 | 16735 | 9291 | 38938 | 43555 |

Location : Km 3*.400

## Projected Traffic Volume for Mostlikely Growth Scenario

| Year | Tollable Vehicles | | | | | | | | | | | | Tollable Vehicles | Tollable PCU | 3w Goods | 3W Pass | 2W | Tractor | Tractor Trailer | Non-Motorised Traffic | | | Toll exempted Vehicles | | | | | Non-tollable Vehicles | Non-tollable PCU | Total Vehicles | Total PCU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Car / Jeep / Van (private) | Car / Jeep / (Taxi) | Car / Jeep (Local) | Bus | | LMV | LCV (4 Tyres) | LCV (6 Tyres) | 2 Axle | 3 Axle | MAV (4 to 6 Axles) | HCM/EME (more than 6 Axles) | | | | | | | | Cycle | Cycle rickshaw | Animal drawn | Car | Mini Bus | Bus | LCV | Truck | | | | |
| | | | | Mini bus | Std. Bus | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2014-15 | 2058 | 263 | 134 | 23 | 312 | 470 | 185 | 367 | 445 | 693 | 562 | 0 | 6671 | 12501 | 97 | 579 | 2837 | 17 | 25 | 22 | 0 | 3 | 70 | 13 | 1 | 2 | 0 | 3611 | 2310 | 10282 | 14811 |
| 2015-16 | 2106 | 285 | 145 | 25 | 340 | 497 | 194 | 439 | 473 | 738 | 725 | 0 | 7135 | 13288 | 105 | 626 | 3057 | 17 | 26 | 22 | 0 | 3 | 20 | 13 | 1 | 2 | 0 | 3804 | 2486 | 10939 | 15774 |
| 2016-17 | 2473 | 209 | 157 | 26 | 470 | 526 | 209 | 433 | 483 | 785 | 768 | 0 | 7633 | 14129 | 114 | 676 | 3322 | 19 | 26 | 21 | 0 | 4 | 21 | 14 | 1 | 2 | 0 | 4220 | 2677 | 11854 | 16806 |
| 2017-18 | 1762 | 334 | 170 | 28 | 393 | 556 | 216 | 458 | 493 | 830 | 813 | 0 | 8169 | 15027 | 123 | 735 | 3598 | 18 | 27 | 21 | 0 | 4 | 21 | 14 | 1 | 2 | 0 | 4553 | 2884 | 12732 | 17916 |
| 2018-19 | 4075 | 342 | 184 | 30 | 537 | 588 | 229 | 484 | 504 | 890 | 900 | 0 | 8743 | 15986 | 134 | 796 | 3896 | 18 | 27 | 20 | 0 | 4 | 22 | 14 | 1 | 2 | 0 | 4935 | 3108 | 13678 | 19094 |
| 2019-20 | 4516 | 393 | 200 | 32 | 576 | 622 | 242 | 510 | 549 | 967 | 911 | 0 | 9361 | 17011 | 145 | 858 | 4220 | 19 | 28 | 20 | 0 | 4 | 22 | 15 | 1 | 2 | 0 | 5337 | 3350 | 14698 | 20381 |
| 2020-21 | 4729 | 420 | 214 | 34 | 606 | 661 | 254 | 536 | 524 | 997 | 964 | 0 | 9906 | 17912 | 156 | 922 | 4521 | 19 | 28 | 20 | 0 | 3 | 22 | 15 | 1 | 2 | 0 | 5710 | 3574 | 15616 | 21486 |
| 2021-22 | 5045 | 449 | 229 | 36 | 640 | 682 | 266 | 562 | 534 | 1049 | 920 | 0 | 10489 | 18854 | 166 | 996 | 4846 | 20 | 29 | 19 | 0 | 3 | 23 | 15 | 1 | 2 | 0 | 6109 | 3814 | 16598 | 22678 |
| 2022-23 | 5393 | 479 | 244 | 39 | 676 | 715 | 278 | 588 | 544 | 1100 | 1047 | 0 | 11106 | 19869 | 177 | 1064 | 5193 | 20 | 29 | 19 | 0 | 3 | 23 | 15 | 1 | 2 | 0 | 6537 | 4070 | 17642 | 23939 |
| 2023-24 | 5764 | 512 | 261 | 42 | 714 | 749 | 291 | 615 | 556 | 1150 | 1094 | 0 | 11760 | 20931 | 189 | 1135 | 5565 | 20 | 30 | 18 | 0 | 3 | 24 | 16 | 1 | 2 | 0 | 6995 | 4344 | 18755 | 25275 |
| 2024-25 | 6162 | 546 | 279 | 42 | 755 | 784 | 305 | 644 | 568 | 1204 | 1144 | 0 | 12455 | 22054 | 202 | 1214 | 5969 | 21 | 31 | 18 | 0 | 3 | 23 | 16 | 1 | 2 | 0 | 7485 | 4638 | 19940 | 26692 |
| 2025-26 | 6599 | 582 | 298 | 44 | 798 | 824 | 319 | 673 | 579 | 1258 | 1195 | 0 | 13044 | 23002 | 215 | 1270 | 6324 | 21 | 31 | 18 | 0 | 3 | 25 | 16 | 1 | 2 | 0 | 7824 | 4899 | 20865 | 27909 |
| 2026-27 | 6990 | 609 | 310 | 46 | 823 | 850 | 331 | 695 | 587 | 1300 | 1236 | 0 | 13662 | 23994 | 225 | 1339 | 6707 | 22 | 32 | 18 | 0 | 3 | 25 | 17 | 1 | 2 | 0 | 8389 | 5174 | 22051 | 29168 |
| 2027-28 | 7390 | 643 | 327 | 48 | 824 | 879 | 340 | 720 | 595 | 1344 | 1277 | 0 | 14310 | 25030 | 237 | 1413 | 7112 | 23 | 32 | 18 | 0 | 3 | 26 | 17 | 1 | 2 | 0 | 8882 | 5486 | 23192 | 30486 |
| 2028-29 | 7826 | 678 | 345 | 50 | 907 | 912 | 355 | 748 | 603 | 1390 | 1322 | 0 | 14990 | 26114 | 250 | 1490 | 7542 | 23 | 33 | 17 | 0 | 3 | 26 | 17 | 1 | 2 | 0 | 9404 | 5775 | 24394 | 31889 |
| 2029-30 | 8264 | 715 | 364 | 52 | 937 | 947 | 369 | 777 | 611 | 1437 | 1367 | 0 | 15704 | 27247 | 264 | 1572 | 7992 | 23 | 34 | 16 | 0 | 3 | 27 | 18 | 1 | 2 | 0 | 9956 | 6102 | 25660 | 33349 |
| 2030-31 | 8731 | 756 | 379 | 54 | 969 | 976 | 383 | 806 | 621 | 1485 | 1413 | 0 | 16270 | 28149 | 275 | 1630 | 8380 | 23 | 34 | 16 | 0 | 3 | 27 | 18 | 1 | 2 | 0 | 10430 | 6381 | 26700 | 34530 |
| 2031-32 | 9214 | 773 | 405 | 56 | 1050 | 1005 | 397 | 834 | 631 | 1534 | 1461 | 0 | 16857 | 29043 | 286 | 1703 | 8812 | 24 | 35 | 16 | 0 | 3 | 28 | 18 | 1 | 2 | 0 | 10927 | 6672 | 27783 | 35755 |
| 2032-33 | 9669 | 800 | 411 | 59 | 1053 | 1035 | 410 | 863 | 640 | 1584 | 1509 | 0 | 17465 | 30049 | 295 | 1772 | 9250 | 24 | 36 | 15 | 0 | 3 | 28 | 19 | 1 | 2 | 0 | 11448 | 6977 | 28913 | 37026 |
| 2033-34 | 9948 | 839 | 428 | 60 | 1086 | 1067 | 423 | 893 | 650 | 1635 | 1557 | 0 | 18097 | 31049 | 310 | 1844 | 9703 | 25 | 36 | 15 | 0 | 3 | 29 | 19 | 1 | 2 | 0 | 11993 | 7296 | 30090 | 38345 |
| 2034-35 | 10250 | 873 | 445 | 62 | 1121 | 1097 | 435 | 923 | 657 | 1686 | 1605 | 0 | 18753 | 32086 | 323 | 1920 | 10154 | 25 | 37 | 15 | 0 | 3 | 30 | 20 | 1 | 2 | 0 | 12565 | 7630 | 31318 | 39716 |
| 2035-36 | 10557 | 909 | 464 | 64 | 1178 | 1131 | 451 | 955 | 681 | 1744 | 1662 | 0 | 19433 | 33158 | 330 | 1989 | 10587 | 26 | 38 | 15 | 0 | 3 | 30 | 20 | 1 | 2 | 0 | 13165 | 7980 | 32598 | 41136 |
| 2036-37 | 10940 | 946 | 482 | 66 | 1175 | 1167 | 464 | 987 | 710 | 1817 | 1732 | 0 | 20139 | 34269 | 330 | 2060 | 11226 | 26 | 39 | 14 | 0 | 3 | 31 | 20 | 1 | 2 | 0 | 13793 | 8346 | 33932 | 42615 |
| 2037-38 | 11079 | 986 | 502 | 68 | 1214 | 1207 | 485 | 1040 | 710 | 1847 | 1763 | 0 | 20872 | 35419 | 364 | 2195 | 11786 | 27 | 39 | 14 | 0 | 3 | 31 | 21 | 1 | 2 | 0 | 14452 | 8729 | 35323 | 44148 |
| 2038-39 | 11532 | 1025 | 521 | 70 | 1264 | 1258 | 482 | 1078 | 738 | 1923 | 1833 | 0 | 21632 | 36609 | 378 | 2281 | 12271 | 27 | 40 | 13 | 0 | 3 | 32 | 21 | 1 | 2 | 0 | 15142 | 9130 | 36774 | 45739 |
| 2039-40 | 12003 | 1067 | 542 | 72 | 1295 | 1270 | 497 | 1050 | 945 | 2110 | 1859 | 0 | 22420 | 37841 | 391 | 2345 | 12985 | 28 | 41 | 13 | 0 | 3 | 33 | 22 | 1 | 2 | 0 | 15866 | 9550 | 38288 | 47391 |
| 2040-41 | 12443 | 1111 | 566 | 75 | 1337 | 1314 | 512 | 1092 | 652 | 2182 | 1375 | 0 | 23239 | 39118 | 410 | 2441 | 13630 | 28 | 42 | 13 | 0 | 3 | 33 | 22 | 1 | 2 | 0 | 16625 | 9990 | 39864 | 49108 |
| 2041-42 | 13004 | 1156 | 589 | 77 | 1381 | 1354 | 527 | 1115 | 667 | 2257 | 1972 | 0 | 24089 | 40440 | 427 | 2541 | 14306 | 29 | 43 | 13 | 0 | 3 | 34 | 22 | 1 | 2 | 0 | 17420 | 10451 | 41589 | 50891 |
| 2042-43 | 13535 | 1203 | 613 | 80 | 1427 | 1395 | 543 | 1149 | 661 | 2334 | 2031 | 0 | 24970 | 41809 | 445 | 2644 | 15017 | 30 | 44 | 12 | 0 | 3 | 35 | 23 | 1 | 2 | 0 | 18254 | 10933 | 43224 | 52742 |
| 2043-44 | 14088 | 1252 | 638 | 82 | 1473 | 1437 | 560 | 1183 | 695 | 2414 | 2092 | 0 | 25886 | 43226 | 463 | 2752 | 15762 | 30 | 44 | 12 | 0 | 3 | 35 | 23 | 1 | 2 | 0 | 19128 | 11438 | 45014 | 54666 |
| 2044-45 | 14663 | 1304 | 664 | 85 | 1522 | 1481 | 578 | 1219 | 670 | 2497 | 2155 | 0 | 26835 | 44695 | 482 | 2865 | 16545 | 31 | 45 | 12 | 0 | 3 | 36 | 24 | 1 | 2 | 0 | 20045 | 11968 | 46880 | 56663 |
| 2045-46 | 15262 | 1357 | 691 | 88 | 1572 | 1525 | 594 | 1256 | 674 | 2583 | 2220 | 0 | 27821 | 46215 | 501 | 2982 | 17366 | 31 | 46 | 12 | 0 | 3 | 37 | 24 | 1 | 2 | 0 | 21005 | 12529 | 48828 | 58736 |

## Projected Traffic Volume for [illegible]stic Growth Scenario

Location : km 32.000

| Year | Tollable Vehicles | | | | | | | | | | | | Tollable Vehicles | Tollable PCU | Re Goods | RV Pass | 2W | Tractor | Tractor Trailer | Non Motorised Traffic | | | Toll Exempted Vehicles | | | | | Non-tollable Vehicles | Non tollable PCU | Total Vehicles | Total PCU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Car / Jeep / Van (private) | Car / Jeep / (Taxi) | Car / Jeep (Local) | Bus | | Tolla AGE | LCV (4 Tyres) | LCV (6 Tyres) | 2 Axle | 3 Axle | MAV (4 to 6 Axles) | MAV (More than 6 | | | | | | | | Cycle | Cycle Rickshaw | Animal drawn | Car | Mini Bus | Bus | LCV | Truck | | | | |
| | | | | Mini Bus | Std. Bus | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2014-15 | 2636 | 254 | 42 | 23 | 548 | 474 | 122 | 268 | 187 | 352 | 312 | 0 | 5218 | 8693 | 121 | 1[illegible] | 2[illegible] | 50 | 4 | 4 | 0 | 0 | 20 | 14 | 1 | 14 | 4 | 2837 | 3664 | 8055 | 38355 |
| 2015-16 | 2936 | 281 | 44 | 25 | 596 | 503 | 130 | 285 | 192 | 376 | 332 | 0 | 5679 | 9387 | 130 | 184 | 2[illegible] | 53 | 5 | 5 | 0 | 0 | 22 | 14 | 1 | 15 | 4 | 3116 | 3870 | 8795 | 31209 |
| 2016-17 | 3226 | 311 | 49 | 27 | 638 | 534 | 138 | 302 | 197 | 402 | 352 | 0 | 6186 | 10145 | 126 | 203 | 2988 | 50 | 4 | 4 | 0 | 0 | 24 | 15 | 1 | 16 | 4 | 3423 | 1993 | 9609 | 32138 |
| 2017-18 | 3560 | 344 | 54 | 30 | 705 | 567 | 146 | 321 | 202 | 430 | 374 | 0 | 6781 | 10973 | 134 | 225 | 3283 | 11 | 10 | 8 | 0 | 0 | 21 | 15 | 1 | 20 | 4 | 3761 | 2183 | 10502 | 33154 |
| 2018-19 | 3948 | 380 | 60 | 32 | 766 | 602 | 155 | 340 | 207 | 459 | 398 | 0 | 7348 | 11868 | 681 | 245 | 3612 | 11 | 10 | 8 | 0 | 0 | 22 | 15 | 1 | 21 | 4 | 4133 | 2392 | 11481 | 14260 |
| 2019-20 | 4368 | 421 | 66 | 35 | 833 | 639 | 165 | 361 | 212 | 491 | 422 | 0 | 8014 | 12845 | 202 | 275 | 3974 | 51 | 10 | 8 | 0 | 0 | 22 | 16 | 1 | 21 | 5 | 4543 | 2621 | 12557 | 15466 |
| 2020-21 | 4768 | 459 | 73 | 38 | 896 | 672 | 173 | 380 | 217 | 519 | 444 | 0 | 8637 | 13748 | 219 | 300 | 4327 | 11 | 10 | 8 | 0 | 0 | 27 | 16 | 1 | 21 | 5 | 4940 | 2844 | 13593 | 16592 |
| 2021-22 | 5204 | 501 | 79 | 40 | 961 | 706 | 182 | 399 | 222 | 548 | 467 | 0 | 9311 | 14719 | 239 | 328 | 4710 | 11 | 10 | 8 | 0 | 0 | 24 | 16 | 1 | 22 | 5 | 5373 | 3086 | 14684 | 17805 |
| 2022-23 | 5680 | 547 | 86 | 43 | 1035 | 742 | 191 | 420 | 227 | 579 | 490 | 0 | 10041 | 15765 | 262 | 358 | 5128 | 12 | 11 | 7 | 0 | 0 | 23 | 16 | 1 | 22 | 5 | 5844 | 3350 | 15885 | 19185 |
| 2023-24 | 6200 | 597 | 94 | 47 | 1113 | 781 | 201 | 441 | 232 | 611 | 515 | 0 | 10832 | 16893 | 285 | 390 | 5583 | 12 | 11 | 7 | 0 | 0 | 24 | 17 | 1 | 23 | 5 | 6357 | 3637 | 17189 | 20528 |
| 2024-25 | 6768 | 652 | 103 | 50 | 1196 | 821 | 211 | 464 | 237 | 646 | 542 | 0 | 11689 | 18304 | 313 | 426 | 6077 | 12 | 11 | 7 | 0 | 0 | 24 | 17 | 1 | 23 | 5 | 6915 | 3949 | 18604 | 22053 |
| 2025-26 | 7390 | 702 | 111 | 53 | 1271 | 855 | 220 | 483 | 241 | 675 | 564 | 0 | 12486 | 19392 | 335 | 459 | 6547 | 13 | 11 | 7 | 0 | 0 | 25 | 17 | 1 | 24 | 5 | 7403 | 4244 | 19889 | 23438 |
| 2026-27 | 7852 | 756 | 119 | 57 | 1351 | 891 | 229 | 503 | 245 | 706 | 587 | 0 | 13297 | 20351 | 362 | 491 | 7053 | 13 | 11 | 7 | 0 | 0 | 25 | 18 | 1 | 24 | 5 | 8012 | 4561 | 21388 | 24812 |
| 2027-28 | 8457 | 815 | 128 | 60 | 1436 | 928 | 239 | 524 | 250 | 738 | 611 | 0 | 14187 | 21585 | 388 | 533 | 7598 | 13 | 12 | 7 | 0 | 0 | 26 | 18 | 1 | 25 | 5 | 8625 | 4903 | 22812 | 26488 |
| 2028-29 | 9109 | 878 | 138 | 64 | 1527 | 966 | 249 | 546 | 254 | 772 | 636 | 0 | 15140 | 22900 | 418 | 570 | 8185 | 13 | 12 | 7 | 0 | 0 | 26 | 18 | 1 | 25 | 5 | 9285 | 5271 | 24425 | 28171 |
| 2029-30 | 9812 | 945 | 149 | 68 | 1623 | 1007 | 259 | 569 | 259 | 807 | 662 | 0 | 16160 | 24302 | 451 | 614 | 8818 | 13 | 12 | 7 | 0 | 0 | 27 | 19 | 1 | 26 | 6 | 9996 | 5667 | 26156 | 29969 |
| 2030-31 | 10430 | 1005 | 158 | 72 | 1706 | 1040 | 268 | 588 | 261 | 837 | 683 | 0 | 17047 | 25513 | 479 | 657 | 9407 | 14 | 13 | 7 | 0 | 0 | 27 | 19 | 1 | 26 | 6 | 10649 | 6030 | 27696 | 31541 |
| 2031-32 | 11086 | 1068 | 168 | 75 | 1793 | 1074 | 277 | 607 | 264 | 869 | 706 | 0 | 17986 | 26784 | 509 | 698 | 10024 | 14 | 13 | 7 | 0 | 0 | 28 | 20 | 1 | 27 | 6 | 11345 | 6416 | 29333 | 33200 |
| 2032-33 | 11784 | 1135 | 179 | 79 | 1884 | 1109 | 286 | 627 | 266 | 901 | 729 | 0 | 18979 | 28127 | 542 | 747 | 10688 | 14 | 13 | 6 | 0 | 0 | 28 | 20 | 1 | 27 | 6 | 12087 | 6828 | 31066 | 34955 |
| 2033-34 | 12526 | 1207 | 190 | 83 | 1981 | 1146 | 295 | 648 | 268 | 934 | 752 | 0 | 20030 | 29542 | 575 | 789 | 11395 | 15 | 14 | 6 | 0 | 0 | 29 | 20 | 1 | 28 | 6 | 12877 | 7266 | 32907 | 36808 |
| 2034-35 | 13315 | 1283 | 202 | 88 | 2087 | 1183 | 305 | 669 | 271 | 969 | 777 | 0 | 21183 | 31034 | 612 | 838 | 12150 | 15 | 15 | 6 | 0 | 0 | 30 | 21 | 1 | 28 | 6 | 13719 | 7734 | 34862 | 38768 |
| 2035-36 | 14154 | 1364 | 215 | 92 | 2188 | 1222 | 315 | 691 | 273 | 1005 | 802 | 0 | 22320 | 32608 | 650 | 891 | 12964 | 16 | 16 | 6 | 0 | 0 | 30 | 21 | 1 | 29 | 6 | 14617 | 8231 | 36937 | 40839 |
| 2035-37 | 15045 | 1449 | 229 | 97 | 2300 | 1263 | 325 | 714 | 276 | 1032 | 828 | 0 | 23566 | 34267 | 692 | 947 | 13811 | 16 | 16 | 6 | 0 | 0 | 31 | 22 | 1 | 29 | 6 | 15574 | 8761 | 39340 | 43878 |
| 2037-38 | 15992 | 1541 | 243 | 102 | 2417 | 1304 | 336 | 737 | 279 | 1081 | 855 | 0 | 24886 | 36018 | 735 | 1007 | 14729 | 16 | 16 | 6 | 0 | 0 | 32 | 22 | 1 | 30 | 6 | 16594 | 9326 | 41479 | 46344 |
| 2038-39 | 16999 | 1638 | 258 | 107 | 2541 | 1347 | 347 | 761 | 283 | 1121 | 882 | 0 | 26282 | 37866 | 781 | 1071 | 15700 | 17 | 17 | 6 | 0 | 0 | 32 | 22 | 1 | 31 | 6 | 17680 | 9927 | 43961 | 47791 |
| 2039-40 | 18069 | 1741 | 275 | 113 | 2671 | 1391 | 358 | 786 | 288 | 1162 | 931 | 0 | 27701 | 39811 | 830 | 1139 | 16730 | 17 | 17 | 6 | 0 | 0 | 33 | 23 | 1 | 31 | 7 | 18838 | 10567 | 46599 | 50178 |
| 2040-41 | 19207 | 1850 | 292 | 118 | 2807 | 1437 | 370 | 812 | 286 | 1206 | 981 | 0 | 29327 | 41867 | 882 | 1210 | 17835 | 17 | 17 | 6 | 0 | 0 | 33 | 24 | 1 | 32 | 7 | 20073 | 11250 | 49480 | 53167 |
| 2041-42 | 20417 | 1967 | 310 | 124 | 2951 | 1484 | 382 | 839 | 299 | 1250 | 1031 | 0 | 30985 | 44035 | 936 | 1284 | 18962 | 18 | 18 | 6 | 0 | 0 | 34 | 25 | 1 | 33 | 7 | 21389 | 11977 | 52393 | 56082 |
| 2042-43 | 21702 | 2091 | 330 | 131 | 3101 | 1533 | 395 | 867 | 292 | 1297 | 1065 | 0 | 32740 | 46325 | 995 | 1361 | 20202 | 19 | 19 | 6 | 0 | 0 | 35 | 26 | 1 | 34 | 7 | 22791 | 12753 | 55511 | 59974 |
| 2043-44 | 23089 | 2223 | 351 | 138 | 3260 | 1584 | 408 | 895 | 293 | 1335 | 1095 | 0 | 34600 | 48740 | 1061 | 1458 | 21532 | 19 | 19 | 5 | 0 | 0 | 36 | 27 | 1 | 35 | 7 | 24285 | 13576 | 58885 | 62366 |
| 2044-45 | 24521 | 2362 | 373 | 145 | 3427 | 1636 | 421 | 925 | 297 | 1395 | 1069 | 0 | 36569 | 51291 | 1127 | 1534 | 23064 | 19 | 19 | 5 | 0 | 0 | 36 | 28 | 1 | 36 | 7 | 25878 | 14455 | 62032 | 65746 |
| 2045-46 | 26065 | 2511 | 396 | 152 | 3602 | 1689 | 435 | 945 | 301 | 1496 | 1105 | 0 | 38655 | 53983 | 1197 | 1612 | 24641 | 20 | 19 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 27575 | 15393 | 66251 | 69374 |

## Projected Traffic Volume for Optimistic Growth Scenario

Location km 57.300

| Year | Tollable Vehicles | | | | | | | | | | | Tollable Vehicles | Tollable PCU | Tractor/Trailer | Mini Bus | Jeep | Tractor | Non Motorised Traffic | | | Toll exempted Vehicles | | | | | Non-tollable Vehicles | Non-tollable PCU | Total Vehicles | Total PCU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Car / Jeep / Van (Private) | Car / Jeep / (Taxi) | Car / Jeep (LTA/GM) | Bus | | | | | | | | | | | | | | Cycle | Cycle rickshaw | Animal drawn | Car | Mini Bus | Bus | LCV | Truck | | | | |
| | | | | 2Axl/Mcv | Std Bus | Public RDE | LCV (4 Tyres) | LCV (6 Tyres) | 2 Axle | 3 Axle | MAV(3 to 5 Axles) | 6/7Axl (Multi Axle) | | | | | | | | | | | | | | | | | |
| 2018-19 | 2436 | 1061 | 1316 | 25 | 412 | 476 | 164 | 337 | 643 | 1113 | 1445 | 0 | 9671 | 12501 | 162 | 578 | 2583 | 12 | 24 | 22 | 11 | 4 | 20 | 13 | 2 | 2 | 0 | 3611 | 2310 | 10282 | 14811 |
| 2019-20 | 1272 | 554 | 686 | 25 | 338 | 499 | 156 | 411 | 675 | 1181 | 1526 | 0 | 7232 | 13423 | 207 | 614 | 4186 | 12 | 24 | 23 | 9 | 6 | 20 | 13 | 1 | 2 | 0 | 3968 | 2526 | 11200 | 15948 |
| 2019-21 | 1620 | 427 | 1193 | 27 | 357 | 581 | 206 | 436 | 684 | 1242 | 1779 | 0 | 7835 | 13419 | 199 | 707 | 3484 | 12 | 26 | 21 | 9 | 4 | 21 | 14 | 1 | 2 | 0 | 4361 | 2765 | 12206 | 17182 |
| 2021-22 | 4005 | 956 | 1411 | 30 | 530 | 651 | 229 | 364 | 949 | 1445 | 1923 | 0 | 8513 | 15495 | 131 | 761 | 3773 | 14 | 27 | 21 | 9 | 4 | 21 | 14 | 1 | 2 | 0 | 4794 | 3037 | 13307 | 18522 |
| 2021-22 | 4481 | 994 | 2031 | 33 | 576 | 597 | 255 | 392 | 933 | 1545 | 1875 | 0 | 9204 | 16662 | 145 | 806 | 4152 | 15 | 27 | 20 | 9 | 4 | 22 | 14 | 1 | 2 | 0 | 5271 | 3337 | 14515 | 19979 |
| 2022-23 | 4931 | 986 | 2339 | 35 | 624 | 631 | 282 | 422 | 923 | 1646 | 1978 | 0 | 10042 | 17926 | 161 | 958 | 4568 | 14 | 29 | 20 | 9 | 4 | 22 | 15 | 1 | 2 | 0 | 5796 | 3635 | 15838 | 21561 |
| 2023-24 | 5350 | 976 | 2532 | 36 | 674 | 667 | 306 | 444 | 932 | 1821 | 2025 | 0 | 10786 | 19882 | 176 | 1041 | 4923 | 15 | 28 | 20 | 9 | 3 | 22 | 15 | 1 | 2 | 0 | 6305 | 3944 | 17089 | 23026 |
| 2024-25 | 5810 | 1210 | 2748 | 38 | 724 | 703 | 329 | 532 | 949 | 1978 | 2074 | 0 | 11589 | 20321 | 192 | 1131 | 5134 | 20 | 29 | 19 | 8 | 3 | 24 | 15 | 1 | 2 | 0 | 6858 | 4279 | 18448 | 24880 |
| 2025-26 | 6328 | 1567 | 2979 | 43 | 778 | 737 | 347 | 600 | 968 | 2148 | 2177 | 0 | 12457 | 21650 | 209 | 1246 | 5496 | 20 | 29 | 19 | 8 | 3 | 23 | 15 | 1 | 2 | 0 | 7462 | 4643 | 19919 | 26285 |
| 2026-27 | 6958 | 1619 | 3195 | 47 | 837 | 774 | 402 | 668 | 973 | 2304 | 2332 | 0 | 13396 | 23075 | 224 | 1360 | 6417 | 20 | 30 | 18 | 8 | 3 | 24 | 16 | 1 | 2 | 0 | 8119 | 5042 | 21515 | 28617 |
| 2027-28 | 7598 | 1675 | 3418 | 50 | 899 | 811 | 427 | 670 | 960 | 2471 | 2489 | 0 | 14810 | 24603 | 240 | 1461 | 6986 | 21 | 31 | 18 | 8 | 3 | 24 | 16 | 1 | 2 | 0 | 8834 | 5476 | 23245 | 30079 |
| 2028-29 | 8180 | 2117 | 3720 | 53 | 956 | 848 | 438 | 698 | 996 | 2670 | 2638 | 0 | 15827 | 25963 | 268 | 1589 | 7575 | 21 | 31 | 18 | 8 | 3 | 25 | 16 | 1 | 2 | 0 | 9509 | 5883 | 24836 | 31845 |
| 2029-30 | 8831 | 2834 | 4019 | 57 | 1018 | 885 | 448 | 727 | 1037 | 2880 | 2788 | 0 | 16306 | 27406 | 289 | 1732 | 8187 | 22 | 32 | 17 | 8 | 3 | 25 | 17 | 1 | 2 | 0 | 10236 | 6321 | 26542 | 33727 |
| 2030-31 | 9431 | 3443 | 4350 | 60 | 1080 | 920 | 458 | 756 | 1078 | 3072 | 2939 | 0 | 17353 | 28910 | 311 | 1855 | 8733 | 22 | 32 | 17 | 8 | 3 | 26 | 17 | 1 | 2 | 0 | 10939 | 6791 | 28372 | 35732 |
| 2031-32 | 10022 | 4009 | 4664 | 63 | 1148 | 958 | 475 | 780 | 1124 | 3246 | 3096 | 0 | 18472 | 30567 | 334 | 1985 | 9308 | 22 | 33 | 17 | 8 | 3 | 26 | 17 | 1 | 2 | 0 | 11662 | 7301 | 30334 | 37868 |
| 2032-33 | 10611 | 4579 | 4959 | 66 | 1220 | 998 | 489 | 822 | 1181 | 3429 | 3251 | 0 | 19669 | 32296 | 361 | 2112 | 10135 | 23 | 34 | 16 | 8 | 3 | 27 | 18 | 1 | 2 | 0 | 12371 | 7848 | 32439 | 40844 |
| 2033-34 | 11200 | 5061 | 5480 | 70 | 1287 | 1031 | 503 | 840 | 1237 | 3648 | 3401 | 0 | 20706 | 33770 | 384 | 2237 | 10866 | 23 | 34 | 16 | 8 | 3 | 27 | 18 | 1 | 2 | 0 | 13001 | 8246 | 34307 | 42620 |
| 2034-35 | 11791 | 5608 | 5813 | 73 | 1418 | 1065 | 515 | 872 | 1293 | 3710 | 3550 | 0 | 21802 | 35328 | 405 | 2431 | 11612 | 24 | 35 | 16 | 8 | 3 | 28 | 18 | 1 | 2 | 0 | 13687 | 8677 | 36289 | 44205 |
| 2035-36 | 12320 | 6170 | 6129 | 76 | 1417 | 1100 | 528 | 900 | 1359 | 3771 | 3660 | 0 | 22980 | 35963 | 434 | 2584 | 12282 | 24 | 36 | 15 | 9 | 3 | 28 | 19 | 1 | 2 | 0 | 15430 | 9442 | 38390 | 46805 |
| 2036-37 | 13054 | 6750 | 6537 | 83 | 1489 | 1136 | 543 | 930 | 1405 | 3840 | 3762 | 0 | 24185 | 36682 | 461 | 2737 | 13099 | 25 | 36 | 15 | 9 | 3 | 29 | 19 | 1 | 2 | 0 | 16435 | 10044 | 40620 | 48716 |
| 2037-38 | 13942 | 7328 | 6977 | 88 | 1565 | 1174 | 557 | 966 | 1471 | 3907 | 3765 | 0 | 25480 | 40490 | 490 | 2920 | 13965 | 25 | 37 | 15 | 9 | 3 | 30 | 20 | 1 | 2 | 0 | 17506 | 10684 | 42996 | 51174 |
| 2038-39 | 14883 | 8412 | 7419 | 93 | 1645 | 1212 | 573 | 998 | 1527 | 3971 | 3961 | 0 | 26849 | 41392 | 521 | 3103 | 14884 | 26 | 38 | 15 | 9 | 3 | 30 | 20 | 1 | 2 | 0 | 18647 | 11366 | 45496 | 53758 |
| 2039-40 | 15883 | 9501 | 7965 | 97 | 1729 | 1252 | 598 | 1031 | 1581 | 4051 | 3814 | 0 | 28297 | 44394 | 554 | 3299 | 15875 | 26 | 39 | 14 | 9 | 3 | 31 | 20 | 1 | 2 | 0 | 19861 | 12093 | 48160 | 56487 |
| 2040-41 | 16946 | 10595 | 8515 | 102 | 1818 | 1291 | 593 | 1065 | 1640 | 4135 | 3872 | 0 | 29829 | 46502 | 589 | 3507 | 16935 | 27 | 39 | 14 | 9 | 3 | 31 | 21 | 1 | 2 | 0 | 21159 | 12866 | 50988 | 59360 |
| 2041-42 | 18078 | 11876 | 9189 | 107 | 1921 | 1336 | 620 | 1103 | 1696 | 4246 | 3918 | 0 | 31449 | 48720 | 626 | 3728 | 18036 | 27 | 40 | 14 | 9 | 3 | 32 | 21 | 1 | 2 | 0 | 22539 | 13690 | 53980 | 62420 |
| 2042-43 | 19272 | 13313 | 9936 | 113 | 2028 | 1380 | 647 | 1139 | 1751 | 4388 | 3966 | 0 | 33163 | 51055 | 669 | 3963 | 19231 | 28 | 41 | 13 | 9 | 3 | 33 | 22 | 1 | 2 | 0 | 24010 | 14566 | 57172 | 65621 |
| 2043-44 | 20543 | 14915 | 10746 | 118 | 2131 | 1427 | 675 | 1177 | 1809 | 4533 | 4014 | 0 | 34976 | 53533 | 707 | 4214 | 20510 | 26 | 42 | 13 | 9 | 3 | 33 | 23 | 1 | 2 | 0 | 25577 | 15500 | 60553 | 69013 |
| 2044-45 | 21911 | 16697 | 11639 | 124 | 2249 | 1472 | 701 | 1217 | 1871 | 4684 | 4112 | 0 | 36895 | 56103 | 751 | 4477 | 21872 | 29 | 43 | 13 | 9 | 3 | 34 | 23 | 1 | 2 | 0 | 27247 | 16495 | 64142 | 73588 |
| 2045-46 | 23364 | 18565 | 12605 | 131 | 2367 | 1520 | 730 | 1259 | 1933 | 4837 | 4212 | 0 | 38925 | 58831 | 799 | 4749 | 23330 | 30 | 44 | 12 | 9 | 3 | 35 | 24 | 1 | 2 | 0 | 29016 | 17554 | 67951 | 76185 |
| 2046-47 | 24888 | 20619 | 13674 | 138 | 2491 | 1570 | 760 | 1299 | 1996 | 4992 | 4313 | 0 | 41078 | 61704 | 849 | 5059 | 24868 | 30 | 44 | 12 | 9 | 3 | 35 | 24 | 1 | 2 | 0 | 30923 | 18682 | 71996 | 80386 |
| 2047-48 | 26518 | 22866 | 14846 | 146 | 2620 | 1620 | 792 | 1339 | 2060 | 5150 | 4415 | 0 | 43348 | 64731 | 902 | 5377 | 26540 | 31 | 45 | 12 | 9 | 3 | 36 | 24 | 1 | 2 | 0 | 32943 | 19883 | 76891 | 84614 |
| 2048-49 | 28248 | 25366 | 16117 | 154 | 2756 | 1672 | 826 | 1381 | 2126 | 5312 | 4518 | 0 | 45755 | 67929 | 958 | 5715 | 28265 | 32 | 46 | 12 | 9 | 3 | 37 | 24 | 1 | 2 | 0 | 35096 | 21163 | 80850 | 89093 |

## Projected Traffic Volume for Pessimistic Growth Scenario

Location : km 32.000

| Year | Tollable Vehicles | | | | | | | | | | | | Tollable Vehicles | Tollable PCU | 3w Goods | 3W Pass | 2W | Tractor | Tractor trailer | Non-Motorised Traffic | | | Toll exempted Vehicles | | | | | Non-tollable Vehicles | Non-tollable PCU | Total Vehicles | Total PCU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Car / Jeep / Van (private) | Car / Jeep / (Taxi) | Car / Jeep (Local) | Bus | | LMV | LCV (4 Tyres) | LCV (6 Tyres) | 2 Axle | 3 Axle | MAV (4 to 6 Axles) | MAV (More than 6 | | | | | | | | Cycle | Cycle rickshaw | Animal drawn | Car | Mini Bus | Bus | LCV | Truck | | | | |
| | | | | Mini Bus | Std. Bus | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2014-15 | 2636 | 254 | 42 | 23 | 548 | 474 | 122 | 268 | 147 | 352 | 312 | 0 | 5218 | 8891 | 121 | 366 | 24654 | 10 | 9 | 9 | 0 | 0 | 20 | 14 | 3 | 19 | 4 | 2837 | 1664 | 8055 | 10555 |
| 2015-16 | 2798 | 269 | 42 | 24 | 575 | 499 | 129 | 282 | 150 | 373 | 329 | 0 | 5509 | 9155 | 125 | 376 | 26626 | 10 | 9 | 9 | 0 | 0 | 20 | 14 | 3 | 19 | 4 | 3018 | 1765 | 8527 | 10920 |
| 2016-17 | 2965 | 286 | 45 | 25 | 604 | 526 | 135 | 297 | 154 | 396 | 347 | 0 | 5819 | 9648 | 136 | 387 | 27999 | 10 | 9 | 9 | 0 | 0 | 23 | 15 | 3 | 20 | 4 | 3210 | 1872 | 9029 | 11520 |
| 2017-18 | 3144 | 303 | 48 | 27 | 633 | 554 | 143 | 313 | 147 | 420 | 366 | 0 | 6147 | 10168 | 141 | 398 | 29454 | 11 | 10 | 8 | 0 | 0 | 23 | 15 | 3 | 20 | 4 | 3415 | 1987 | 9562 | 12155 |
| 2018-19 | 3335 | 321 | 51 | 28 | 665 | 583 | 150 | 330 | 160 | 445 | 386 | 0 | 6483 | 10717 | 153 | 410 | 31179 | 11 | 10 | 8 | 0 | 0 | 22 | 15 | 3 | 21 | 4 | 3633 | 2108 | 10127 | 12825 |
| 2019-20 | 3537 | 341 | 54 | 29 | 697 | 615 | 158 | 347 | 164 | 472 | 407 | 0 | 6860 | 11297 | 162 | 223 | 33386 | 11 | 10 | 8 | 0 | 0 | 22 | 16 | 3 | 22 | 5 | 3866 | 2238 | 10726 | 13535 |
| 2020-21 | 3700 | 357 | 56 | 30 | 724 | 642 | 165 | 363 | 169 | 495 | 425 | 0 | 7162 | 11778 | 170 | 233 | 35173 | 11 | 10 | 8 | 0 | 0 | 22 | 16 | 3 | 24 | 5 | 4070 | 2351 | 11232 | 14129 |
| 2021-22 | 3872 | 373 | 59 | 31 | 751 | 670 | 172 | 379 | 176 | 516 | 444 | 0 | 7478 | 12280 | 178 | 244 | 37167 | 11 | 10 | 8 | 0 | 0 | 23 | 16 | 3 | 22 | 5 | 4285 | 2470 | 11763 | 14750 |
| 2022-23 | 4051 | 390 | 62 | 33 | 779 | 698 | 180 | 395 | 183 | 541 | 463 | 0 | 7808 | 12804 | 186 | 255 | 38973 | 12 | 11 | 7 | 0 | 0 | 23 | 16 | 3 | 22 | 5 | 4511 | 2595 | 12320 | 15399 |
| 2023-24 | 4239 | 409 | 64 | 34 | 808 | 730 | 188 | 413 | 191 | 571 | 484 | 0 | 8159 | 13351 | 195 | 267 | 40850 | 12 | 11 | 7 | 0 | 0 | 24 | 17 | 3 | 23 | 5 | 4750 | 2727 | 12903 | 16078 |
| 2024-25 | 4435 | 427 | 67 | 35 | 838 | 762 | 196 | 431 | 199 | 598 | 505 | 0 | 8514 | 13923 | 203 | 279 | 44816 | 12 | 11 | 7 | 0 | 0 | 24 | 17 | 3 | 23 | 5 | 5002 | 2866 | 13516 | 16789 |
| 2025-26 | 4578 | 441 | 70 | 36 | 865 | 789 | 203 | 446 | 206 | 622 | 523 | 0 | 8789 | 14366 | 210 | 288 | 46111 | 12 | 11 | 7 | 0 | 0 | 25 | 17 | 3 | 25 | 5 | 5212 | 2981 | 14001 | 17347 |
| 2026-27 | 4727 | 456 | 72 | 37 | 892 | 817 | 210 | 462 | 214 | 646 | 541 | 0 | 9073 | 14825 | 217 | 298 | 48813 | 12 | 11 | 7 | 0 | 0 | 25 | 18 | 3 | 24 | 5 | 5431 | 3101 | 14504 | 17926 |
| 2027-28 | 4880 | 470 | 74 | 38 | 905 | 846 | 218 | 478 | 221 | 671 | 560 | 0 | 9366 | 15298 | 224 | 307 | 50023 | 13 | 12 | 7 | 0 | 0 | 26 | 18 | 3 | 25 | 5 | 5660 | 3226 | 15026 | 18524 |
| 2028-29 | 5038 | 485 | 76 | 39 | 928 | 876 | 225 | 495 | 230 | 698 | 579 | 0 | 9669 | 15787 | 231 | 317 | 52242 | 13 | 12 | 7 | 0 | 0 | 26 | 18 | 3 | 25 | 5 | 5898 | 3356 | 15567 | 19143 |
| 2029-30 | 5201 | 501 | 79 | 40 | 952 | 906 | 233 | 512 | 242 | 725 | 600 | 0 | 9982 | 16292 | 239 | 327 | 54471 | 13 | 12 | 7 | 0 | 0 | 27 | 19 | 3 | 26 | 6 | 6149 | 3492 | 16129 | 19784 |
| 2030-31 | 5298 | 511 | 80 | 41 | 966 | 931 | 240 | 527 | 248 | 748 | 616 | 0 | 10190 | 16644 | 243 | 334 | 5652 | 14 | 12 | 7 | 0 | 0 | 27 | 19 | 3 | 26 | 6 | 6341 | 3596 | 16531 | 20240 |
| 2031-32 | 5397 | 520 | 82 | 41 | 980 | 957 | 246 | 541 | 254 | 771 | 633 | 0 | 10403 | 17004 | 248 | 340 | 5840 | 14 | 12 | 7 | 0 | 0 | 28 | 20 | 3 | 27 | 6 | 6540 | 3704 | 16944 | 20708 |
| 2032-33 | 5498 | 530 | 83 | 42 | 995 | 984 | 253 | 556 | 245 | 796 | 650 | 0 | 10621 | 17373 | 252 | 346 | 6033 | 14 | 13 | 6 | 0 | 0 | 28 | 20 | 3 | 27 | 6 | 6747 | 3815 | 17368 | 21188 |
| 2033-34 | 5601 | 540 | 85 | 42 | 1009 | 1011 | 260 | 571 | 266 | 821 | 668 | 0 | 10844 | 17751 | 257 | 353 | 6233 | 14 | 13 | 6 | 0 | 0 | 29 | 20 | 3 | 28 | 6 | 6960 | 3930 | 17804 | 21681 |
| 2034-35 | 5706 | 550 | 87 | 43 | 1028 | 1038 | 267 | 587 | 217 | 840 | 687 | 0 | 11072 | 18138 | 262 | 359 | 6439 | 15 | 13 | 6 | 0 | 0 | 30 | 21 | 3 | 28 | 6 | 7180 | 4049 | 18251 | 22187 |
| 2035-36 | 5813 | 560 | 88 | 44 | 1039 | 1067 | 275 | 603 | 288 | 873 | 706 | 0 | 11305 | 18534 | 267 | 366 | 6657 | 15 | 14 | 6 | 0 | 0 | 30 | 21 | 3 | 29 | 6 | 7406 | 4171 | 18711 | 22705 |
| 2036-37 | 5922 | 571 | 90 | 44 | 1054 | 1096 | 282 | 620 | 249 | 900 | 725 | 0 | 11543 | 18939 | 272 | 373 | 6872 | 15 | 14 | 6 | 0 | 0 | 31 | 22 | 3 | 29 | 6 | 7641 | 4298 | 19184 | 23237 |
| 2037-38 | 6033 | 581 | 92 | 45 | 1069 | 1127 | 290 | 637 | 259 | 929 | 745 | 0 | 11787 | 19355 | 277 | 380 | 7100 | 15 | 14 | 6 | 0 | 0 | 31 | 22 | 3 | 30 | 6 | 7883 | 4428 | 19669 | 23783 |
| 2038-39 | 6146 | 592 | 93 | 45 | 1085 | 1158 | 298 | 654 | 240 | 958 | 765 | 0 | 12036 | 19780 | 282 | 387 | 7335 | 16 | 14 | 6 | 0 | 0 | 32 | 22 | 3 | 31 | 6 | 8132 | 4561 | 20168 | 24341 |
| 2039-40 | 6261 | 603 | 95 | 46 | 1101 | 1190 | 306 | 672 | 241 | 988 | 786 | 0 | 12290 | 20215 | 287 | 394 | 7577 | 16 | 15 | 6 | 0 | 0 | 33 | 23 | 3 | 31 | 7 | 8390 | 4700 | 20680 | 24915 |
| 2040-41 | 6378 | 615 | 97 | 47 | 1117 | 1222 | 315 | 691 | 242 | 1019 | 808 | 0 | 12551 | 20661 | 293 | 402 | 7828 | 17 | 15 | 6 | 0 | 0 | 33 | 23 | 3 | 32 | 7 | 8656 | 4842 | 21206 | 25503 |
| 2041-42 | 6498 | 626 | 99 | 48 | 1133 | 1256 | 324 | 710 | 243 | 1051 | 830 | 0 | 12817 | 21118 | 298 | 409 | 8087 | 17 | 15 | 6 | 0 | 0 | 34 | 24 | 3 | 32 | 7 | 8930 | 4989 | 21747 | 26107 |
| 2042-43 | 6620 | 638 | 100 | 48 | 1150 | 1291 | 332 | 729 | 244 | 1084 | 853 | 0 | 13089 | 21586 | 303 | 417 | 8355 | 17 | 16 | 5 | 0 | 0 | 35 | 24 | 3 | 33 | 7 | 9213 | 5141 | 22303 | 26727 |
| 2043-44 | 6744 | 650 | 102 | 49 | 1167 | 1326 | 342 | 750 | 245 | 1119 | 876 | 0 | 13368 | 22066 | 310 | 425 | 8632 | 17 | 16 | 5 | 0 | 0 | 35 | 24 | 3 | 34 | 7 | 9506 | 5297 | 22874 | 27363 |
| 2044-45 | 6870 | 662 | 104 | 50 | 1184 | 1363 | 351 | 770 | 246 | 1154 | 901 | 0 | 13653 | 22557 | 316 | 433 | 8917 | 18 | 16 | 5 | 0 | 0 | 36 | 25 | 3 | 33 | 7 | 9808 | 5458 | 23481 | 28015 |
| 2045-46 | 6999 | 674 | 106 | 50 | 1201 | 1400 | 361 | 791 | 247 | 1190 | 925 | 0 | 13945 | 23060 | 321 | 441 | 9212 | 18 | 17 | 5 | 0 | 0 | 37 | 26 | 3 | 35 | 7 | 10120 | 5624 | 24054 | 28684 |

## Projected Traffic Volume for Pessimistic Growth Scenario

Location : km 57.300

| Year | Tollable Vehicles | | | | | | | | | | | | Tollable Vehicles | Tollable PCU | Bw Goods | 3W Pass | 2W | Tractor | Tractor Trailer | Non-Motorised Traffic | | | Toll exempted Vehicles | | | | | Non-tollable Vehicles | Non-tollable PCU | Total Vehicles | Total PCU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Car / Jeep / Van (private) | Car / Jeep / (Taxi) | Car / Jeep (Local) | Bus | | Tata ACE | LCV (4 Tyres) | LCV (6 Tyres) | 2 Axle | 3 Axle | MAV (4 to 6 Axles) | MAV (More than 6 Axles) | | | | | | | | Cycle | Cycle rickshaw | Animal drawn | Car | Mini Bus | Bus | LCV | Truck | | | | |
| | | | | Mini bus | Std. Bus | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2014-15 | 2958 | 263 | 134 | 23 | 412 | 470 | 183 | 187 | 463 | 693 | 695 | 0 | 6671 | 12501 | 97 | 578 | 2832 | 17 | 25 | 22 | 0 | 4 | 20 | 13 | 1 | 2 | 0 | 3621 | 2910 | 10292 | 14811 |
| 2015-16 | 3337 | 279 | 142 | 24 | 432 | 495 | 193 | 408 | 471 | 735 | 722 | 0 | 7038 | 13155 | 103 | 613 | 3038 | 17 | 26 | 22 | 0 | 4 | 20 | 14 | 1 | 2 | 0 | 3839 | 2466 | 10877 | 15601 |
| 2016-17 | 3327 | 296 | 151 | 25 | 454 | 522 | 203 | 420 | 479 | 779 | 767 | 0 | 7426 | 13845 | 109 | 650 | 3237 | 18 | 26 | 21 | 0 | 4 | 21 | 14 | 1 | 2 | 0 | 4082 | 2592 | 11508 | 16437 |
| 2017-18 | 3528 | 314 | 160 | 27 | 476 | 549 | 214 | 452 | 487 | 826 | 804 | 0 | 7837 | 14573 | 116 | 690 | 3428 | 18 | 27 | 21 | 0 | 4 | 21 | 14 | 1 | 2 | 0 | 4340 | 2746 | 12177 | 17319 |
| 2018-19 | 3742 | 333 | 170 | 28 | 500 | 579 | 225 | 476 | 496 | 876 | 843 | 0 | 8270 | 15342 | 123 | 731 | 3654 | 18 | 27 | 20 | 0 | 4 | 22 | 14 | 1 | 2 | 0 | 4616 | 2910 | 12886 | 18252 |
| 2019-20 | 3969 | 353 | 180 | 29 | 526 | 609 | 237 | 502 | 504 | 929 | 894 | 0 | 8729 | 16155 | 130 | 776 | 3886 | 19 | 28 | 20 | 0 | 4 | 22 | 15 | 1 | 2 | 0 | 4909 | 3088 | 13638 | 19240 |
| 2020-21 | 4152 | 369 | 188 | 30 | 544 | 636 | 248 | 524 | 511 | 974 | 933 | 0 | 9110 | 16834 | 136 | 811 | 4106 | 19 | 28 | 20 | 0 | 4 | 22 | 15 | 1 | 2 | 0 | 5164 | 3237 | 14274 | 20071 |
| 2021-22 | 4345 | 386 | 197 | 31 | 565 | 664 | 259 | 542 | 519 | 1021 | 976 | 0 | 9507 | 17544 | 142 | 849 | 4330 | 20 | 29 | 19 | 0 | 3 | 23 | 15 | 1 | 2 | 0 | 5433 | 3396 | 14940 | 20940 |
| 2022-23 | 4546 | 404 | 206 | 33 | 586 | 691 | 270 | 571 | 527 | 1071 | 1017 | 0 | 9923 | 18285 | 149 | 888 | 4566 | 21 | 29 | 19 | 0 | 3 | 23 | 15 | 1 | 2 | 0 | 5717 | 3563 | 15639 | 21848 |
| 2023-24 | 4756 | 423 | 215 | 34 | 608 | 724 | 282 | 598 | 534 | 1123 | 1062 | 0 | 10357 | 19059 | 156 | 929 | 4815 | 22 | 30 | 18 | 0 | 3 | 24 | 16 | 1 | 2 | 0 | 6015 | 3739 | 16372 | 22798 |
| 2024-25 | 4977 | 442 | 225 | 35 | 631 | 756 | 294 | 625 | 542 | 1178 | 1109 | 0 | 10811 | 19868 | 163 | 972 | 5076 | 23 | 31 | 18 | 0 | 3 | 24 | 16 | 1 | 2 | 0 | 6329 | 3924 | 17140 | 23792 |
| 2025-26 | 5138 | 457 | 233 | 36 | 652 | 782 | 305 | 646 | 559 | 1224 | 1146 | 0 | 11161 | 20508 | 168 | 1004 | 5300 | 23 | 31 | 18 | 0 | 3 | 25 | 16 | 1 | 2 | 0 | 6589 | 4075 | 17750 | 24583 |
| 2026-27 | 5336 | 472 | 240 | 37 | 664 | 810 | 316 | 667 | 565 | 1272 | 1186 | 0 | 11523 | 21169 | 171 | 1036 | 5531 | 22 | 32 | 17 | 0 | 3 | 25 | 17 | 1 | 2 | 0 | 6860 | 4239 | 18383 | 25402 |
| 2027-28 | 5570 | 487 | 248 | 38 | 681 | 839 | 327 | 690 | 579 | 1322 | 1229 | 0 | 11897 | 21854 | 180 | 1070 | 5771 | 22 | 32 | 17 | 0 | 3 | 26 | 17 | 1 | 2 | 0 | 7142 | 4396 | 19039 | 26250 |
| 2028-29 | 5768 | 504 | 256 | 39 | 705 | 869 | 339 | 715 | 598 | 1373 | 1272 | 0 | 12283 | 22561 | 185 | 1105 | 6025 | 23 | 33 | 17 | 0 | 3 | 26 | 17 | 1 | 2 | 0 | 7436 | 4586 | 19719 | 27127 |
| 2029-30 | 5964 | 519 | 264 | 40 | 730 | 899 | 350 | 740 | 620 | 1422 | 1316 | 0 | 12603 | 23293 | 191 | 1140 | 6285 | 24 | 34 | 16 | 0 | 3 | 27 | 18 | 1 | 2 | 0 | 7743 | 4743 | 20425 | 28036 |
| 2030-31 | 6165 | 536 | 273 | 41 | 755 | 929 | 360 | 765 | 641 | 1473 | 1362 | 0 | 12956 | 23823 | 195 | 1167 | 6547 | 23 | 34 | 16 | 0 | 3 | 27 | 18 | 1 | 2 | 0 | 7977 | 4877 | 20933 | 28700 |
| 2031-32 | 6357 | 550 | 279 | 41 | 778 | 949 | 370 | 787 | 659 | 1518 | 1404 | 0 | 13238 | 24367 | 199 | 1194 | 6717 | 24 | 35 | 16 | 0 | 3 | 28 | 18 | 1 | 2 | 0 | 8220 | 5015 | 21455 | 29382 |
| 2032-33 | 6570 | 569 | 289 | 42 | 798 | 975 | 382 | 803 | 682 | 1569 | 1452 | 0 | 13522 | 24925 | 202 | 1226 | 6934 | 24 | 36 | 15 | 0 | 3 | 28 | 19 | 1 | 2 | 0 | 8470 | 5157 | 21991 | 30082 |
| 2033-34 | 6788 | 588 | 298 | 43 | 824 | 1002 | 394 | 825 | 704 | 1618 | 1496 | 0 | 13815 | 25487 | 206 | 1253 | 7161 | 25 | 36 | 15 | 0 | 3 | 29 | 19 | 1 | 2 | 0 | 8727 | 5303 | 22542 | 30800 |
| 2034-35 | 6998 | 606 | 308 | 44 | 850 | 1033 | 405 | 848 | 726 | 1668 | 1542 | 0 | 14114 | 26083 | 210 | 1281 | 7390 | 25 | 37 | 15 | 0 | 3 | 30 | 20 | 1 | 2 | 0 | 8993 | 5454 | 23108 | 31537 |
| 2035-36 | 6523 | 580 | 296 | 44 | 787 | 1058 | 417 | 871 | 698 | 1719 | 1590 | 0 | 14423 | 26684 | 210 | 1275 | 7645 | 25 | 38 | 15 | 0 | 3 | 30 | 20 | 1 | 2 | 0 | 9267 | 5508 | 23689 | 32292 |
| 2036-37 | 6645 | 591 | 301 | 44 | 793 | 1087 | 428 | 895 | 711 | 1771 | 1592 | 0 | 14735 | 27301 | 216 | 1299 | 7898 | 26 | 39 | 14 | 0 | 3 | 31 | 20 | 1 | 2 | 0 | 9550 | 5768 | 24286 | 33069 |
| 2037-38 | 6770 | 603 | 306 | 45 | 805 | 1117 | 439 | 920 | 723 | 1820 | 1636 | 0 | 15057 | 27934 | 222 | 1323 | 8160 | 27 | 39 | 14 | 0 | 3 | 31 | 21 | 1 | 2 | 0 | 9842 | 5933 | 24899 | 33867 |
| 2038-39 | 6897 | 613 | 312 | 45 | 820 | 1148 | 452 | 945 | 736 | 1869 | 1681 | 0 | 15386 | 28583 | 226 | 1348 | 8430 | 27 | 40 | 14 | 0 | 3 | 32 | 21 | 1 | 2 | 0 | 10103 | 6102 | 25510 | 34685 |
| 2039-40 | 7026 | 625 | 318 | 46 | 828 | 1180 | 464 | 971 | 748 | 1918 | 1727 | 0 | 15723 | 29248 | 230 | 1373 | 8709 | 26 | 41 | 13 | 0 | 3 | 33 | 22 | 1 | 2 | 0 | 10454 | 6276 | 26177 | 35524 |
| 2040-41 | 7158 | 637 | 324 | 47 | 840 | 1212 | 477 | 998 | 760 | 1967 | 1775 | 0 | 16068 | 29931 | 235 | 1399 | 8997 | 26 | 42 | 13 | 0 | 3 | 33 | 22 | 1 | 2 | 0 | 10774 | 6456 | 26842 | 36387 |
| 2041-42 | 7292 | 649 | 330 | 48 | 856 | 1246 | 489 | 1026 | 772 | 2020 | 1823 | 0 | 16422 | 30631 | 239 | 1425 | 9295 | 24 | 43 | 13 | 0 | 3 | 34 | 23 | 1 | 2 | 0 | 11105 | 6641 | 27526 | 37272 |
| 2042-43 | 7428 | 661 | 336 | 48 | 865 | 1280 | 499 | 1054 | 785 | 2075 | 1871 | 0 | 16783 | 31350 | 243 | 1452 | 9602 | 23 | 44 | 12 | 0 | 3 | 35 | 23 | 1 | 2 | 0 | 11446 | 6832 | 28229 | 38182 |
| 2043-44 | 7567 | 673 | 343 | 49 | 878 | 1315 | 512 | 1083 | 797 | 2132 | 1920 | 0 | 17154 | 32086 | 248 | 1479 | 9920 | 20 | 44 | 12 | 0 | 3 | 35 | 23 | 1 | 2 | 0 | 11798 | 7029 | 28951 | 39115 |
| 2044-45 | 7709 | 686 | 349 | 50 | 890 | 1351 | 526 | 1113 | 809 | 2192 | 1978 | 0 | 17533 | 32842 | 253 | 1506 | 10238 | 21 | 45 | 12 | 0 | 3 | 36 | 24 | 1 | 2 | 0 | 12161 | 7232 | 29693 | 40074 |
| 2045-46 | 7854 | 698 | 355 | 50 | 903 | 1390 | 541 | 1143 | 822 | 2253 | 2032 | 0 | 17921 | 33617 | 258 | 1535 | 10588 | 21 | 46 | 12 | 0 | 3 | 37 | 24 | 1 | 2 | 0 | 12536 | 7441 | 30456 | 41058 |

# APPENDIX -A: DESCRIPTION OF SERVICES
## (i) TERMS OF REFERNECE

**PPP Techno-Economic Feasibility Study and Transaction Advisor for 12 State Roads in the State of Andhra Pradesh, India**

### 1. INTRODUCTION

The State Government of Andhra Pradesh (GOAP) accorded Administrative Sanction for 38 road projects under BOT/PPP mode by engaging consultants to take up DFRs/TEFRs and intends to take up consultancy services for techno- economic feasibility and transaction advisor for 12 Sate roads in the state.

As per the GOAP's strategic vision for the provision, operation and maintenance of infrastructure in the state, it has identified the need to upgrade and operate the high traffic roads in the state through public private partnership arrangements. The *Client* has been tasked with the procurement of concessionaires to design, finance, construct, maintain and operate the roads by tapping into central government financing if required. In this context, the *Client* seeks to hire services of a firm to: (i) undertake the PPP techno-economic feasibility study for the 12 State roads; and (ii) process the "in principle" approval for financing by the central government Viability Gap Fund (VGF) scheme. Subsequently, the *Client* envisages the engagement of a PPP transaction advisor to manage the procurement process for the concessioning of the roads, and for processing the final VGF approval. However, the *Client* reserves the right to award or not the subsequent phase of the assignment for PPP transaction advisory services, on completion of the feasibility study and on obtaining the VGF in principle approval. The 12 roads being considered for PPP Techno-Economic feasibility are:

| Sl. No | Name of work | Approximate Length of Road in Kilometres |
|---|---|---|
| 1 | Sanga Reddy – Narsapur – Toopran – Gajwel – Bhongir – Chityal Road | 164 |
| 2 | Ongole- Bestavaripet | 109 |
| 3 | Mahaboobnagar – Nalgonda Road (Km 0/0 to km 163/2). | 163.2 |
| 4 | Konda Modu – Guntur (Part of Hyd – Guntur Road) (Km 239.73 to km 298.391) including | 70 |
| | bye – pass at Sattenapalli (11.34 km) – Total Length @ 70 Kms. | |
| 5 | Hyderabad – Narsapur Road | 28 |
| 6 | Jangaon – Cheryal – Duddeda road. | 46.4 |

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| Sl. No | Name of work | Approximate Length of Road in Kilometres |
|---|---|---|
| 7 | Jangaon – Suryapet Road | 84.4 ✓ |
| 8 | Suryapet – Mothey – Khammam Road. | 58.3 ✓ |
| 9 | Guntur – Bapatla Road | 49 |
| 10 | Vijayanagaram – Palakonda road | 70.3 |
| 11 | Kurnool – Guntur (km 0/0 to km 115/0) | 115 |
| 12 | Hyderabad – Bijapur Road (from km 23/6 to 60/0 – Manneguda) | 36.4 ✓ |
| | **Total** | 994 |

(See **Annexure-I** for a high-level conceptual discussion on the characteristics of the roads).

Potential consultants are required to be familiar with relevant state and national regulations for PPP.

These terms of reference are part of the request for proposals for a consultancy firm/transaction advisor[1] representing a team of suitably qualified and experienced financial, technical and legal advisors to help the GOAP to:

- ✓ **Phase 1**: Undertake a comprehensive PPP techno-economic feasibility study for the selected state roads and preliminary engineering design.
- ✓ **Phase 2**: If required afterwards by the client, provide transaction advisory services for the appropriate procurement of the contracts and training of Chief Engineer (R&B) PPP/R&B Department staff on PPP contract management.

The scope of work is divided into these two phases. The transaction advisor is required to submit a bid for two phases, stating separately the cost for Phase 1 and Phase 2.

[1]Reference to 'consultancy firm/transaction advisor' includes the entire advisory team, or relevant members, under the management of a single lead advisor who shall contract with the R&B, PPP. This team will be called "Transaction Advisor".

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## 2. SCOPE OF WORK

The scope of work for the transaction advisor is:

**Phase 1: PPP Techno-Economic Feasibility study and PPP Preliminary/Detailed Engineering Design.** The main objective is to establish the technical, economic, and financial viability of the selected roads and prepare preliminary engineering designs and preliminary project reports for the identified PPP roads. The viability of the project designed as a partially access controlled facility shall be established taking in to account the requirement with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads whatever necessary, type of intersections, underpasses / flyovers /ROB's rehabilitation and widening of existing and / or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates vis-à-vis the investment and financial return through toll and other revenues.

The transaction advisor will be required to produce a comprehensive feasibility study based on a preliminary project report for the proposed roads using several PPP modalities. This must enable the GOAP to determine:

- full road life costs
- affordability limits
- risks and their costs
- optimal value-for-money methods of delivery.

**Phase 2: PPP procurement.** If, on the basis of the feasibility study, a PPP solution is decided on, and if the R&B, PPP requires it, the transaction advisor will be required to provide the necessary technical, legal and financial advisory support for the procurement of private parties. This must be in compliance with all relevant national and state regulation and policies, and World Bank Guidelines (if financial is to be required from the Bank), and will include training of staff of the *Client* on PPP contract administration / management.

## 3. DELIVERABLES

**Phase-1: PPP Techno-Economic Feasibility Study and Preliminary / Detailed Engineering Design Deliverables.**

**1. PPP Techno-economic Feasibility Report.**

The transaction advisor is required to produce, in close liaison with the *Client*, a comprehensive PPP feasibility study for the proposed roads, based on preliminary engineering designs. The feasibility study needs to clearly demonstrate affordability for the full project life and propose the optimal value-for-money solution for the GOAP to achieve its desired outcomes. It must follow standard practice (and the contents shown in **Annexure II**) and include solution option analysis, project due diligence, value and risk assessment (including a comprehensive risk matrix), economic valuation and procurement plan. The feasibility study must be compiled in a single report (with relevant annexures), and delivered as both electronic and hard copy documents. All financial models must be in Excel format, and clearly set out all



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assumptions made, sensitivity analyses carried out, and model outputs. They must also be sufficiently adaptable for use by others at later stages. The feasibility study must be presented with a thorough executive summary and must be accompanied by a PowerPoint presentation that encapsulates all the key features of the study. The executive summary and PowerPoint presentation must be compiled in such a manner that they can be used by the GOAP's management for decision-making purposes. Detailed requirements for project data and software are attached in **Annexure III.**

In order for the transaction advisor to be able to complete the detailed Techno-Economic Feasibility Study, it must necessarily complete and deliver the tasks and reports listed in Annexure II, including: (i) Quality Assurance Plan (QAP); (ii) Inception Report (IR); (iii) Technical Feasibility Report; (iv) Strip Plan and Clearances; (v) Land Acquisition Report; and (vi) Preliminary Project Report following the specifications as described in Annexure II.

**2. Presentation of the PPP Techno-economic Feasibility Study**

The transaction advisor will deliver a presentation of the results contained in the Feasibility study.

**3. PPP Project Agreement**

GOAP intends to use the Model Concession Agreement (MCA) for Build-Operate-Transfer (BOT) roads developed by GOI. Therefore, the transaction advisor is required to draft the specific PPP agreements for each of the studied roads, based to the extent possible on the MCA. The Planning Commission, Govt. of India, is planning to release shortly a state-level model concession agreement pertaining to state BOT roads. Should this agreement be finalized in time, the transaction advisor would be asked to base the agreements on this new state-level MCA. Close liaison with the GOAP management and the PPP unit of the GOI at DEA and Planning Commission is required during drafting of the Agreement.

**4. Submission of PPP Project Agreement and Project Report to the Central Government VGF funding**

If the GOAP decides to pursue a PPP solution for the road in question, the deliverables by the consultant must be of a standard that will be accepted by the Central Government (DEA and the Planning Commission as necessary) for the purposes of requesting VGF funding. Moreover, the transaction advisor will be required to submit the Project Agreement and the Project Report and required application forms for obtaining the "in principle" approval by the empowered institution. The transaction advisor is therefore advised to be fully familiar with the requirements as stated in the two notifications issued by the Department of Economic Affairs (DEA) concerning: (i) the procedures for approval of central sector Public Private Partnerships; and (ii) the guidelines for forwarding proposals for financial support to Public Private Partnerships in infrastructure under the VGF (see Annex 1 for the Background on the VGF initiative). These are:



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| | |
|---|---|
| F.No1/5/2005-PPP: | Procedure for approval of Public Private Partnerships |
| F.No.1/4/2005-PPP: | Guidelines for forwarding proposals for financial support to Public Private Partnerships in infrastructure under the Viability Gap Funding Scheme |

The Transaction Advisor shall answer all queries from DEA until the submission is filed to the specifications of DEA

**Phase 2: PPP Procurement Deliverables.** If the GOAP decides on a PPP procurement solution, the transaction advisor may be required to work with the GOAP to manage the procurement process for securing contracts with private parties. The transaction advisor will then have to deliver the following:

**1. GOAP and GOI Approval and Administration of the Bidding Process**

The transaction advisor must prepare a complete set of procurement documents, complying with procurement law, policies, and guidelines, and in accordance with the tendering systems of the GOAP. The documentation must be consistent with the results of the techno-economic feasibility study and enable the *Client* to obtain necessary approvals from the PPP APEX Committee of AP or Finance Secretary as required.

The transaction advisor must also give the GOAP all the necessary drafting, bidder communication and administrative support necessary for the entire procurement process to be conducted in accordance with law and policy, and to the highest standards of efficiency, quality and integrity.

**1.1. Pre-qualification**

The transaction advisor must design and administer a pre-qualification (request for qualification (RFQ)) process with the intention of:

- ensuring that the GOAP's exact interest is communicated clearly to the market
- determining the extent and nature of interest in the private sector
- pre-qualifying a competitive number of competent contractor and consortia of contractors in an equitable and transparent way.

The desired result is that every pre-qualified bidder is capable of providing the facilities and services required by the GOAP.

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The transaction advisor must: prepare all the necessary RFQ documentation, including advertising material; set up and administer the process by which the GOAP can pre-qualify the parties; and help the GOAP evaluate and pre-qualify bidders.

1.2. Payment Mechanism

The transaction advisor must develop a rigorous payment mechanism that captures the elements of risk transfer established in the feasibility study.

1.3. Bid Evaluation Criteria and Bid Process Design

The transaction advisor must: set up a bid evaluation system and criteria; design a suitable bid process that will ensure comparable bids; devise effective systems for communicating with bidders; inspire market confidence; and incorporate all other requirements for the project. If appropriate, a system that allows for variant bids may be designed. Due regard must be giving to the requirements of the central government VGF for using the lowest capital grant requested by the private sector as the bidding variable.

1.4. Bidding Documents (SBD)

The transaction advisor must prepare bidding documents in accordance with best industry practice and with GOAP ,consistent with the results of the PPP feasibility study. The bidding documents must concisely set out:

- the output specifications of the GOAP
- requirements for compliant bids
- a risk profile as established in the feasibility study
- the payment mechanism
- the bid process
- evaluation criteria
- bidder communication systems.

1.5. GOAP and GOI Approval

The transaction advisor must compile all the documentation necessary for the GOAP to obtain approvals to enable the procurement process to begin. This includes approval from the PPP APEX Committee of AP or Finance Secretary as required.

1.6. Administration of the Bidding Process

If GOAP is accessing the VGF, then bids shall be invited within four months of receipt of the "in principle" approval for VGF by DEA, unless the period has been formally extended by DEA as necessary. It is the responsibility of the transaction advisor to obtain this extension if required.

The transaction advisor is to provide all necessary administrative support to the GOAP for the efficient and professional management of the bidding process. This includes managing a data room, facilitating structured engagement between the GOAP, and

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bidders, helping the GOAP communicate effectively with bidders, and receiving bids.

2. Evaluation of Bids, Demonstrating Value for Money

2.1. Evaluation of Bids

The authorized staff of the GOAP, helped by the transaction advisor, must evaluate the bids.

2.2. The Value-for-money Report / Bid Evaluation Report:

The results of the bidding and evaluation of bids must be presented in a single value-for-money report/ Bid Evaluation Report (with relevant annexures) that demonstrates clearly how value for money will be achieved with the preferred bidder. The report must clearly indicate the preferred and second-ranked bidders and provide explanations for the recommendations

3. PPP Project Agreement Discussions, Management Plan and Approvals

The transaction advisor must assist the GOAP in the discussions for contract finalization with the preferred bidder. This will involve categorising issues appropriately, developing timelines for completion, and planning discussion tactics and processes for reaching agreement. The transaction advisor must ensure that all agreements reached are incorporated into all the financial, commercial and legal documentation, and must assist with drafting the necessary and related correspondence, including minutes of discussions.

The final terms of the agreements, each as discussed and agreed with the preferred bidder, must be submitted by the GOAP, along with the PPP agreement management plan road-wise for approval of APEX committee or Secretary Finance as required. The transaction advisor is responsible for compiling the necessary submissions for the GOAP to obtain this approval from the PPP Apex Committee of AP. In addition, the transaction advisor must, in close liaison with the GOAP, draft a comprehensive PPP agreement management plan for the GOAP. This must include arrangements to have in place for management and monitoring of PPP contract during the entire duration of the contract.

The transaction advisor must ensure that a comprehensive legal due diligence been completed. This will relate to legal compliance, competence and capacity to enter into the PPP agreement.

4. PPP Project Agreement Signature, Close-out Report and Financial Closure

The transaction advisor must help the GOAP with all functions related to signing the final agreement. The transaction advisor must also compile a comprehensive close-out report. The close-out report will be a confidential document of the GOAP, and will also be lodged with GOI if required.

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**5. Final Approval for Central Government VGF**

Within three months of the date of award (unless an extension has been formally received by DEA), the transaction advisor will ensure that the lead financial institution (or the party named as such from within the consortium of financial institutions) presents its project appraisal report and updated VGF formats for the approval of DEA.

The transaction advisor will also facilitate the tripartite agreement between GOI, the private sector and the lead financial institution, so that the VGF can be accessed.

**6. Training**

During the 3 months allowed for the task 5 above, the transaction adviser will conduct a work shop at Hyderabad on PPP for Senior / Middle level / Junior Level Engineers (excluding traveling allowance and residential accommodation)

## 4. DURATION OF THE SERVICES

The consultancy will be carried out over a period of 18 months, as follows.

**Phase 1** : $1^{st}$ – $7^{th}$ Months

**Phase 2** : $8^{th}$ – $18^{th}$ months

In providing the services the consultants should use highly qualified technical resources in the preparation of preliminary detail engineering design and technical feasibility studies of the selected roads.

The Reports and other submissions to the Client required during the consultancy are as scheduled below:

| Phase | Duration | Task |
|---|---|---|
| I | 1 Month | Mobilization, Inception Report and Quality Assurance Plan Document |
| | 5 Months | Technical Feasibility Report, Strip Plan, clearances and LAR |
| | 6 Months | Preliminary Project Report |
| | 7 Months | PPP Techno-economic Feasibility Report, Draft PPP Agreement, Assistance for the *Client* in GOI Approval for VG funding |

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| Phase | Duration | Task |
|---|---|---|
| 2 | 9 Months | Preparation of Bidding Documents for Pre-Qualification and assisting the *Client* in Selection of Pre-qualified Bidders, Preparation of bidding documents and other activities connected with finalization of Pre-qualified bidders |
| | 12 Months | Preparation of Bidding Documents for and assisting the *Client* in Selection of Bidders other activities connected with procurement of Private Partner |
| | 15 Months | Assisting the *Client* in Project Agreement Signature and compilation of Close-out report with the bidder |
| | 18 Months | Final Agreement from VGF of GoI and facilitation of tripartite agreement, Imparting training to the staff of the *Client* in PPP contract administration |

## 5. PROJECT TEAM

### 5.1 General Qualifications of Consultancy Services

The transaction advisor must be a single legal entity with all other necessary expertise secured via subcontract, or under a joint venture arrangement. The Client will enter into a single contract for the delivery of the work set out in these terms of reference. Foreign firms providing proposals must become familiar with local conditions and laws, and take them into account in preparing their proposals.

The transaction advisor will comprise a team, managed by a single lead advisor. The members of the team will have both the skill and experience necessary to undertake the range of tasks set out in these terms of reference. Each individual on the team must be personally available to do the work as and when required. The lead advisor will be held accountable, in terms of the transaction advisor contract, for ensuring project deliverables and for the professional conduct and integrity of the team.

The skills and experience required in the transaction advisor are as follows:

- financial analysis, with relevant PPP and project finance experience
- PPP procurement and structuring
- legal, with relevant Indian or South Asian experience in the drafting and negotiating of PPP agreements
- project planning
- relevant expertise in road & bridge design, construction, and operation
- discussions before signature of contract
- contract management
- project management.

If the identified roads pass through any industrial/mining belts of the state, it is required that the transaction advisor's team should have specialized traffic forecasting expertise related to the characteristics of India's/ AP's industry. The traffic forecasting should focus

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on truck and rail mode split analysis for heavy industry cargo in addition to traditional traffic forecasting methodology.

The transaction advisor shall also hold stakeholder consultations with industry/mine in the area and with truckers to obtain information for assessing alternative BOT ownership structures and BOT modalities. Consultations will also provide inputs to:

(i) Select the appropriate contract award criteria for the concession;

(ii) Contribute to Concession Agreement clauses such as setting and adjusting tariff rates (for example, higher truck traffic rates and periodic tariff adjustment related to road damage caused by the trucks);

(iii) Determine the role of the industry companies, if any, in the BOT ownership structure;

The financial feasibility of combining some of the roads into one BOT should be explored by the transaction advisor.

### 5.2 Required Qualifications

A total of 50 man- months is estimated for the entire phase 1 & 2. The Transaction Adviser is required to deliver the services from a location in Hyderabad.

The list of suggested key personnel to be fielded by the Consultant is shown below. These key persons will be supported by adequate technical and other staff. However, the Consultant is expected to make their own assessment for the required man month for the key personnel.

| Position | Job Description | Minimum Qualification of Proposed Staff |
|---|---|---|
| **Lead Transaction Advisor / PPP Financial Expert** | To act as a Team Leader for the Transaction Advisory Services | B.E / Management Degree in Finance/ Economics with 20 Years of Experience and 5 years in the relevant field. He must have experience in the Projects associated with PPP model. |
| **PPP Legal Expert** | Overall responsible for Contract Document Preparation | Graduate in Law. He must have extensive international experience of 10 Years of Experience and 6 years in the relevant field in all aspects of Legal aspects which cover Procurement under PPP |

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| Position | Job Description | Minimum Qualification of Proposed Staff |
|---|---|---|
| **Highway Engineer** | Overall responsible for Contract Document Preparation/Writing Technical Specification etc. | B.E. Civil/ Civil Engineer. He must have extensive international experience of 15 Years of Experience and 5 years in the Supervision activities under the roads and highways projects under BOT/PPP |
| **PPP Contract Management/ Procurement Specialist** | Overall responsible for Contract Management activities | B.E. Civil / Civil Engineer. He must have extensive international experience of 15 Years of Experience and 5 years in the Procurement and contract management of roads and highways projects under BOT/PPP. |
| **Quality Management Specialist** | Overall responsible for Quality Management activities | B.E. Civil/ Civil Engineer. He must have extensive international experience of 10 Years of Experience and 5 years in Quality/Management aspects of roads and highways projects under BOT/PPP. |
| **Environmental Management Specialist** | Responsible for development of an Environmental and social frame work for PPP Contract System. | Graduate in Civil Engineering / Environmental Engineering / Post graduate in Environmental sciences with about 10 years of experience of which 5 years on environmental impact assessment of road sector projects in similar capacity. The candidate must have the experience of preparing environmental management plans and supervising & monitoring implementation plans for road sector. |
| **Social Management Specialist** | | |

The consultants should submit the proposal as per the staff requirements indicated herein. Consultants may, if they wish, also indicate alternative staffing arrangements, which they consider to be more suitable. However, for evaluation purposes, the consultant must specify to which key staff the alternative arrangement correspond.

After award of the contract the client expects all of the proposed key personnel to be available during implementation of the contract. The client will not consider substitutions during contract implementation except under exceptional circumstances

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up to a maximum of one-third of the key personnel. In case of replacements, the Consultant will ensure that there is a reasonable overlap between the staff to be replaced and replacement.

## 6. REMUNERATION AND MANAGEMENT OF CONTRACT

### 6.1 Remuneration

Phase 1 & Phase 2 of the work should be costed separately.

As not all roads studied may be viable as PPP, the Transaction adviser is required to submit details of cost for each activity, enabling adjustments in payments for activities not performed. Payment shall be adjusted accordingly to the actual number of Kms for which Phase 2 is being undertaken. However the total cost for the Financial Proposal must be priced based on all roads studied being viable for Phase 2.

### 6.2. Management of transaction Advisor by R&B, PPP

A project officer has been appointed by the Client to take full responsibility for managing the transaction advisor's work and for ensuring delivery on the project. The project officer will establish a project team to engage regularly with the transaction advisor for efficiently completing the various delivery items. Frequent meetings with the Transaction Advisor at site office or in Delhi are foreseen during project preparation. The project team will meet at least monthly and the transaction advisor will report progress to these meetings, as instructed by the project officer.

During the entire period of services, the Transaction Advisor shall interact continuously with the *Client* and provide any clarifications as regards to methods being followed and carry out any modification as suggested by the *Client*. A programme of various activities shall be provided to the *Client* and prior intimation shall be given to the *Client* regarding start of key activities such as boring, survey etc. so that inspections of the *Client* officials can be arranged in time. In addition, the *Client* officers and other Government officers may visit the site at any time, individually or collectively to acquaint themselves with the field investigation and survey works.

All equipment, software and books etc, required for the satisfactory delivery of the services for this project shall be obtained by the Transaction Advisor at their own cost and shall be their property.

The project officer will confirm that the transaction advisor has satisfactorily completed each deliverable before invoices can be submitted to the GOAP for payment.

The project officer is the General Manager, PPP and can be contacted at office of Chief Engineer (R&B) PPP, Quality Control Building, Errumanzil, Hyderabad – 500 082

### 6.3. Review Committee to Monitor Consultant's Works

A review committee consisting of the following officers of the RBD shall review the progress of the work and the reports to be submitted by the consultant.

Chief Engineer (R&B) PPP

Black Infrastructure Consultancy Services Pvt. Ltd. Bangalore CONSULTANT



CHIEF ENGINEER (R&B) PPP

2. General Manager, PPP
3. Executive Engineer, PPP

The Review Committee will co-opt experts to set their opinion on financial and legal aspects of these projects.

The Review Committee will review the reports submitted by the Consultant, give suggestions and modifications, if any, within two weeks of receipt and would be sole authority to approve the reports. The Review Committee may also hold meetings with the Consultant as necessary to discuss reports submitted and review the progress etc.

The consultant would give detailed program of completion of each of the activity for which the Consultant is responsible. The program may be prepared in the form of bar charts/CPM chart/PERT charts or any other latest technique, which can be updated, with the help of available computer packages.

## 7. DATA, SERVICES, AND FACILITIES TO BE PROVIDED BY THE CLIENT

The following and any other such data, available with the *Client* shall be provided;

(a) Available base mapping, existing road inventories including data on pavement history and condition, traffic statistics and road accident statistics, geographical maps of all districts including category of road thereon;

(b) Relevant permits, security and other clearances for the consultant teams for working in the sensitive areas.

Attention is drawn to the following, **which are not provided by the *Client* and are to be arranged by the Consultant at his own cost.**

1. The *Client* will not provide office accommodation. The Consultant shall make his own office accommodation arrangements for his key personnel and other staff of this assignment including furniture, equipment, operation and maintenance. The Consultant may purchase /hire furniture and equipment for the offices. Upon completion of the assignment the furniture and equipment purchased shall become the property of the *Client* and the same shall be handed over to the *Client* free of cost.

2. The Client will not provide project vehicles to the Consultant. The Consultant shall purchase/hire vehicles and make his own arrangements for registration, insurance, operation and maintenance

3. The Consultant shall be responsible for making his own arrangements for communications.

CONSULTANT



CHIEF ENGINEER (R&B) PPP

## Annexure-I

### Summary of High-Level Financial Pre-Feasibility Screening of Potential PPP Roads

**Introduction:**

This note presents the high-level conceptual discussion on the characteristics of the roads and results of a high level pre-feasibility screening analysis to select roads of Roads and Buildings Department (RBD) for improvements on a PPP basis.

The following 12 candidate roads were initially proposed to be taken up under PPP. The roads were widened/strengthened by the RBD. These roads are proposed to be developed to2-lane with paved shoulders/ 4-lane with central median/divider under PPP

| Sl. | Name of work | Approximate Length of Road in Kilometres | Width of ROW in metres | Existing Carraigeway |
|---|---|---|---|---|
| 1 | Sanga Reddy – Narsapur – Toopran – Gajwel – Bhongir – Chityal Road | 164 | 30 | 2L |
| 2 | Ongole- Bestavaripet | 109 | 30 | 2L |
| 3 | Mahaboobnagar – Nalgonda Road (Km 0/0 to km 163/2). | 163.2 | 30 | 2L |
| 4 | Konda Modu – Guntur (Part of Hyd – Guntur Road) (Km 239.73 to km 298.391) including bye – pass at Sattenapalli (11.34 km) – Total Length @ 70 Kms. | 70 | 30 | IL |
| 5 | Hyderabad – Narsapur Road | 28 | 30 | 2L |
| 6 | Jangaon – Cheryal – Duddeda road. | 46.4 | 30 | 2L |
| 7 | Jangaon – Suryapet road | 84.4 | 30 | 2L |

CONSULTANT



CHIEF ENGINEER (R&B) PPP

| Sl. | Name of work | Approximate Length of Road in Kilometres | Width of ROW in metres | Existing Carraigeway |
|---|---|---|---|---|
| 8 | Suryapet – Mothey – Khammam Road | 58.3 | 30 | 2L |
| 9 | Guntur – Bapatla Road | 49 | 30 | 2L |
| 10 | Vijayanagaram – Palakonda road | 70.3 | 30 | 2L |
| 11 | Kurnool – Guntur (km 0/0 to km 115/0) | 115 | 30 | 2L/S.L |
| 12 | Hyderabad – Bijapur Road (from km 23/6 to 60/0 – Manneguda) | 36.4 | 30 | 4L/2L |
| | **Total** | 994 | | |

Feedback Infrastructure Services Pvt. Ltd. Bangalore

CONSULTANT





CHIEF ENGINEER (R&B) PPP

## Annexure-II

## Detailed Scope of Work for Techno-Economic Feasibility Study

### TASKS

**1. Primary Tasks.** General scope of services shall be cover but not limited to the following major tasks:

i. Review of all available reports and published information about the roads and the project influence area;

ii. Environmental and social impact assessment, including such as related to cultural properties, natural habitats, involuntary resettlement etc;

(a) public consultation including consultation with communities located among the road, NGOs working in the area, other stakeholders and relevant Govt. Depts at all the different stages of the assignment (such as inception stage, feasibility stage, preliminary design stage and final designs);

iii Detailed reconnaissance;

iv Identification of possible improvements in existing alignment and bypassing congested locations with alternatives, evaluations of different alternatives comparisons on techno – economic and other considerations and recommendations regarding most appropriate options;

v. Traffic studies including traffic surveys and axle load survey and demand forecasting for thirty years;

vi. Inventory and conditions survey of roads;

vii. Inventory and condition survey for bridges, cross drainage structures and drainage provisions;

viii. Detailed topographic surveys using Total stations and GPS;

ix. Pavement investigations;

x. Sub – grade characteristics and strength: investigation of required sub- grade and sub-soil characteristics and strength for road and embankment design and subsoil investigation;

xi. Detailed design of road, its cross- sections, horizontal and vertical alignment and design of embankment of height more than 6m and also in poor soil conditions and where density consideration require, even lesser height embankment;

xii. Detailed design of structure, preparation of GAD and construction drawings for cross drainage structures and underpasses etc;

xiii. Identification of the type and design of intersections;

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CONSULTANT



CHIEF ENGINEER (R&B) PPP

xiv. Design of complete drainage system and disposal point for storm water;
xv. Value analysis/value engineering and project costing;
xvi. Economic and financial analysis;
xvii. Contract packaging and implementation schedule;
xviii. Strip plan indicating the scheme for carriageway widening, location of all existing utility services (both over-and underground ) and the scheme for the relocation, trees to be felled and planted and land acquisition requirements including schedule for LA: reports documents and drawings arrangements of estimates for cutting of trees and shifting of utilities from the concerned departments;
**xix. Financial viability of project and different PPP financing options (BOT, BOOT, BOLT, etc);**
xx. Preparation of detailed project report, cost of estimate, approved for construction drawings, rate analysis, detailed bill of quantities, bid documents for execution of civil works through PPP basis;
xxi. Design of toll plaza and identification of their numbers and location and office cum residential complex including working drawings;
xxii. Design of weighing stations , parking areas and rest areas;
xxiii. Any other user oriented facility reroute toll facility;
xxiv. Preparation of social plans for the project for the project affected people as per policy of the lending agencies / Govt of India / Govt. of AP R & R policy with following information

- Objectives of the Project
- The need for the Resettlement in the Project and evaluation of measures to minimize resettlement.
- Description and results of public consultation and plans for continued participation of PAPs .
- Definition of PAPs and eligibility criteria.
- Census and survey results number affected, how are they affected and what impact will they experience.
- Legal and entitlement policy framework – support principles for different categories of Impact.
- Arrangement for monitoring and evaluation (internal and external)
- Implementation schedule for resettlement which is linked to the civil works contract.
- A matrix of scheduled activities linked to land acquisition procedures to indicate clearly what steps and actions will be taken at different stages and the time frame.
- The payment of compensation and resettlement during the acquisition process.
- An itemized budget (replacement value for all assets) and unit costs for different assets.





CHIEF ENGINEER (R&B) PPP

**2. Estimation of Costs.** The Transaction Advisor shall prepare detailed project cost for the roads, including the cost of environmental and social safeguards proposed based on MORTH's Standard Data book and market rate for the inputs. The estimation of quantities, based on detailed designs, and costs would be worked out separately for each road. The project cost estimates so prepared are to be checked against rates for similar on – going works in India under APRDC/RBD / World Bank/ ADB financed road sector projects.

**3. Economic Analysis.** The Transaction Advisor shall carry out economic analysis for the roads. The analysis shall take in to account ongoing and planned road and transport infrastructure projects and future developments plans in the project areas. The benefits and cost streams should be worked out for the project using HDM-IV or other internationally recognized life–cycle costing model. The economic analysis shall cover but be not limited to be following aspects:

i. asses the capacity of existing roads and the effects of capacity constraints on vehicle operating costs (VOC)
ii. calculate VOCs for the existing road situation;
iii. quantity all economic benefits, including those from reduced congestion, travel distance, road maintenances cost savings and reduced incidence of road accidents;
iv. estimate the economic internal rate of return (EIRR) for the roads over a 15-
v. Year period. In calculating the EIRR, identify the tradable and non-tradable components of projects costs and the border price value of the tradable components;
vi. saving in time value.

Economic Internal Rate of Return (EIRR) and Net Present Value (NPV), "with" and " without time and accident savings " should be worked out based on these cost–benefit stream. Sensitivity of EIRR and NPV worked out for the different scenarios. Some indicative scenarios are given below:

| | |
|---|---|
| Scenario-I | Base costs and base benefits |
| Scenario-II | Base costs plus 15% and base benefits |
| Scenario-III | Base costs and base benefits minus 15% |
| Scenario-IV | Base costs plus 15 % and base benefits minus 15 % |

**4. Financial Analysis and Financing Options.** The values of input parameters, assumptions and calibration methodologies for financial analysis, and the rationale for their selection, shall be clearly stated and approved by R&B, PPP. Financial sensitivity shall be carried out to reflect different user fee scenarios and funding options. The Transaction Advisor shall suggest positive ways of enhancing the project viability and furnish different financial models for implementing on BOT format.

Feedback Infrastructure Services (P) Ltd. Bangalore
CONSULTANT



CHIEF ENGINEER (R&B) PPP

FEEDBACK INFRA

Feedback Infra Private Limited
(Earlier known as Feedback Infrastructure Services Private Limited)
Highways Division
No. 14, Langford Garden, First Floor, Langford Avenue
Lalbagh Road, (Near Richmond Circle)
Bangalore 560 025, INDIA
Tel. +91 80 4284 0555 Fax. +91 80 4132 0989
Email: inquiries@feedbackinfra.com

www.feedbackinfra.com

No. FIPL/Highways/R&B (PPP)/17-18/H/34

02 May 2017

To
**Project Director**
**Project Implementation Unit/Hyderabad**
National Highways Authority of India
Dr. No.331/2RT. 2nd Floor,
P.S. Nagar, Masab Tank,
Hyderabad - 500 057. Telangana. India

Office of the Project Director
2-12-
02 MAY 2017

**Kind Attn: Smt Shailaja/PD/PIU/Khammam**

**Sub:** Techno-Economic Feasibility Study for 7 state Roads in the Telangana State- **Tripartite Supplementary Agreement for Hyderabad - Manneguda section of New NH-163.**

**Ref:** 1. Contract Agreement No: 1/CE-PPP/GM/EE PPP/DEE 3/2013-14, dated 14.05.13
2. Supplemental contract Agreement signed on 14.08.2014.
3. E-N-C lr. No. 3043/E_N_C(R&B)/DCE/EE/DEE-III(PPP)/AEE-5 Dt: 19-09-2016

Sir,

With reference to the above subject, we are herewith submitting the Original Signed copy of Tripartite Supplementary Agreement for Hyderabad - Manneguda section of New NH-163 for your record please.

Thanking you and assuring you of our best services at all times.

Yours sincerely,
For **Feedback Infra** Pvt. Ltd.

**Srinivasa Chari D**
Asst. Vice President
Head – Operations (South)

**Encl: as above**

Copy for information along with copy of Tripartite Supplementary Agreement

(i) RO/NHAI/Hyd.
(ii) Engineer-in-Chief (R & B), NH, CRF, PPP, LWE & BLDG, Ground Floor, Errum Manzil, Hyderabad – 500087.
(iii) Superintendent Engineer, NH Circle, 4th Floor, Errum Manzil, Hyderabad-500 087.

hyd – manneguda

TRIPARTITE SUPPLEMENTARY AGREEMENT

Between

NATIONAL HIGHWAYS AUTHORITY OF INDIA
(Ministry of Road Transport & Highways)
Plot No: G-5 & 6, Sector-10, Dwarka, New Delhi - 110075.

AND

ROADS & BUILDINGS DEPARTMENT,
NATIONAL HIGHWAYS WING
GOVERNMENT OF TELANGANA
Errum Manzil, Hyderabad - 500 082, Telangana

AND

M/s Feedback Infra Private Ltd.,
No: 14, Langford Garden,
First Floor, Langford Avenue, Lalbagh Road(Near Richmond Circle)
Banglore-560 025.

For

*CONSULTANCY SERVICES FOR PPP TECHNO-ECONOMIC FEASIBILITY STUDY AND TRANSACTION ADVISOR FOR HYDERABAD-MANNEGUDA SECTION OF NEW NH-163.*

తెలంగాణ तेलंगाना TELANGANA

Sl. No: 6935 Date.25/04/2017.
Sold To : A PrakashBabu
S /o : Kistaiah R/o. Hyd.
To Whom : Feedback Infra Pvt. Ltd.

K. N. LAL BABU
Licenced Stamp Vendor
LICENCE NO.16-07-086/2012,
R.L.NO.16-07-002/2015.
H No.3-5-948/ 91/A, Himayath Nagar
HYDERABAD DISTRICT
PHONE NO. 09492424379

**TRIPARTITE SUPPLEMENTARY AGREEMENT**

This AGREEMENT (hereinafter called the **"Tripartite Supplementary Agreement"**) is made on 28th day of the month of **April 2017.**

Among

1. **The Engineer-in-Chief (NH), Roads & Buildings Department,** Government of Telangana, Errum Manzil, Hyderabad - 500 082, Telangana (hereinafter called the **"Previous Authority"** which expression shall include their respective successors and permitted assigns, unless the context otherwise requires):

2. **The Chairman, National Highways Authority of India (NHA),** Plot No.G-5 & 6, SEctor-10, Dwarka, New Delhi - 110 075 an autonomous body under the Ministry of Road Transport & Highways (hereafter called the **"New Authority"** which expression shall include their respective successors and permitted assigns, unless the context otherwise requires).

**and**

3. **M/s Feedback Infra Private Ltd., Address:** No: 14, Langford Garden, First Floor, Langford Avenue, Lalbagh Road(Near Richmond Circle), Bangalore-560 025 (here after called the **Consultant** which expression shall include their respective successors and permitted assigns).

Feedback Infra Private Limited Bangalore

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Project Director
NHAI, PIU
HYDERABAD.

Superintending Engineer (R&B)
N.H. Circle, Hyderabad. T.S.

For transfer of the Supplemental Agreement dated 14/08/2014 earlier entered between **"Previous Authority"** and **"Consultant"** (hereafter called as the **"Agreement"**) for the **"Consultancy Services"**

For

*"CONSULTANCY SERVICES FOR PPP TECHNO-ECONOMIC FEASIBILITY STUDY AND TRANSACTION ADVISOR FOR HYDERABAD-MANNEGUDA SECTION OF NEW NH-163"* (hereinafter called as the "Work").

WHEREAS

(A) An agreement has been signed between "Previous Authority" and Consultant.

(B) The Consultant has agreed to complete the work as per Agreement upon assignment of the said Project to the New Authority.

(C) The "Previous Authority" in compliance with the decision of its Competent Authority in the Ministry of Road Transport and Highways, Govt. of India, New Delhi, herein after referred to as "MoRTH", communicated to "Previous Authority" and "New Authority" vide Ministry's Office File No.RW/NH-12037/27/2016-(P-7), dated 29/04/2016 are in agreement to handover / takeover said work.

(D) In view of decision of MoRTH, consultant has submitted its no objection to Previous Authority vide his letter No. FIPL/Highways/R&B(PPP)/17-18/H/026 ,dated 20/04/2017 & agreed to complete the work on the same covenant as envisage in the agreement signed with Previous Authority and modifications in payment schedule in Original Contract agreement approved by NHAI HQ vide NHAI HQ letter no: NHAI/Tech/Hyd-Man/TS/2017/96557 dated 15/03/2017.

(E) The Consultant has also agreed & consented to amendment to definition of Authority provided in the Agreement signed with previous Authority whereby Authority will be replaced by the **"Chairman, National Highways Authority of India, Government of India, New Delhi, the "New Authority"**.

(F) The new Authority in compliance to the decision of MoRTH agreed to take over the responsibility of **"Authority"** in the **"Agreement"** and also agreed to amendment to definition of Authority provided in the Agreement signed with the Previous Authority whereby Authority will be replaced by **"Chairman, National Highways Authority of India, Government of India, New Delhi, the "New Authority"**.

(G) All the parties hereto in Agreement to deduce in writing a Tripartite Supplementary Agreement.

NOW, THEREFORE, the parties hereby agrees as follows:

1) The Previous Authority has agreed to handover the work to New Authority.

2) The consultant has also agreed & consented to amendment of definition of Authority provided in the agreement signed with the Previous Authority whereby Authority will be

Feedback Infra Private Limited Bangalore

Superintending Engineer (R&B)
N.H. Circle, Hyderabad. T.S.

Project Director
NHAI, PIU
HYDERABAD.



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replaced by **"Chairman, National Highways Authority of India, Government of India, New Delhi, the "New Authority"**.

3) The new Authority, in compliance to the decision of MoRTH agreed to take over the responsibility of **"Authority"** in the **"Agreement"** and also agreed to amendment to definition of Authority provided in the agreement signed with the Previous Authority whereby Authority will be replaced by **"Chairman, National Highways Authority of India, Government of India, New Delhi, the New Authority"**.

4) All the clauses of original agreement signed between Previous Authority and Consultant will remain the same and are acceptable to all the parties. The **"Agreement"** shall be deemed as it is signed by the **"New Authority"** except definition of Authority provided above.

5) The deliverables submitted by the "Consultant", up to the date of this **"Supplementary Agreement"**, to the **"Previous Authority"** shall be accepted and paid by the **"Previous Authority"**. Subsequent deliverables shall be submitted to, accepted by and paid by the **"New Authority"**.

6) Upon signing this supplementary agreement new Authority undertake all responsibilities arising out of the agreement signed between Previous Authority & the Consultant.

7) The cutoff date for responsibilities towards Consultant for the work done by them would be date on which the Tripartite Supplementary Agreement has been signed i.e., all the recoverable / payables up to the date of signing of this Tripartite Supplementary Agreement would be that of Previous Authority from the Consultant or else the new authority would recover/ pay from/to the consultant & make good / recover to / from **Engineer-in-Chief (R&B), NH, Roads & Buildings Department**, Government of Telangana.

8) The recovery/ release of Mobilization Advance, Performance Security and other deductions shall be done as per Schedule to this Agreement signed between Previous Authority and Consultant.

9) The consultant agree that the mobilization advance made by the Previous Authority be recover by it from the amount payable to the Consultant by the Previous Authority & if at all any balance remain same shall be recovered by the New Authority & reimburse to Previous Authority within 15 days from the date of receipt of notice/ letter from Previous Authority to New Authority.

10) The Consultant and NEW Authority agree that Previous Authority shall release the Performance Security submitted by it and obtained a fresh Performance Security of similar nature in favour of New Authority within 7 days upon release of Performance Security by the Previous Authority.

11) The Consultant has agreed to bear the cost of stamp duty & engrossment thereof.

In WITNESS WHEREOF, the Parties hereto have caused the **"Supplementary Agreement"** to be signed in their respective names as of the day and year first above written.

Project Director
NHAI, PIU
HYDERABAD

Superintending Engineer (R&B)
N.H. Circle, Hyderabad. T.S.

| SIGNED and SEALED on behalf of | Consultant | "Previous Authority" | "New Authority" |
|---|---|---|---|
| Signature | | | |
| Name | Srinivasa Chari Dasaroju | Dr. C.Vasantha | Sailaja |
| Designation | Authorized Representative | Dr. C.Vasantha, The Superintending Engineer(NH), R&B Dept. Hyderabad | Project Director, NHAI. |
| Address: | M/s Feedback Infra Pvt Ltd, Bangalore | The Engineer-in-Chief (NH), Roads & Buildings Department, Government of Telangana, Errum Manzil, Hyderabad - 500 082 | Project Director, PIU-Hyderabad National Highways Authority of India, Hyderabad. |

Witness:

1 ..... C Venkat Reddy (Feedback)

2 ..... C Batta Vanitha (Feedback)

3 ..... C. Santhosh Kumar (Feedback)

Authority letter from all the Authorised signatories may be obtained and attached with this agreement.

Photo identity of Authorised signatories may also be obtained, verified and attached with this agreement.

Like, Photo Identity of witness may also be obtained and attached with this agreement

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075

NHAI/Tech/Hyd-Man/TS/2017/96557

Date: 15.03.2017

To

Regional Officer,
National Highways Authority of India.
H.No. 8-2-334/18,
Road No. 3, Banjara Hills,
Hyderabad-500034

Sub: Four laning of Hyderabad-Manneguda section of new NH-163-Modifications in payment terms w.r.t. Original Contract Agreement for recently transferred State R&B road to NHAI-reg.

Sir,

Please refer to your letter No. NHAI/RO-HYD/11027/H-M/GC/2017/218 dated 20.02.2017 seeking therewith approval for rearrangement of payment schedules within contract price as requested by the Consultant.

2. In this regard, it is to mention that the Competent Authority has approved the following payment schedule for the subject consultancy work:

| S. No. | Deliverables | Fee (%) |
|---|---|---|
| 1&2 | Signing of Agreement and Mobilization, submission of Techno Economic Feasibility Report | 40 |
| 3 | Submission of revised Technical Feasibility Report as per prevailing NHAI Guidelines | 25 |
| 4 | Submission of Technical Schedules and Bid documents | 15 |
| | Submission of Land Plan Schedules | 05 |
| | Submission of 3(a) & 3(A) notifications | 05 |
| 5 | Submission of 3(D) notification including FMBs & Sub-division plans etc., alongwith any other related LA documents as per requirements of NHAI/CALA, peg marking at site and Utility Relocation. | 10 |
| | Total | 100 |

3. It is requested to expedite the submission of Feasibility Report for subject work.

Yours faithfully,

(R.K. Singh)
General Manager (Tech)

Project Director
NHAI, PIU
HYDERABAD

Superintending Engineer (R&B)
N.H. Circle, Hyderabad. T.S.

Copy to: PD, PIU-Hyderabad for information and necessary action.

**Feedback Infra Private Limited**
(Formerly known as Feedback Infrastructure Services Private Limited)
*Highways Division*
No. 14, Langford Garden, First Floor, Langford Avenue
Lalbagh Road, (Near Richmond Circle)
Bangalore 560 025, INDIA
Tel: +91 80 4284 0555 Fax: +91 80 4132 0989
Email: inquiries@feedbackinfra.com

www.feedbackinfra.com

[illegible]

20th April 2017

To
The Superintendent Engineer
NH Circle(Hyd
4th Floor, Errum Manzil
Hyderabad 500 087

Sub: Consultancy Services for PPP Techno-Economic Feasibility Study and Transaction Advisor for 7 State Roads in the State of Telangana, India -Hyderabad – manneguda section of new NH-163 - No objection for handing over part project stretch to NHAI.

Ref: 1. Contract Agreement No: 1/CE-PPP/GM/EE PPP/DEC 3/2013-14, dated 14.05.13
2. Supplemental contract Agreement signed on 14.08.2014.
3. ENC Letter No: 3043/E_N_C (R&B)/DCE/EE/DEE-III(PPP)/AEE-5 Dt: 19-09-2016

Madam,

With reference to the above subject and letter under reference no.3, we have no objection for transferring the stretch Km: 14/000 to Km: 61/780 to NHAI. We are also ready to work & complete the project with NHAI as per the terms & conditions of original agreement and modifications in payment schedule in Original Contract agreement approved by NHAI HQ vide NHAI HQ letter no: NHAI/Tech/Hyd-Man/TS/2017/96557 dated 15/03/2017.

Thanking you and assuring you of our best services at all times

Yours sincerely,
For **Feedback Infra Pvt. Ltd.**

D.S.C. 20/4/17

**Srinivasa Chari D**
Asst. Vice President &
Head-of-operations (South)

**Feedback Infra Private Limited**
(Formerly known as Feedback Infrastructure Services Private Limited)
*Highways Division*
15th Floor, Tower 9B, DLF Cyber City, Phase-III
Gurgaon 122 002, Haryana, INDIA
Tel: +91 124 431 6100 Fax: +91 124 431 6655
Email: bdcentral@feedbackinfra.com

www.feedbackinfra.com

FEEDBACK INFRA
*Making Infrastructure Happen*

24th April, 2017

To,

The Superintending Engineer(NH)
R&B Dept, Hyderabad

**Subject:** Consultancy Services for PPP Techno-Economic Feasibility Study and Transaction Advisor for Hyderabad-Manneguda section of new NH-163

Reg.: Authorization to sign the Tripartite Supplementary Agreement

Dear Sir,

We, Feedback Infra Pvt. Ltd., hereby authorize Mr. Srinivasa Chari Dasaroju, Asst Vice President Cum Head-Operations (South) of our organization for signing the Tripartite Supplementary Agreement for the subject project.

Thanking you,

Yours faithfully,
For Feedback Infra Pvt Ltd.

(Rajeev Bhatnagar)
CEO (Highways Division)

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport & Highways)
कार्यालय मुख्य महा प्रबंधक, हैदराबाद क्षेत्र
Office of the Chief General Manager, Hyderabad Region
H.No. 8-2-334/18, सड़क नं.3, बंजारा हिल्स, हैदराबाद 500034
D.No. 8-2-334/18, Road No.3 Banjara Hills, Hyderabad 500034.

फोन / Tel 040-23551774
फैक्स / Fax 040-23551775
ई-मेल / E-mail rohyderabad@nhai.org
nhairohyd@gmail.com

NHAI/RO-HYD/11023/New NHs/GC/ 6015 dt:20.07.2017

To
The Project Director,
National Highways Authority of India,
Project Implementation Unit,
D.No.331/2RT, 2nd Floor,
P.S.Nagar, Masabtank.
Hyderabad – 500 057.

परियोजना निदेशक का कार्यालय
Office of the Project Director
3440
21 JUL 2017
पी.आई.यू., हैदराबाद/PIU, Hyderabad
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
National Highways Authority of India

Madam,

**Sub:** RO-Hyderabad- Four laning of NH-163 from Hyderabad (ORR near APPA Junction at Km 14+000) to Manneguda (Km 59+500) in the State of Telangana - **Alignment Approval Communicated** – Reg.

**Ref:** 1. PD, PIU-Hyderabad Lr.No.NHAI/PIU-HYD/NH-163/2017/599, dt:01.06.2017.
2. PD, PIU-Hyderabad Lr No.NHAI/PIU-HYD/NH-163/2017/647, dt:12.06.2017.
3. PD, PIU-Hyderabad Lr.No.NHAI/PIU-HYD/NH-163/HYD-MANNE/LA/2017/777, dt:01.06.2017.

This has reference to the letters cited, wherein approval is sought for Alignment Plan submitted by the DPR Consultant,M/s.Feedback Infra Pvt. Ltd., for the subject cited stretch. In view of the recommendations of the Project Director, PIU-Hyderabad, approval of the proposed alignment by Competent Authority is hereby conveyed for taking further necessary action.

Yours faithfully

S. Sarayu

(S.Sarayu)
Manager (Tech.)

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075

दूरभाष / Phone 91-11-25074100/25074200
फैक्स / Fax 91-11-25093507 / 25093514

11025/22/PPP/2018/NHAI

13, March, 2018

**OFFICE MEMORANDUM**

Sub.: (i) Four laning of NH-163 from Hyderabad (ORR Appa Junction) (Design Km 14.000/Existing Km 14.000) to Manneguda (Design Km 60.391/Existing Km 59.500) (Design Length = 46.391 Km) in the State of Telangana under NH (O) on HAM. [Civil Construction Cost –730.40 Cr., Total Project Cost – 776.60 Cr., Total Capital Cost – 953.03 Cr.]

(ii) Four laning of NH-161 from Ramsanpalle (Design Km 39.980/Existing Km 44.757) to Mangloor (Design Km 86.788/Existing Km 91.350) (Design Length =46.808 Km) in the State of Telangana under Bharatmala Pariyojana on HAM. [Civil Construction Cost –895.45 Cr., Total Project Cost – 950.63 Cr., Total Capital Cost – 1220.83 Cr.]

(iii) Four laning of the Suryapet Design Ch. 0.420/Existing Km 128.500 of NH-65) to Khammam (Design Ch. 59.046/Existing Km.50.750 of old SH42) of NH-365B (Old SH-42) (Design Length = 58.626 Km) in the state of Telangana under Bharatmala Pariyojana on HAM. [Civil Construction Cost –1143.18 Cr., Total Project Cost – 1220.81 Cr., Total Capital Cost – 1920.32 Cr.]

The proposal of the above project was appraised by the Project Appraisal and Technical Scrutiny Committee (PATSC), NHAI in its meeting held on 28.02.2018. The minutes of the meeting as prepared by Technical division and approved by Chairman of the Committee is enclosed herewith.

The above is issued with the due approval of Competent Authority.

Encl: As above

Prakhar

(Prakhar Srivastava)
Dy. Mgr (Tech)-PPP

To

(i) Shri Rohit Kumar Singh, Member (Finance)
(ii) Shri Niraj Verma, Member (PPP)
(iii) Shri Siba Narayan Nayak, CGM (Fin)
(iv) Shri Akhilesh Srivastava, CGM (IT)
(v) Shri Manoj Kumar, CGM (Tech)
(vi) Shri Navin Kumar, CGM (Tech)
(vii) Shri S.K. Mishra, CGM (Tech)-AP
(viii) Shri Amit Bhardwaj, Dy. Advisor, NITI Aayog
(ix) Shri R.K. Singh, Advisor (Tech), NHAI

*(Ministry of Road Transport and Highways)*
*Project Implementation Unit*
*25A & 28A, Staff Quarters,*
*Administrative Staff College of India (ASCI)*
*College Park Campus*
*Road No.3, Banjara Hills*
*Hyderabad - 500 034, Telangana*
*Land Mark: Near TV9 Bus Stop*

## Detail of Trees falling under NH's ROW

**Project Name**: 4-laning of Hyderabad-Manneguda Section of NH-163 from Km.14 to Km.59.500

- The total project highway length is 46.405Km (Design length) in which bypasses/realignment length is 11.435Km and length along the existing road is 34.970Km. The widening of existing alignment has been proposed with eccentric widening through which the trees on one side have been saved along existing project alignment. The details of tree effected for 60mts ROW due to widening is tabulated below:

| S.No. | Banyan Trees | | Other Trees | | Total Trees | |
|---|---|---|---|---|---|---|
| | Forest | Non-Forest | Forest | Non-Forest | Forest | Non-Forest |
| 1 | 274 | 762 | 6894 | 2120 | 7168 | 2882 |
| Total | | 1036 | | 9014 | | 10050 |

1. Total Number of **Banyan Trees** falling in NH's ROW : 1036 No's
2. Total Number of **Other Trees** falling in NH's ROW : 9014 No's
3. Total Number of Trees falling in NH's ROW in Forest : 7168 No's
4. Total Number of Trees falling in NH's ROW in Non-Forest: 2882 No's

- Total Number of Trees falling under NH's RoW: 10050No's.

- The above figure almost remain same even for 45mts ROW on account of eccentric widening proposed along the existing project alignment.

- Enumeration of Trees Completed, Verification of Enumerated Data completed. Certification of ownership is received for all the 3 mandals namely Moinabad, Chevellamandals of Rangareddy Districts and Pudur Mandal of Vikarabad District. Submission of tree felling permission is under process.

- On date 4.5.2019, an article has been published on https://timesofindia.indiatimes.com/city/hyderabad/nhai-steps-back-on-road-project-as-locals-activists-cry-green-murder/articleshow/69640328.cmson NHAI steps back on road project as

locals, activists cry 'green murder'. The tendering process for work on the Hyderabad-Chevella-Bijapur Highway, has been stalled, sources in the National Highways Authority (NHAI) said on Monday. The development follows protests by residents and activists who opposed the axing and translocation of over 9,000 trees on the stretch.

- The project was earlier included under BharatmalaPriyojana at S.No. 576 of Annexure VII of MoM dated 14.11.2018 with High Priority under NH(O) with average expected traffic is 1,38,083 PCU whereas the actual DPR traffic is 13,780 PCU in Section Km 14 to Km 41.4 & 19028 PCU in Km 41.4 to km 59.50 as on Feb 2018. The figure was erroneously reflected in MoM dated 14.11.2018.

- In this regard, the project has been stalled not because of protest of local resident and environmental activities but because of management decision of NHAI vide letter no.135363 dated 22.05.19, wherein it was requested Ministry to assign the subject stretch to State (R&B), NH for further augmentation and maintenance.

- Environmental / Tree Enumeration Status: Environmental Clearance is not required for this project.

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