

**BEFORE THE NATIONAL GREEN TRIBUNAL SOUTHERN ZONE AT
CHENNAI**

Appeal No. 18 of 2026

Gouraram Sri Ram Reddy and Anr.

...Appellants

-Vs-

Union of India, MOEF&CC and Anr.

...Respondents

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Dated this the 1st of July, 2026



Through

A.Yogeshwaran

Counsel for the Appellant

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ANNEXURE – 5
LIST OF AFFECTED TREES

Development of Greenfield Regional Expressway on northern side of Hyderabad connecting from Girmapur village (on NH-65 at Ch 492.200 km) in Sangareddy district to Choutuppal (on NH-65 at Ch.55.400 km) in Yadadri Bhuvanagir district via Medak and Siddipet District, comprising total design length 158.645 km, in the state of Telengana under Bharatmala Pariyojana.

BRIEF DETAILS OF TREE ENUMERATION

1. Trees in Notified Forest Area under FCA-

Majority of affected trees in forest area are Rosewood, Red Sanders, Neem, teak, peepal Pterocarpus marsupium etc. Trees are enclosed below.

S.No.	District	Division	Poles	Trees	Total
1.	Medak	Medak	7670	370	8040
2.	Siddipet	Siddipet	2292	36995	39287
3.	Yadadri Bhuvangiri	Yadadri Bhuvangiri	4420	2720	7140
TOTAL			13872	40595	54467

2. Trees affected in Agriculture Land

S.No.	District	Poles	Trees	Total
1.	Sangareddy	0	66	66
2.	Siddipet	943	3772	4715
3.	Medak	4710	4555	9265
4.	Yadadri Bhuvangiri	3850	8644	12494
TOTAL		9503	17037	26540

- Majority of affected trees in agriculture land are Rosewood, Neem, Teak, Mango, Coconut, Custard apple etc.

Total affected trees in Project

S.No.	Particulars	Poles	Trees	Total
1	Trees in Reserve Forest	13872	40595	54467
2.	Trees in Agriculture Land	9503	17037	26540
TOTAL		23375	57632	81007

Enumeartion list of plants in the proposed for Diversion for Development of Green field Regional Express Highway (Regional Ring Road (RRR)) in compartment no.264(Gajwel Shareef RF) in Gajwel Section, Gajwel Range, Siddipet (Dist)

S.No	Range	Section	Beat	RF	C#	Species	H (Mts)	MG (Mts)	Cumt	Remarks
1	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Thani	3.20	0.40	0.03	TGFD raised 105 Ha SMM plantation in 2016-17 year
2	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Allaneredu	3.30	0.41	0.03	TGFD raised 105 Ha SMM plantation in 2016-17 year
3	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Neeruddi	4.10	0.38	0.04	TGFD raised 105 Ha SMM plantation in 2016-17 year
4	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Darshanam	3.80	0.52	0.06	TGFD raised 105 Ha SMM plantation in 2016-17 year
5	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Rela	3.30	0.56	0.06	TGFD raised 105 Ha SMM plantation in 2016-17 year
6	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Narepi	2.80	0.48	0.04	TGFD raised 105 Ha SMM plantation in 2016-17 year
7	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Nemali nara	2.90	0.44	0.04	TGFD raised 105 Ha SMM plantation in 2016-17 year
8	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Yegisa	5.50	0.56	0.11	TGFD raised 105 Ha SMM plantation in 2016-17 year
9	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Battaganapu	5.70	0.58	0.12	TGFD raised 105 Ha SMM plantation in 2016-17 year
10	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Maredu	4.20	0.56	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
11	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Thella chinduga	4.10	0.57	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
12	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Thurka Vepa	3.90	0.55	0.07	TGFD raised 105 Ha SMM plantation in 2016-17 year
13	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Ravi	5.20	0.65	0.14	TGFD raised 105 Ha SMM plantation in 2016-17 year
14	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Palakodisa	5.50	0.66	0.15	TGFD raised 105 Ha SMM plantation in 2016-17 year
15	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Palakodisa	6.10	0.69	0.18	TGFD raised 105 Ha SMM plantation in 2016-17 year
16	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Gummadi Teak	4.60	0.52	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
17	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Ravi	2.90	0.44	0.04	TGFD raised 105 Ha SMM plantation in 2016-17 year
18	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Vepa	3.30	0.55	0.06	TGFD raised 105 Ha SMM plantation in 2016-17 year
19	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Thapsi	3.40	0.56	0.07	TGFD raised 105 Ha SMM plantation in 2016-17 year
20	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Nemali nara	3.90	0.56	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
21	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Ganga Ravi	4.40	0.68	0.13	TGFD raised 105 Ha SMM plantation in 2016-17 year
22	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Allaneredu	4.50	0.67	0.13	TGFD raised 105 Ha SMM plantation in 2016-17 year
23	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Darshanam	5.10	0.62	0.12	TGFD raised 105 Ha SMM plantation in 2016-17 year
24	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Nemali nara	5.30	0.49	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
25	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Thurka Vepa	6.10	0.43	0.07	TGFD raised 105 Ha SMM plantation in 2016-17 year
26	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Palakodisa	5.30	0.48	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
27	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Ravi	4.20	0.68	0.12	TGFD raised 105 Ha SMM plantation in 2016-17 year
28	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Chinduga	4.40	0.66	0.12	TGFD raised 105 Ha SMM plantation in 2016-17 year
29	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Chinduga	3.80	0.68	0.11	TGFD raised 105 Ha SMM plantation in 2016-17 year
30	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Palakodisa	6.20	0.60	0.14	TGFD raised 105 Ha SMM plantation in 2016-17 year
31	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Vagumaddi	6.00	0.58	0.13	TGFD raised 105 Ha SMM plantation in 2016-17 year
32	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Neeruddi	4.10	0.67	0.12	TGFD raised 105 Ha SMM plantation in 2016-17 year
33	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Ippa	4.20	0.49	0.06	TGFD raised 105 Ha SMM plantation in 2016-17 year
34	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Ippa	3.60	0.45	0.05	TGFD raised 105 Ha SMM plantation in 2016-17 year
35	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Yegisa	3.90	0.78	0.15	TGFD raised 105 Ha SMM plantation in 2016-17 year
36	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Rosewood	3.70	0.58	0.08	TGFD raised 105 Ha SMM plantation in 2016-17 year
37	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Rosewood	3.70	0.55	0.07	TGFD raised 105 Ha SMM plantation in 2016-17 year
38	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Dirshanam	4.80	0.68	0.14	TGFD raised 105 Ha SMM plantation in 2016-17 year
39	Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	Nemali nara	4.40	0.62	0.11	TGFD raised 105 Ha SMM plantation in 2016-17 year

Enumeartion list of plants in the proposed for Diversion for Development of Green field Regional Express Highway (Regional Ring Road (RRR)) in compartment no.264(Gajwel Shareef RF) in Gajwel Section, Gajwel Range, Siddipet (Dist)

S.No	Range	Section	Beat	RF	C#	Species	H (Mts)	MG (Mts)	Cumt	Remarks
39256	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Narepi	6.10	0.69	0.182	Natural Forest in RF Mailaram
39257	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Yegisa	5.10	0.68	0.147	Natural Forest in RF Mailaram
39258	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Battaganapu	5.20	0.58	0.109	Natural Forest in RF Mailaram
39259	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Maredu	5.50	0.55	0.104	Natural Forest in RF Mailaram
39260	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Ravi	3.80	0.49	0.057	Natural Forest in RF Mailaram
39261	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Palakodisa	5.10	0.62	0.123	Natural Forest in RF Mailaram
39262	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Palakodisa	5.30	0.49	0.080	Natural Forest in RF Mailaram
39263	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Gummadi Teak	6.10	0.43	0.070	Natural Forest in RF Mailaram
39264	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Neeruddi	5.30	0.48	0.076	Natural Forest in RF Mailaram
39265	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Darshanam	4.20	0.68	0.121	Natural Forest in RF Mailaram
39266	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Rela	5.10	0.68	0.147	Natural Forest in RF Mailaram
39267	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Narepi	5.50	0.66	0.150	Natural Forest in RF Mailaram
39268	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Vepa	5.20	0.58	0.109	Natural Forest in RF Mailaram
39269	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Thani	5.50	0.55	0.104	Natural Forest in RF Mailaram
39270	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Allaneredu	3.80	0.49	0.057	Natural Forest in RF Mailaram
39271	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Neeruddi	5.10	0.62	0.123	Natural Forest in RF Mailaram
39272	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Darshanam	5.30	0.49	0.080	Natural Forest in RF Mailaram
39273	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Rela	6.10	0.43	0.070	Natural Forest in RF Mailaram
39274	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Narepi	5.50	0.56	0.108	Natural Forest in RF Mailaram
39275	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Nemali nara	5.70	0.58	0.120	Natural Forest in RF Mailaram
39276	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Yegisa	4.20	0.56	0.082	Natural Forest in RF Mailaram
39277	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Battaganapu	5.20	0.65	0.137	Natural Forest in RF Mailaram
39278	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Maredu	5.50	0.66	0.150	Natural Forest in RF Mailaram
39279	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Ravi	4.50	0.67	0.126	Natural Forest in RF Mailaram
39280	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Palakodisa	5.10	0.62	0.123	Natural Forest in RF Mailaram
39281	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Palakodisa	5.30	0.49	0.080	Natural Forest in RF Mailaram
39282	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Gummadi Teak	6.10	0.43	0.070	Natural Forest in RF Mailaram
39283	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Yegisa	5.10	0.68	0.147	Natural Forest in RF Mailaram
39284	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Rela	5.50	0.66	0.150	Natural Forest in RF Mailaram
39285	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Narepi	6.10	0.69	0.182	Natural Forest in RF Mailaram
39286	Gajwel	Gajwel	Mutrajpally	Mailaram	265	Nemali nara	4.60	0.52	0.078	Natural Forest in RF Mailaram
39287	Gajwel	Gajwel	Mutrajpally	Mailaram	265					
TOTAL									3.76	

Abstract							
Range	Section	Beat	RF	Compt.No	From	To	Nos
Gajwel	Gajwel	Mutrajpally	Gajwel Shareef	264	1	15385	15385
			Mailaram	265	15386	39287	23902


District Forest Officer
SIDDIPET

ANNEXURE- 8
DETAILED TRAFFIC STUDY
REPORT

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1 TRAFFIC SURVEYS AND ANALYSIS

1.1 INTRODUCTION

This chapter presents the field traffic surveys undertaken as a part of this study and as per TOR requirements and to understand the existing traffic characteristics, methodology adopted for calculation of diverted traffic and traffic forecasting on the project section. Traffic forecasts made for the project roads over 30-year horizon period will form the basis for further work on pavement design, economic benefits like reduction in Vehicle Operating Costs, Travel time cost and developing capacity augmentation proposals.

As part of this study, a systematic methodology has been followed to assess the characteristics of the traffic on the project road. The details pertaining to the data collection, primary as well as secondary, and results from its analysis are presented in the following sections.

1.2 OBJECTIVES AND SCOPE OF WORK

The objective of the study is to estimate diverted traffic, lane requirements and tollable traffic projections for horizon period. The scope of services of this study is to:

- Performing traffic surveys
- Review the past traffic data on the project stretch and other competing / alternative routes.
- Analyze the network conditions, traffic characteristics and level of toll charged for the competing/alternate routes if any;
- Network Analysis of the project stretch;
- Estimation of the ADT & AADT based on the findings of the study
- Study of the Project Influence Area, alternate routes to the Project and assessing the possibility of diversion of traffic from / to the Project road under consideration due to existing or future developments.
- To study the economic and financial feasibility for proposed Hyderabad Regional Ring road Alignment

1.3 HOMOGENOUS SECTIONS

The Proposed road section is divided into Homogenous sections based on existing radial roads and major settlements along the alignment. Traffic Surveys were conducted on Hyderabad Outer Ring Road Exit and entry toll plaza points to analyze the likely diverted traffic on the proposed greenfield corridor.

Table 1-1: Survey Location

S. No.	Survey Type	Location	Toll Plaza/ Mid-Block
1	Classified Volume Count	NH 65 (Hyderabad – Solapur)	Patancheru
		NH 765D (Hyderabad – Nanded)	Dundigal
		NH 44 (Hyderabad – Nagpur)	Medchal
		SH 1 (Hyderabad – Karimnagar)	Shamirpet
		NH 163 (Hyderabad – Warangal)	Ghatkesar
		NH 65 (Hyderabad – Vijayawada)	Pedda Amberpet
		Ghatkesar – Pedda Amberpet Section on ORR	Near Gowrelli
2	Origin and	NH 65 (Hyderabad – Solapur)	Patancheru

S. No.	Survey Type	Location	Toll Plaza/ Mid-Block
	Destination	NH 765D (Hyderabad – Nanded)	Dundigal
		NH 44 (Hyderabad – Nagpur)	Medchal
		SH 1 (Hyderabad – Karimnagar)	Shamirpet
		NH 163 (Hyderabad – Warangal)	Ghatkesar
		NH 65 (Hyderabad – Vijayawada)	Pedda Amberpet
3	Axle Load	NH 65 (Hyderabad – Solapur)	Patancheru
		NH 65 (Hyderabad – Vijayawada)	Pedda Amberpet

1.4 TRAFFIC SURVEYS: TYPE, LOCATIONS AND DURATION

In order to capture and assess the traffic characteristics, travel pattern the Consultants have conducted the following primary traffic surveys.

- Classified Traffic Volume Count Survey
- Origin-Destination Survey
- Axle load Surveys

The survey stations were selected after a thorough site reconnaissance considering following:

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

The traffic surveys were undertaken during the months of October 2021. The survey photographs are shown in Figure 1-1 and Figure 1-2.



Figure 1-1: Traffic Survey location Map

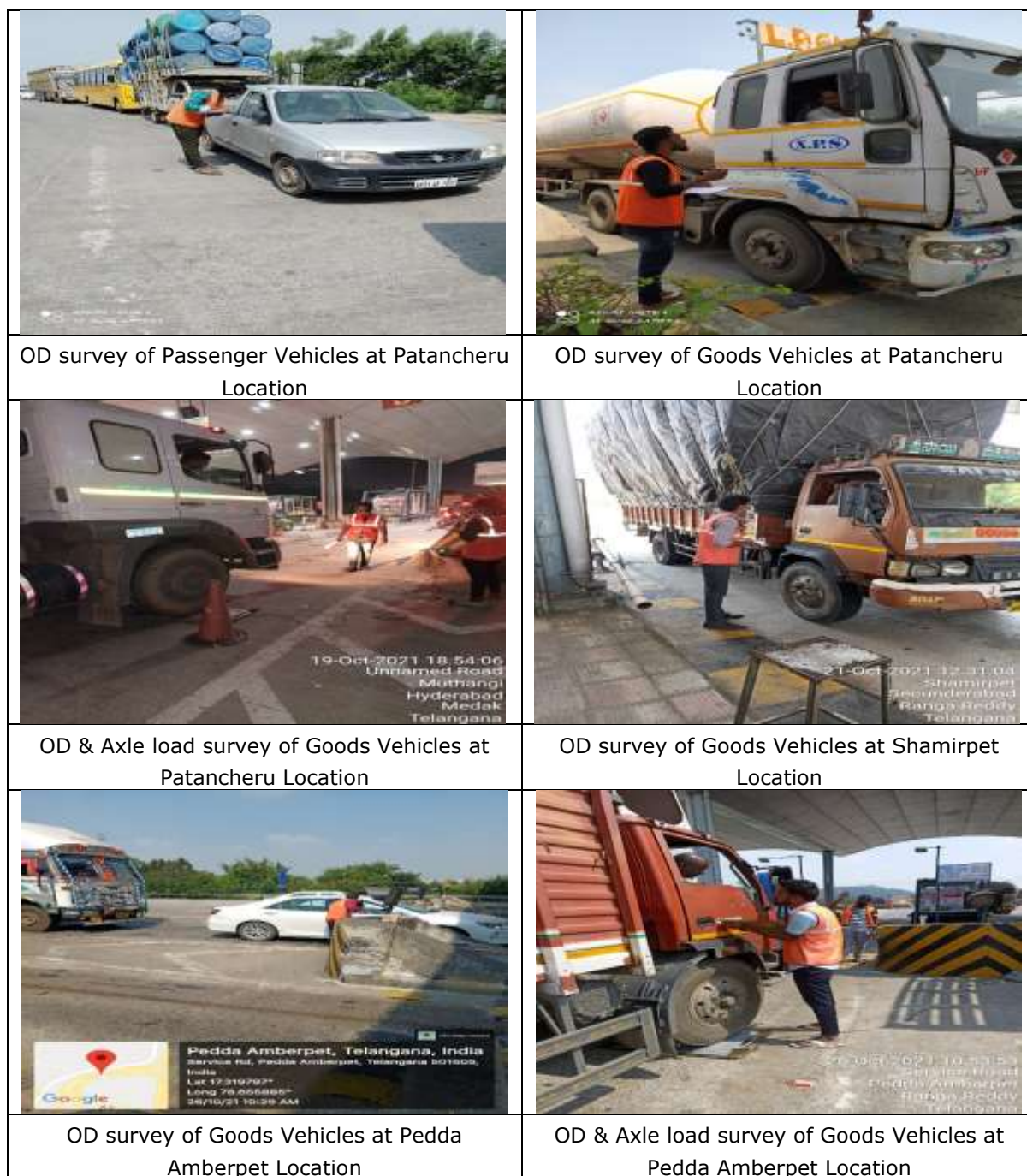


Figure 1-2: survey photographs

1.4.1 Survey Methodology

Classified Traffic Volume Counts

Volume count survey was conducted on Hyderabad ORR Toll locations. The survey was conducted round-the-clock. For recording classified mode-wise information, vehicles were grouped under the categories as given in below Table 1-2.

Table 1-2: Vehicle classification system adopted

S. No.	Motorized
1	Car/Jeep/Van
2	Mini Bus
3	Govt. Bus

S. No.	Motorized
4	Private Bus
5	Light Motor Vehicle goods
6	Light Commercial vehicles (4 Wheels & 6 Wheels)
7	2 Axle Trucks
8	3 Axle Trucks
9	Multi Axle Vehicles

Video graphic technology is implemented for performing midblock and at Toll locations. Vehicles on both directions were captured by high definition cameras.

Origin-Destination Survey

The origin-destination (OD) survey was conducted with an objective to study the travel pattern of goods and passenger traffic along the study corridor. The results were used for assessing the interaction with surrounding regions/states and in estimating traffic growth rates and also calculating diverted traffic.

The OD surveys were conducted for one day (24 hours) at various locations on the project corridor at midblock volume count stations. The survey was undertaken simultaneously with classified volume counts in order to assess the sample size and expansion factor thereafter. Roadside interview method was adopted. The vehicles were stopped on random sample basis with the help of traffic police and drivers were interviewed by trained enumerators to collect the necessary data.

Axle load Survey

The Axle load survey was conducted to determine the Vehicle Damage Factor (VDF) and axle load spectrum for pavement designs.

1.5 TRAFFIC VOLUME ANALYSIS

1.5.1 Classified Traffic Volume Count

Data collected at the site was computerized for further analysis. The various vehicle types having different size and characteristics were converted into passenger car equivalents. Passenger car unit values (PCU) suggested in IRC-64-1990, 'Guidelines for Capacity of Roads in Rural Areas' have been adopted. The PCU values are presented in Table 1-3.

Table 1-3: Adopted PCU's value

Vehicle Type	PCU's
Car/Jeep/Van	1
Mini Bus	1.5
Govt. Bus	3
Private Bus	3
Light Motor Vehicle goods	1
Light Commercial vehicles	1.5
2 Axle Trucks	3
3 Axle Trucks	3
Multi Axle Vehicles	4.5

1.5.1 Average Daily Traffic (ADT)

Traffic volume count data by direction at each location is averaged to obtain the Average Daily Traffic (ADT).

Table 1-4: Summary of ADT on ORR Toll plaza's

Location	Patancheru	Dundigal	Medchal	Shamirpet	Ghatkesar	Pedda Amberpet
Vehicle Type						
Passenger Vehicles	13787	8086	8503	7826	9679	10413
Goods Vehicles	9921	5520	12289	4089	5329	9906
Total Vehicles	23708	13306	20792	11915	15008	20319
Total PCU	42018	20978	38944	17649	23097	38807

Table 1-5: Summary of ADT at midblock location near Gowrelli location

Location	Ghatkesar to Pedda Amberpet	Pedda Amberpet to Ghatkesar	ADT
Vehicle Type			
Passenger Vehicles	5915	5873	11787
Goods Vehicles	5316	5101	10417
Total Vehicles	11231	10973	22204
Total PCU	19381	19105	38486

1.5.2 Hourly Variation and Directional Distribution of Traffic

Hourly variation of traffic at the count stations in terms of Vehicles & PCU's are presented in Figure 1-3 to Figure 1-9. Peak hour traffic and directional distribution of traffic of all survey locations are presented in Table 1-6.

Table 1-6: Peak Hour and Directional Distribution

Survey Location	Peak Hour Vehicles	Peak Hour	Peak Hour Factor	Peak Hour PCU's	Directional Distribution
Patancheru	1429	18.00-19.00	6.0%	2392	50% - 50%
Dundigal	1005	17.00-18.00	7.6%	1411	49% - 51%
Medchal	1420	19.00-20.00	6.8%	2458	51% - 49%
Shamirpet	880	17.00-18.00	7.4%	1139	49% - 51%
Ghatkesar	1116	18.00-19.00	7.4%	1585	50% - 50%
Pedda Amberpet	1299	09.00-10.00	6.4%	2109	52% - 48%
Near Gowrelli	1297	10.00-11.00	5.8%	2030	51% - 49%

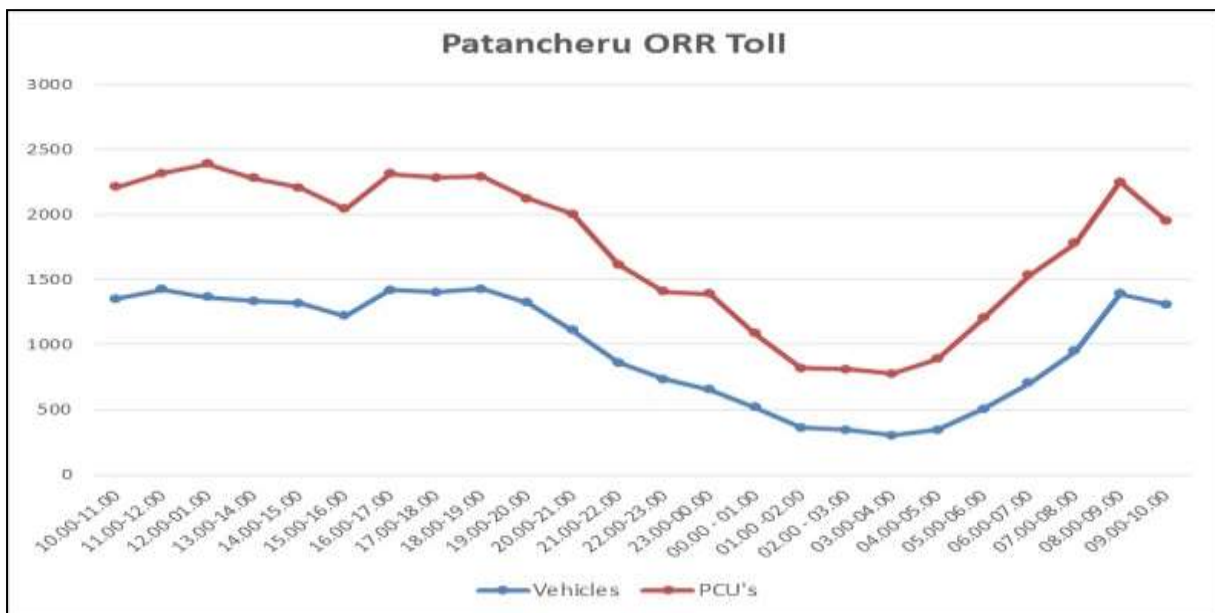


Figure 1-3: Average Hourly volume at Patancheru ORR Toll

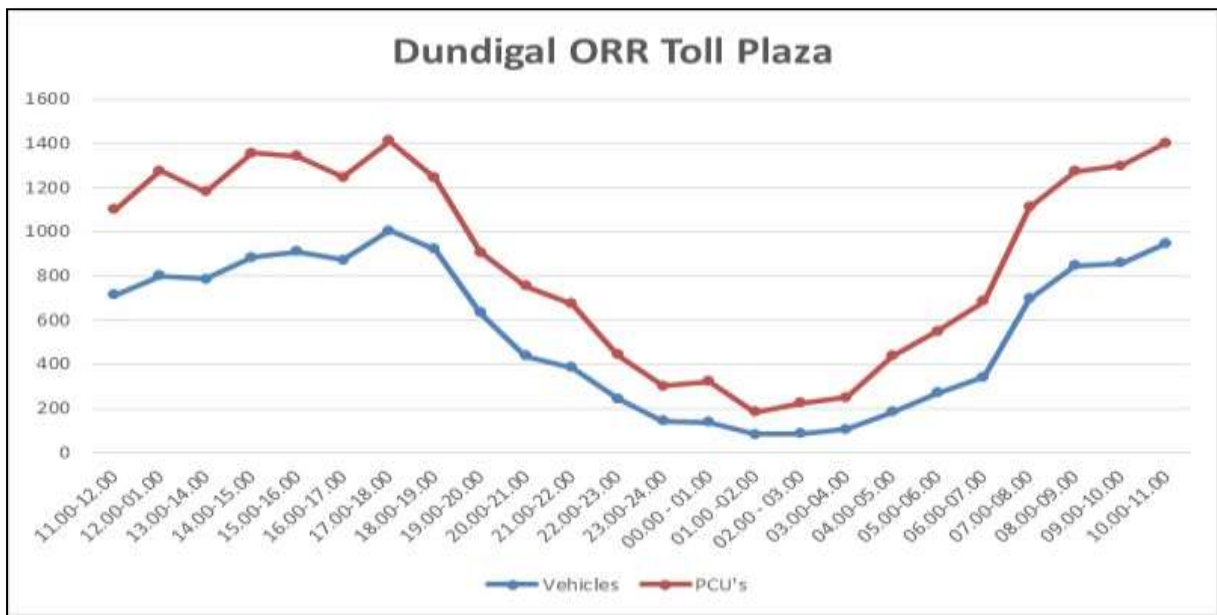


Figure 1-4: Average Hourly volume at Dundigal ORR Toll plaza

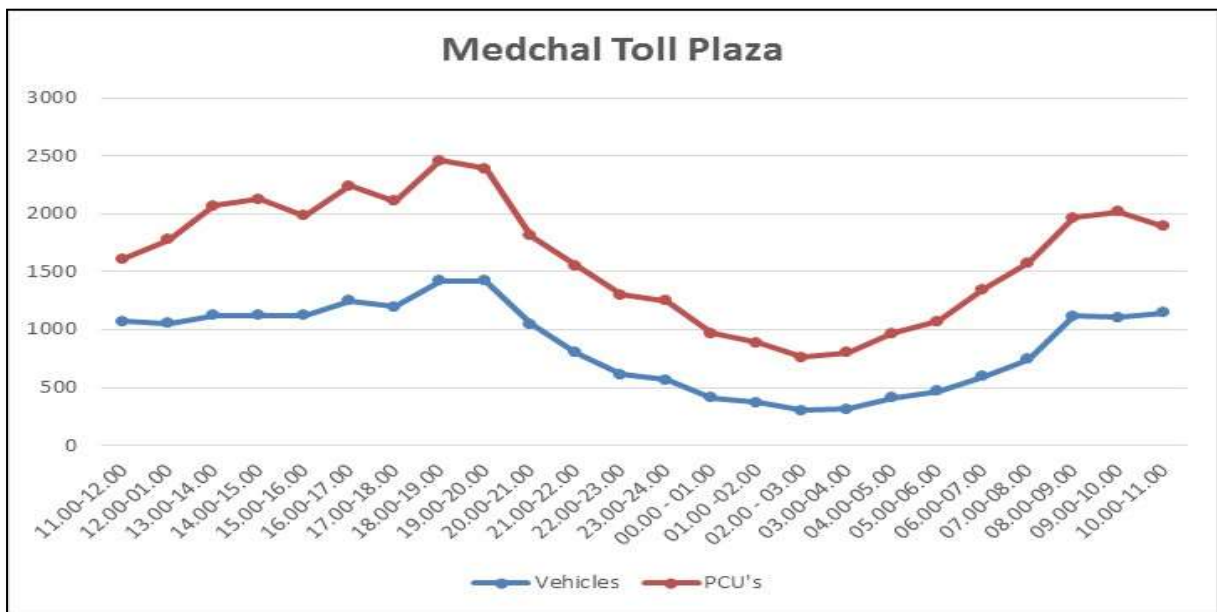


Figure 1-5: Average Hourly volume at Medchal ORR Toll plaza

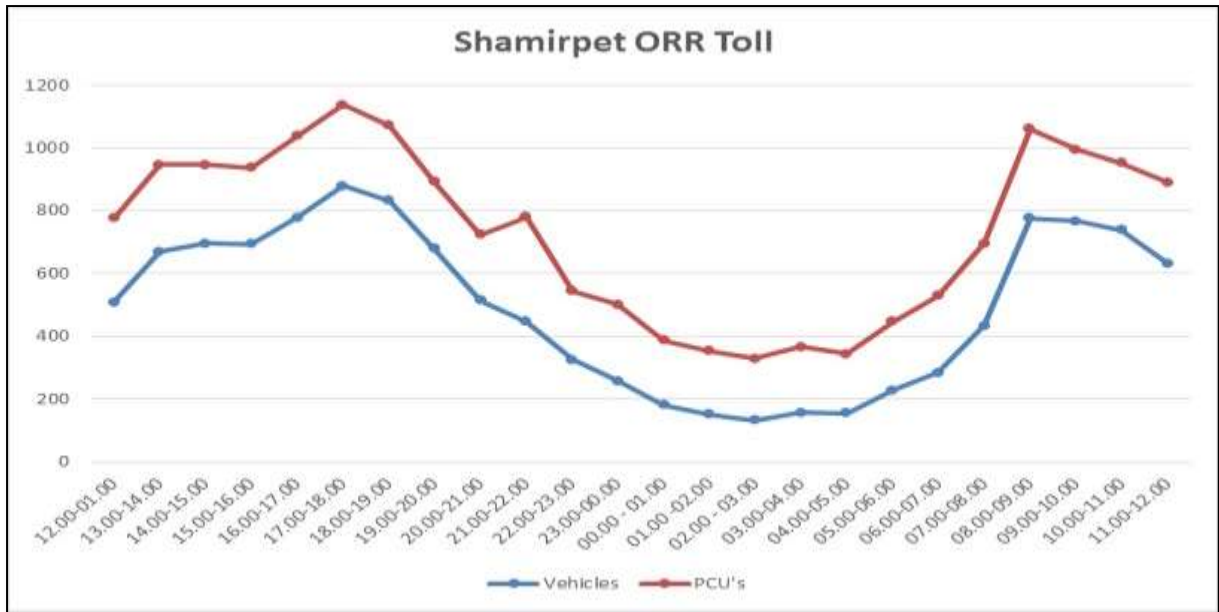


Figure 1-6: Average Hourly volume at Shamirpet ORR Toll

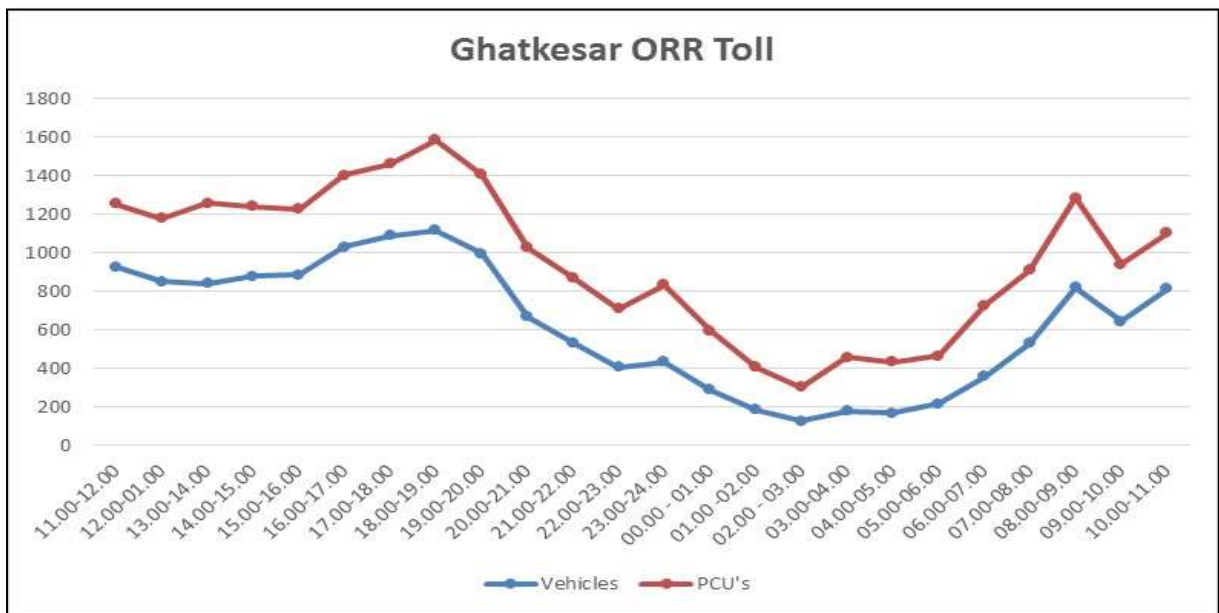


Figure 1-7: Average Hourly volume at Ghatkesar ORR Toll

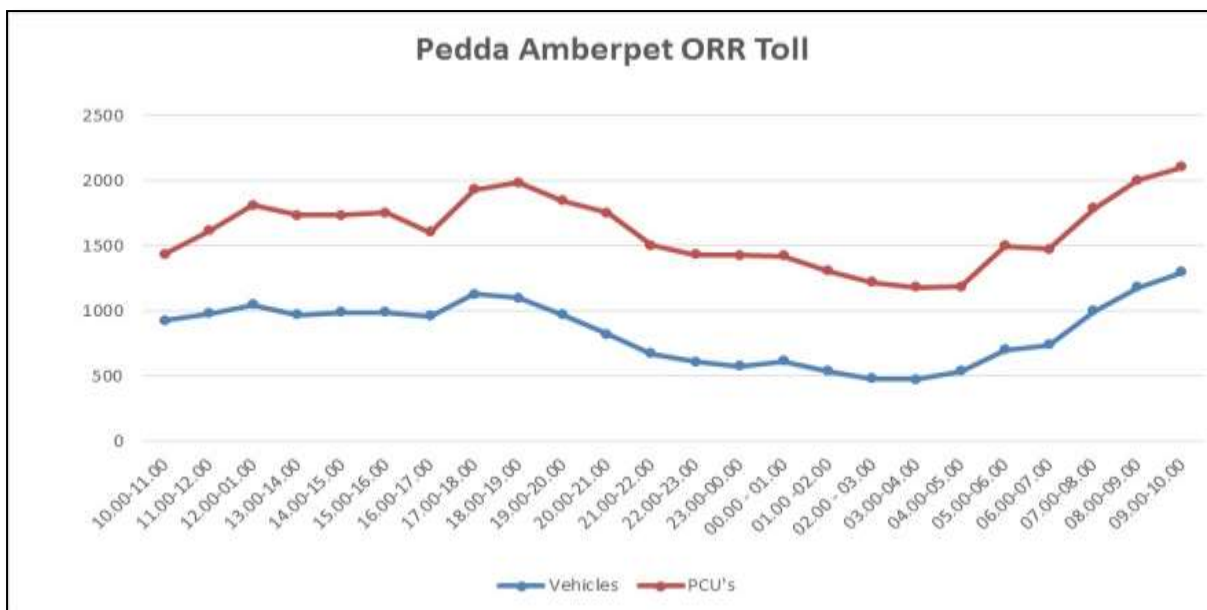


Figure 1-8: Average Hourly volume at Pedda Amberpet ORR Toll

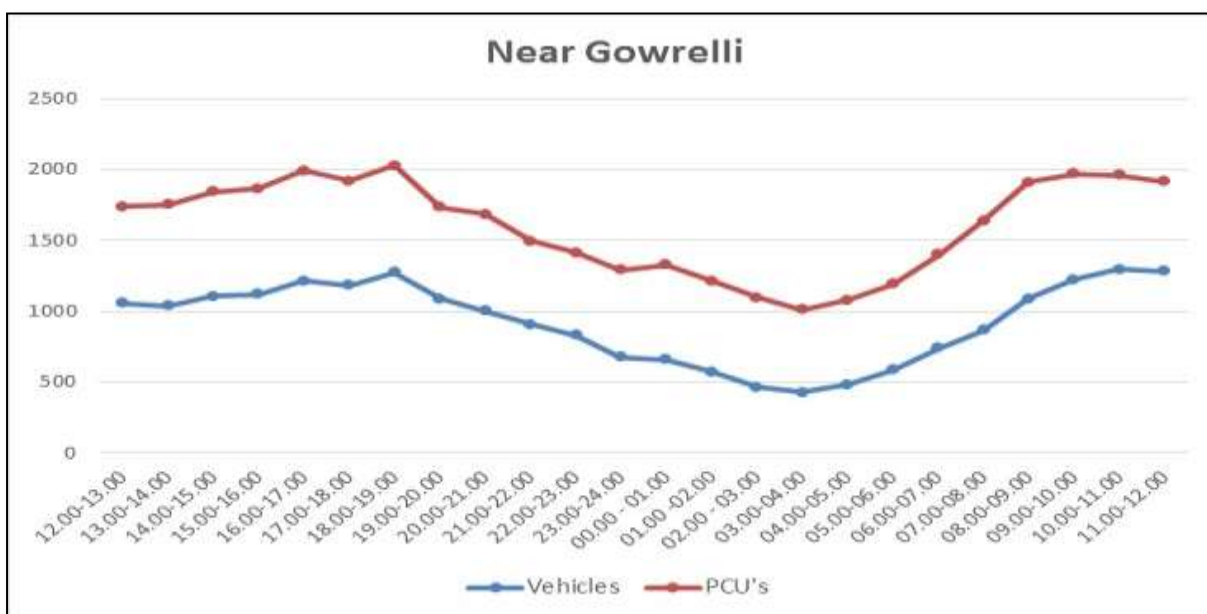


Figure 1-9: Average Hourly volume near Gowrelli Location

1.5.3 Traffic Composition

Composition of traffic observed at the count stations is presented in Table 1-7.

Table 1-7: Share of Vehicles in Average Daily Traffic

Vehicles	Patancheru	Dundigal	Medchal	Shamirpet	Ghatkesar
Cars	57%	59%	40%	63%	64%
Buses	1%	2%	1%	2%	1%
Goods Vehicles	42%	39%	59%	34%	36%
Total	100	100	100	100	100

Table 1-8: Share of Vehicles in Average Daily Traffic

Vehicles	Pedda Amberpet	Gowrelli
Cars	51%	53%
Buses	1%	0%
Goods Vehicles	49%	47%
Total	100	100

1.5.4 Average Annual Daily Traffic (AADT)

Seasonality factors for different vehicle types are necessary in order to arrive at the average traffic representing the whole year. The factors are generally established from past traffic data from PWD/Toll plaza's or from the petrol/ diesel sales data at existing petrol pumps along the project roads. The correction factor for Hyderabad Regional Ring Road section is presented in Table 1-9.

Table 1-9: Seasonal Correction factor

S. No.	Petrol	Diesel
1	1.0	1.00

Mode-wise factors are applied to Average Daily Traffic volumes to obtain the Average Annual Daily Traffic (AADT) for individual survey stations. The location wise ADT and AADT is included in Table 1-10.

Table 1-10: ADT and AADT at traffic count locations

Location	Patancheru	Dundigal	Medchal	Shamirpet	Ghatkesar
Car/ Jeep	12784	7620	7940	7461	9145
Taxi	729	203	341	91	386
School Bus	0	0	0	0	0
Mini Bus	63	27	52	182	19
Govt Bus	0	0	0	0	0
Pvt Bus	191	179	98	84	113
LMV	1067	1041	1400	1119	1120
LCV-4	411	267	699	125	378
LCV-6	2380	1465	4354	1055	1246
2 Axle Truck	1209	597	1436	179	451
3 Axle Truck	1939	823	1917	743	888
4-6 Axle Truck	2915	1027	2483	864	1246
7++ Axle	0	0	0	4	0
HCM/EME	0	0	0	0	0
Ambulance	4	0	14	6	4
Police Car	16	57	58	2	12
Vehicles	23708	13306	20792	11915	15008
PCU's	42018	20978	38944	17649	23097

Table 1-11: ADT and AADT at traffic count locations

Location	Pedda Amberpet	Gowrelli
Car/ Jeep	9746	11206
Taxi	559	488
School Bus	0	0
Mini Bus	58	30
Govt Bus	3	0

Location	Pedda Amberpet	Gowrelli
Pvt Bus	40	64
LMV	1643	2311
LCV-4	88	265
LCV-6	2072	2314
2 Axle Truck	1253	1498
3 Axle Truck	1460	1500
4-6 Axle Truck	3390	2529
7++ Axle	0	0
HCM/EME	0	0
Ambulance	4	0
Police Car	3	0
Vehicles	20319	22204
PCU's	38807	38486

1.6 DATA COLLECTION

Traffic survey data was collected from respective PIU's/ Toll Plaza on radial roads and past DPR reports. The collected data was studied to understand the existing traffic pattern on the existing road sections parallel to proposed greenfield section. Toll data from respective toll plazas and DPR reports are presented below.

Table 1-12: Past Traffic data

Source of data	DPR	DPR	DPR	Toll Plaza	Toll Plaza	Toll Plaza
Vehicle Type / Location	Near Girmapur - NH 65	Sanga Reddy – Nanded NH 161	Narsapur - Medak NH 765D	Hyderabad - Nagpur Road NH 44	Hyderabad -Warangal NH 163	Hyderabad - Vijayawada NH 65
Car /Jeep	5471	2792	4679	8321	16645	21447
LCV /Mini Bus	677	57	655	773	611	1863
Truck	667	482	0	1508	1457	230
Bus	379	399	1333	396	0	3013
3 Axle Truck	624	653	728	1302	252	316
3 Axle Bus	0	0	0	0	0	918
MAV (4-6 Axle)	817	376	442	1568	1955	2920
OSV	1	0	0	2	1	3
Tollable Vehicles	8636	4759	7837	13870	20921	30710
Tollable PCU's	15178	9172	13834	26161	31491	50826

1.7 O-D SURVEY ANALYSIS

1.7.1 Data Checking

The field data collected was entered into computer for further analysis. Incorrect and inconsistent records were corrected by crosschecking it with original field data sheets. The checked and corrected data were used for final analysis. The sample size obtained is given in Table 1-13.

Table 1-13: Sample size of OD survey at survey locations

Vehicle Type	Patancheru	Dundigal	Medchal	Shamirpet	Ghatkesar	Pedda Amberpet
Car/ Jeep/ Van	24%	38%	30%	21%	25%	33%
Taxi	20%	50%	20%	79%	45%	20%
Mini Bus	73%	22%	23%	20%	89%	59%
Pvt Bus	61%	30%	43%	52%	54%	20%
LMV	26%	20%	28%	33%	28%	27%
LCV - 4 W	20%	20%	20%	48%	20%	49%
LCV -6 W	29%	20%	25%	51%	49%	30%
2 Axle Truck	32%	48%	30%	51%	38%	32%
3 Axle Truck	25%	35%	26%	70%	33%	33%
4 - 6 Axle Truck	25%	29%	23%	45%	24%	23%

1.7.2 Zoning System

For analysis of O-D data and preparation of trip tables for studying the regional interaction, a zoning system was developed for the project influence area. The zoning system was developed at four levels. In first level, immediate influence areas of project road were assigned zone codes. Secondly, all-important towns located along the project stretch were considered. In next level, all nearby districts were grouped into zones. Finally, states beyond the influence area were aggregated broadly in terms of direction of travel. In all, a 44-zone system was evolved. The list of traffic zones is presented in Table 1-14.

Table 1-14: Zoning Scheme

S. No.	Village	District	State	TAZ No.
1	L B nagar, Vanasthalipuram, Hayat Nagar	Ranga Reddy	Telangana	1
2	Chandrayangutta, Aramgarh, Balapur, DRDO	Ranga Reddy	Telangana	2
3	Annojiguda, Edulabad, Ghatkesar, Narapally	Medchal- Malkajgiri	Telangana	3
4	Airport, Shamshabad, Adibatla, Raviryal	Ranga Reddy	Telangana	4
5	Charminar, MGBS, Afzulgunj, Chanchalguda, Saidabad	Hyderabad	Telangana	5
6	Secunderabad, Begumpet, Ameerpet, JBS, Ram Nagar, Vidya Nagar	Hyderabad	Telangana	6
7	Jubilee Hills, Hitech City, Banjara Hills, Toli Chowk, Abids	Hyderabad	Telangana	7
8	Ameerpet, SR Nagar, Erragadda, Sanath Nagar	Hyderabad	Telangana	8
9	Sherlingampally Region	Ranga Reddy	Telangana	9
10	Financial District, Gachibowli, Manikonda, Nanakramguda	Ranga Reddy	Telangana	10
11	Chilkur, TSPA Junction, Appa Junction	Ranga Reddy	Telangana	11
12	Maheshwaram, Shadnagar, Kadthal, Kothur	Ranga Reddy	Telangana	12
13	Chevella, Manneguda	Ranga Reddy	Telangana	13
14	Shankarpalle	Ranga Reddy	Telangana	14
15	Ibrahimpattanam, yacharam, Mall, Yamjal	Ranga Reddy	Telangana	15
16	Cherlapalli, ECIL	Medchal- Malkajgiri	Telangana	16
17	Alwal, Hakimpet, Kaziguda	Medchal- Malkajgiri	Telangana	17
18	Kompally, Medchal, Jeedimetla, Kandlakoya, Suchitra	Medchal- Malkajgiri	Telangana	18

S. No.	Village	District	State	TAZ No.
19	Shamirpet,Turkapally, Moula Ali,Raja Bollaram	Medchal- Malkajgiri	Telangana	19
20	Dundigal, Gandhi maisamma,Bowrampet	Medchal- Malkajgiri	Telangana	20
21	Keesara, Bogaram, Dammaiguda, Cheeriyal	Medchal- Malkajgiri	Telangana	21
22	IDA Bollaram & Rest of Hyderabad	Medchal- Malkajgiri	Telangana	22
23	Patancheru,Beeramguda, Isnapur, Muthangi	Sangareddy	Telangana	23
24	GITAM College,Sanga Reddy,Pothreddipalle,Irgipally	Sangareddy	Telangana	24
25	Sadashivpet, Suraram,Aroor	Sangareddy	Telangana	25
26	Zahirabad,Narayankhed, Kamkole	Sangareddy	Telangana	26
27	Rest of Sangareddy District	Sangareddy	Telangana	27
28	Siddipet District	Siddipet	Telangana	28
29	Jogipet,Papannapet	Medak	Telangana	29
30	Medak, Bonthapalle, Narsapur,Kulcharam	Medak	Telangana	30
31	Tupran, Manoharabad, Chegunta,Muppireddypalli, Doulatabad	Medak	Telangana	31
32	Pragnapur, Mulug, Gowraram, Jagdevpur,Vantimamidi	Medak	Telangana	32
33	Warangal, Jangaon and Yadadri Bhuvanagiri Districts			33
34	Bhadadri Kothagudem, Khammam and Mulugu Districts			34
35	Wanaparthi, Nalgonda and Suryapet Districts			35
36	Mahbubnagar, Jogulamba Gadwal, Narayanpet and Vikarabad Districts			36
37	Rajanna Sircilla, Nizamabad, Kamareddy and Nirmal Districts			37
38	Adilabad, Mancheria, Karimnagar, Peddapally and Bhupalpally Districts			38
39	Andhra Pradesh, Orissa and Chhattisgarh States			39
40	Tamil Nadu, Kerala and Puducherry			40
41	Karnataka state and Goa			41
42	Maharashtra, Madhya Pradesh, Rajasthan, Delhi, Haryana, Jammu, Ladakh, Punjab & Himachal Pradesh States			42
43	Jharkhand, Bihar, Assam, Nagaland, Manipur, Arunachal Pradesh States			43
44	Nepal			44

1.7.3 Commodity Groups

Different commodities recorded during the O-D survey were classified into 20 categories. Due consideration has been given to include all possible commodities moving along the project road. Details of vehicle carrying commodity type is presented location wise in below Table 1-15 to Table 1-20.

Table 1-15: Vehicle wise commodity distribution at location 1

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Food Grains	5.1%	7.1%	4.5%	3.7%	5.1%	4.5%
Minerals & Ores	0.7%	4.8%	2.3%	1.0%	3.2%	1.3%
Machines/ parts	5.5%	4.8%	5.3%	6.3%	6.3%	6.3%
Fruits & Vegetables	6.6%	2.4%	6.1%	4.7%	3.4%	4.8%
Iron & Steel	7.4%	2.4%	7.2%	5.5%	8.1%	7.3%
Fertilizers and Chemicals	2.2%	4.8%	3.0%	1.6%	2.2%	3.1%

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Textiles & Clothing	1.5%	2.4%	0.6%	1.8%	1.4%	0.8%
Wood & Wood products	3.3%	0.0%	2.5%	1.8%	1.6%	3.6%
Cement	1.1%	4.8%	2.9%	2.6%	4.9%	6.2%
Petroleum Products	5.9%	0.0%	4.6%	4.2%	5.7%	5.2%
Beverages	0.0%	2.4%	0.3%	0.3%	0.0%	0.6%
Sand	2.9%	0.0%	3.6%	1.8%	3.2%	3.1%
Bricks	2.9%	4.8%	1.7%	1.8%	1.8%	3.6%
Stone/ Aggregates	3.7%	4.8%	3.0%	3.1%	3.4%	3.8%
Water Tanker	2.9%	2.4%	3.3%	1.0%	4.0%	2.0%
Plastics	2.2%	2.4%	4.3%	4.4%	3.0%	3.1%
Household Goods	1.5%	2.4%	2.7%	2.9%	1.6%	1.7%
Courier/ Parcel	4.0%	7.1%	9.2%	10.2%	9.5%	10.1%
Others	5.1%	4.8%	3.6%	3.9%	3.2%	5.0%
Empty	35.3%	35.7%	29.1%	37.3%	28.1%	24.2%
Total	100%	100%	100%	100%	100%	100%

Table 1-16: Vehicle wise commodity distribution at location 2

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Food Grains	7.2%	8.5%	8.7%	4.9%	6.9%	17.5%
Minerals & Ores	1.6%	2.1%	4.5%	2.1%	4.1%	4.6%
Machines/ parts	0.8%	2.1%	2.8%	6.3%	5.8%	3.6%
Fruits & Vegetables	4.0%	4.3%	3.5%	2.5%	1.7%	4.6%
Iron & Steel	4.0%	6.4%	7.6%	18.9%	16.2%	5.6%
Fertilizers and Chemicals	4.0%	10.6%	3.5%	1.1%	0.7%	5.3%
Textiles & Clothing	1.6%	0.0%	2.1%	4.2%	2.7%	0.7%
Wood & Wood products	3.2%	4.3%	2.1%	2.5%	5.2%	3.6%
Cement	1.6%	2.1%	1.0%	0.0%	0.3%	0.7%
Petroleum Products	3.2%	2.1%	0.3%	0.0%	0.0%	0.7%
Beverages	0.0%	2.1%	0.0%	0.0%	0.0%	0.3%
Sand	4.8%	0.0%	1.4%	0.0%	0.3%	4.0%
Bricks	2.4%	2.1%	1.0%	1.8%	0.0%	0.7%
Stone/ Aggregates	2.4%	0.0%	2.1%	0.0%	0.7%	1.7%
Water Tanker	0.8%	0.0%	1.0%	1.4%	3.4%	1.7%
Plastics	1.6%	6.4%	2.1%	6.0%	4.8%	3.3%
Household Goods	0.0%	0.0%	0.3%	3.2%	3.1%	0.3%
Courier/ Parcel	0.8%	0.0%	0.7%	0.0%	0.0%	0.7%
Others	2.4%	0.0%	1.0%	0.7%	0.0%	1.7%
Empty	53.6%	46.8%	54.3%	44.6%	44.0%	38.7%
Total	100%	100%	100%	100%	100%	100%

Table 1-17: Vehicle wise commodity distribution at location 3

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Food Grains	1.5%	1.0%	3.8%	3.7%	5.7%	4.5%

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Minerals & Ores	1.8%	2.0%	0.7%	0.9%	0.4%	1.0%
Machines/ parts	5.9%	3.0%	8.2%	10.0%	8.5%	9.2%
Fruits & Vegetables	3.8%	6.0%	4.6%	2.8%	4.0%	4.9%
Iron & Steel	4.8%	5.0%	4.1%	2.3%	5.1%	5.9%
Fertilizers and Chemicals	3.1%	6.0%	3.9%	6.0%	3.8%	3.3%
Textiles & Clothing	1.0%	2.0%	1.4%	2.3%	1.2%	1.6%
Wood & Wood products	0.3%	0.0%	1.2%	1.9%	1.8%	2.1%
Cement	2.3%	1.0%	1.0%	3.0%	1.0%	1.6%
Petroleum Products	3.6%	2.0%	3.0%	3.7%	2.0%	3.5%
Beverages	0.0%	3.0%	0.7%	0.5%	0.8%	1.2%
Sand	1.0%	0.0%	0.2%	0.7%	1.6%	0.2%
Bricks	0.5%	1.0%	0.4%	0.2%	0.4%	0.0%
Stone/ Aggregates	2.5%	4.0%	2.7%	0.7%	2.0%	2.3%
Water Tanker	0.8%	1.0%	1.1%	0.9%	1.4%	1.2%
Plastics	2.8%	3.0%	2.7%	1.6%	1.4%	2.6%
Household Goods	3.1%	4.0%	2.3%	3.7%	3.0%	2.8%
Courier/ Parcel	9.7%	10.0%	13.0%	11.6%	11.5%	9.2%
Others	9.2%	5.0%	7.1%	5.8%	5.9%	7.3%
Empty	42.5%	41.0%	37.9%	37.6%	38.7%	35.9%
Total	100%	100%	100%	100%	100%	100%

Table 1-18: Vehicle wise commodity distribution at location 4

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Food Grains	7.0%	3.3%	7.4%	2.2%	6.8%	7.7%
Minerals & Ores	0.0%	0.0%	1.9%	1.1%	0.2%	1.3%
Machines/ parts	3.5%	0.0%	5.0%	4.3%	3.1%	3.3%
Fruits & Vegetables	14.1%	6.7%	9.1%	2.2%	7.1%	4.4%
Iron & Steel	3.3%	3.3%	4.6%	2.2%	6.0%	10.3%
Fertilizers and Chemicals	3.0%	3.3%	3.0%	1.1%	1.9%	2.1%
Textiles & Clothing	0.0%	0.0%	0.2%	0.0%	0.4%	1.3%
Wood & Wood products	3.0%	0.0%	1.9%	0.0%	0.4%	1.5%
Cement	1.6%	0.0%	1.3%	5.4%	3.9%	3.1%
Petroleum Products	1.9%	0.0%	2.0%	0.0%	2.7%	1.3%
Beverages	3.5%	6.7%	2.6%	4.3%	2.1%	2.8%
Sand	2.4%	1.7%	3.7%	0.0%	1.7%	6.2%
Bricks	4.1%	3.3%	5.9%	3.3%	4.1%	9.5%
Stone/ Aggregates	0.5%	0.0%	0.6%	0.0%	0.4%	0.3%
Water Tanker	1.1%	0.0%	0.7%	2.2%	1.9%	0.3%
Plastics	2.2%	0.0%	2.2%	0.0%	2.3%	2.1%
Household Goods	1.4%	1.7%	1.3%	1.1%	1.0%	1.3%
Courier/ Parcel	5.4%	21.7%	9.5%	7.6%	14.7%	11.8%
Others	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
Empty	42.0%	48.3%	37.0%	63.0%	39.2%	29.7%

Commodity Type	LMV	LCV – 4 W	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Total	100%	100%	100%	100%	100%	100%

Table 1-19: Vehicle wise commodity distribution at location 5

Commodity Type	LMV	LCV – 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Food Grains	4.2%	4.2%	5.3%	4.1%	5.1%
Minerals & Ores	3.9%	2.3%	2.9%	2.0%	3.7%
Machines/ parts	6.1%	8.6%	9.4%	6.8%	9.2%
Fruits & Vegetables	4.8%	5.7%	7.0%	2.7%	4.4%
Iron & Steel	7.4%	6.4%	6.4%	5.1%	10.9%
Fertilizers and Chemicals	1.0%	1.5%	2.9%	2.4%	2.4%
Textiles & Clothing	2.9%	3.3%	1.8%	2.7%	3.4%
Wood & Wood products	1.9%	2.6%	4.7%	1.4%	3.7%
Cement	1.9%	2.3%	1.2%	0.7%	1.0%
Petroleum Products	1.6%	2.4%	1.2%	1.7%	2.7%
Beverages	2.3%	3.1%	0.6%	6.1%	2.4%
Sand	1.6%	1.6%	2.9%	0.3%	1.0%
Bricks	0.3%	0.7%	1.8%	1.4%	0.0%
Stone/ Aggregates	2.3%	3.7%	3.5%	4.4%	3.4%
Water Tanker	0.0%	0.0%	0.0%	0.0%	0.0%
Plastics	3.5%	6.4%	7.0%	5.5%	4.4%
Household Goods	0.0%	0.0%	0.0%	0.0%	0.0%
Courier/ Parcel	8.4%	6.2%	8.8%	7.5%	6.5%
Others	0.0%	0.0%	0.0%	0.3%	0.0%
Empty	46.0%	39.1%	32.7%	44.7%	35.7%
Total	100%	100%	100%	100%	100%

Table 1-20: Vehicle wise commodity distribution at location 6

Commodity Type	LMV	LCV - 4 W	LCV - 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Food Grains	5.7%	7.0%	6.1%	5.0%	7.1%	5.2%
Minerals & Ores	2.1%	0.0%	2.1%	2.3%	2.1%	2.7%
Machines/ parts	6.6%	11.6%	9.3%	8.8%	7.7%	8.9%
Fruits & Vegetables	8.4%	7.0%	5.3%	6.5%	6.7%	7.5%
Iron & Steel	8.7%	7.0%	10.6%	7.8%	9.6%	9.3%
Fertilizers and Chemicals	2.1%	2.3%	1.6%	2.5%	2.3%	3.4%
Textiles & Clothing	3.2%	2.3%	1.4%	1.0%	0.6%	1.2%
Wood & Wood products	1.8%	2.3%	2.6%	4.0%	2.3%	2.3%
Cement	1.6%	4.7%	2.7%	3.5%	1.9%	3.2%
Petroleum Products	4.8%	0.0%	3.1%	1.8%	4.8%	2.1%
Beverages	1.1%	0.0%	0.5%	0.0%	0.8%	0.4%
Sand	4.1%	4.7%	2.9%	4.0%	1.9%	4.2%
Bricks	3.4%	2.3%	3.9%	1.8%	2.9%	2.7%
Stone/ Aggregates	6.6%	0.0%	3.1%	6.8%	3.3%	4.3%
Water Tanker	2.7%	2.3%	1.9%	0.5%	1.5%	2.7%

Commodity Type	LMV	LCV - 4 W	LCV - 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Plastics	3.9%	9.3%	3.9%	6.8%	4.0%	4.7%
Household Goods	2.1%	2.3%	1.3%	1.3%	2.9%	1.8%
Courier/ Parcel	4.3%	9.3%	6.6%	7.3%	8.1%	4.3%
Others	1.6%	4.7%	2.9%	3.5%	3.5%	3.0%
Empty	25.3%	20.9%	28.2%	24.7%	26.2%	26.1%
Total	100%	100%	100%	100%	100%	100%

1.7.4 Lead Analysis

The survey data was analyzed to assess the lead distribution for goods and passenger vehicles. The distribution observed for different vehicle types is grouped into various ranges and lead distribution data are presented in Table 1-21 to Table 1-26 for different locations.

Table 1-21: Trip Length Distribution in % of goods vehicles at Patancheru location

Lead Range in Kms	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
0 - 20	0%	0%	0%	0%	0%	0%
20 - 50	1%	2%	3%	3%	3%	2%
50 - 100	32%	31%	27%	21%	19%	20%
100 - 250	10%	2%	10%	8%	6%	9%
250 - 500	12%	10%	12%	14%	15%	15%
> 500	44%	55%	49%	54%	57%	55%
Total	100 %	100%	100%	100%	100%	100%

Table 1-22: Trip Length Distribution in % of goods vehicles at Dundigal Location

Lead Range in Kms	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
0 - 20	6%	6%	4%	4%	7%	3%
20 - 50	37%	36%	32%	20%	19%	22%
50 - 100	26%	30%	22%	17%	11%	13%
100 - 250	22%	6%	17%	15%	14%	19%
250 - 500	3%	6%	9%	13%	16%	12%
> 500	6%	15%	16%	30%	33%	32%
Total	100%	100%	100%	100%	100%	100%

Table 1-23: Trip Length Distribution in % of goods vehicles at Medchal location

Lead Range in Kms	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
0 - 20	2%	1%	3%	1%	2%	2%
20 - 50	16%	14%	13%	14%	11%	12%
50 - 100	10%	13%	10%	9%	10%	10%
100 - 250	7%	14%	9%	10%	8%	11%
250 - 500	8%	8%	9%	9%	8%	7%
> 500	57%	50%	56%	56%	61%	57%
Total	100%	100%	100%	100%	100%	100%

Table 1-24: Trip Length Distribution in % of goods vehicles at Shamirpet location

Lead Range in Kms	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
0 - 20	5%	7%	6%	3%	2%	3%
20 - 50	24%	22%	20%	20%	19%	13%
50 - 100	22%	13%	20%	22%	24%	16%
100 - 250	35%	48%	37%	39%	36%	41%
250 - 500	9%	7%	9%	9%	10%	12%
> 500	4%	3%	9%	8%	10%	15%
Total	100 %	100%	100%	100%	100%	100%

Table 1-25: Trip Length Distribution in % of goods vehicles at Ghatkesar location

Lead Range in Kms	LMV	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
0 - 20	0%	0%	0%	2%	1%
20 - 50	18%	16%	18%	14%	13%
50 - 100	20%	18%	16%	14%	19%
100 - 250	33%	39%	41%	42%	39%
250 - 500	19%	15%	13%	17%	14%
> 500	11%	11%	12%	11%	14%
Total	100%	100%	100%	100%	100%

Table 1-26: Trip Length Distribution in % of goods vehicles at Pedda Amberpet location

Lead Range in Kms	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
0 - 20	0%	0%	0%	0%	0%	0%
20 - 50	5%	5%	4%	3%	4%	4%
50 - 100	6%	5%	5%	6%	6%	5%
100 - 250	13%	14%	14%	14%	14%	12%
250 - 500	34%	28%	33%	34%	34%	31%
> 500	42%	49%	45%	44%	43%	49%
Total	100%	100%	100%	100%	100%	100%

Average Lead Analysis

The average distance travelled by the vehicles were calculated from OD survey and are presented in the below Table 1-27.

Table 1-27: Average Lead in kms of goods vehicles in Kms at all location

Average Lead in kms	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Patancheru	475.56	559.40	519.39	545.42	563.06	575.85
Dundigal	122.52	182.87	204.95	333.48	404.51	366.36
Medchal	769.57	644.15	797.25	764.29	848.65	794.44
Shamirpet	145.96	147.92	182.21	172.30	198.09	265.64
Ghatkesar	221.24	-	209.97	218.37	211.01	233.54
Pedda Amberpet	521.33	656.88	562.62	535.53	517.43	564.30

Table 1-28: Average Lead in kms of Passenger vehicles in Kms at all location

Average Lead in kms	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Patancheru	269.46	296.13	264.85	349.20
Dundigal	174.80	126.18	70.00	119.54
Medchal	236.09	264.56	204.17	292.17
Shamirpet	114.63	110.00	99.86	83.07
Ghatkesar	131.59	137.01	127.12	124.80
Pedda Amberpet	367.91	335.45	386.53	110.75

1.7.5 Load Analysis

The survey data was analyzed to assess the load distribution for goods vehicles. The distribution observed for different vehicle types is grouped into various ranges and load distribution data are presented in Table 1-29 to Table 1-34 for all survey locations.

Table 1-29: Trip Load Distribution in % of goods vehicles at Patancheru ORR location

Load Range in Tonnes	LMV	LCV - 4 W	LCV - 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Empty	35%	36%	29%	37%	28%	24%
0 - 5	64%	48%	11%	3%	0%	0%
5 - 10	0%	14%	60%	52%	6%	3%
10 - 15	1%	0%	0%	8%	12%	7%
15 - 20	0%	0%	0%	0%	50%	11%
> 20	0%	2%	0%	0%	4%	54%
Total	100%	100%	100%	100%	100%	100%

Table 1-30: Trip Load Distribution in of goods vehicles at Dundigal location

Load Range in Tonnes	LMV	LCV - 4 W	LCV - 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Empty	53%	47%	55%	45%	44%	39%
0 - 5	47%	49%	24%	6%	0%	0%
5 - 10	0%	4%	21%	33%	8%	1%
10 - 15	0%	0%	0%	14%	11%	6%
15 - 20	0%	0%	0%	2%	24%	14%
> 20	0%	0%	0%	0%	12%	40%
Total	100%	100%	100%	100%	100%	100%

Table 1-31: Trip Load Distribution in % of goods vehicles at Medchal location

Load Range in Tonnes	LMV	LCV - 4 W	LCV - 6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Empty	42%	41%	38%	38%	39%	36%
0 - 5	57%	54%	5%	4%	0%	0%
5 - 10	0%	5%	54%	55%	10%	1%
10 - 15	0%	0%	4%	4%	7%	2%
15 - 20	0%	0%	0%	0%	44%	9%
> 20	0%	0%	0%	0%	0%	52%
Total	100%	100%	100%	100%	100%	100%

Table 1-32: Trip Load Distribution in % of goods vehicles at Shamirpet location

Load Range in Tonnes	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Empty	42%	48%	37%	63%	39%	30%
0 - 5	54%	37%	13%	12%	0%	0%
5 - 10	2%	15%	50%	20%	21%	6%
10 - 15	0%	0%	0%	5%	22%	4%
15 - 20	0%	0%	0%	0%	17%	6%
> 20	1%	0%	0%	0%	0%	55%
Total	100%	100%	100%	100%	100%	100%

Table 1-33: Trip Load Distribution in % of goods vehicles at Ghatkesar location

Load Range in Tonnes	LMV	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Empty	46%	39%	33%	44%	36%
0 - 5	54%	9%	3%	0%	0%
5 - 10	0%	50%	56%	16%	6%
10 - 15	0%	2%	9%	5%	5%
15 - 20	0%	0%	0%	34%	8%
> 20	0%	0%	0%	0%	45%
Total	100%	100%	100%	100%	100%

Table 1-34: Trip Load Distribution in % of goods vehicles at Pedda Amberpet location

Load Range in Tonnes	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Empty	25%	21%	28%	25%	26%	26%
0 - 5	75%	53%	41%	5%	0%	0%
5 - 10	0%	26%	31%	69%	16%	12%
10 - 15	0%	0%	0%	2%	17%	4%
15 - 20	0%	0%	0%	0%	38%	10%
> 20	0%	0%	0%	0%	3%	49%
Total	100%	100%	100%	100%	100%	100%

Average Load Analysis

The average load carried by the vehicles were calculated from OD survey and Axle load survey and are presented in the below Table 1-35 and Table 1-36.

Table 1-35: Average load of goods vehicles at all count stations excluding empty vehicles

Average Load in Tonnes	LMV	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Patancheru	1.33	5.74	6.77	8.49	16.01	23.12
Dundigal	1.08	3.50	5.55	9.23	17.04	25.29
Medchal	1.51	3.98	6.62	8.08	15.78	25.38
Shamirpet	2.54	4.42	6.84	7.82	14.28	25.80
Ghatkesar	1.33	-	6.83	8.82	14.53	20.12
Pedda Amberpet	1.02	5.82	6.01	7.86	14.76	20.74

Table 1-36: Average load of goods vehicles at all count stations including empty vehicles

Average Load in Tonnes	LM V	LCV - 4 W	LCV -6 W	2 Axle Truck	3 Axle Truck	4 - 6 Axle Truck
Patancheru	0.86	3.69	4.80	5.32	11.51	17.52
Dundigal	0.51	1.86	2.53	5.12	9.55	15.46
Medchal	0.87	2.35	4.11	5.04	9.67	16.28
Shamirpet	1.47	2.28	4.31	2.89	8.68	18.13
Ghatkesar	0.72	-	4.17	5.93	8.08	12.94
Pedda Amberpet	0.76	4.60	4.32	5.92	10.89	15.33

1.7.6 Trip Purpose

Trip purpose of all passenger vehicles at all OD survey locations were analyzed and presented in the below Table 1-37 to Table 1-42.

Table 1-37: Trip purpose in % at Patancheru location

Purpose	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Work/Service	81%	80%	85%	85%
Business	11%	12%	9%	8%
Education	2%	0%	2%	0%
Shopping	2%	2%	0%	1%
Religious	3%	4%	2%	4%
Social	0%	0%	2%	1%
Others	1%	1%	0%	2%
Total	100%	100%	100%	100%

Table 1-38: Trip purpose in % at Dundigal location

Purpose	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Work/Service	77%	69%	83%	85%
Business	10%	14%	0%	11%
Education	3%	8%	0%	0%
Shopping	3%	4%	17%	2%
Religious	5%	3%	0%	2%
Social	1%	2%	0%	0%
Others	2%	1%	0%	0%
Total	100%	100%	100%	100%

Table 1-39: Trip purpose in % at Medchal location

Purpose	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Work/Service	83%	90%	75%	95%
Business	5%	6%	17%	0%
Education	2%	0%	0%	0%
Shopping	2%	1%	0%	0%
Religious	5%	3%	8%	2%
Social	1%	0%	0%	2%
Others	1%	0%	0%	0%
Total	100%	100%	100%	100%

Table 1-40: Trip purpose in % at Shamirpet location

Purpose	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Work/Service	64%	63%	58%	80%
Business	15%	14%	11%	0%
Education	1%	3%	0%	0%
Shopping	5%	6%	3%	2%
Religious	4%	10%	8%	16%
Social	0%	1%	0%	0%
Others	11%	4%	19%	2%
Total	100%	100%	100%	100%

Table 1-41: Trip purpose in % at Ghatkesar location

Purpose	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Work/Service	71%	75%	53%	74%
Business	10%	11%	0%	7%
Education	3%	1%	0%	3%
Shopping	2%	1%	6%	0%
Religious	9%	8%	6%	5%
Social	1%	0%	6%	2%
Others	4%	4%	29%	10%
Total	100%	100%	100%	100%

Table 1-42: Trip purpose in % at Pedda Amberpet location

Purpose	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Work/Service	81%	80%	85%	50%
Business	11%	12%	9%	25%
Education	2%	2%	3%	25%
Shopping	2%	3%	0%	0%
Religious	3%	1%	0%	0%
Social	0%	1%	3%	0%
Others	1%	0%	0%	0%
Total	100%	100%	100%	100%

1.7.7 Average Occupancy

Average occupancy of all passenger vehicles summarized in the following Table 1-43.

Table 1-43: Average occupancy of passenger vehicles

Average Occupancy	Car/ Jeep/ Van	Taxi	Mini Bus	Pvt Bus
Patancheru	3.17	3.12	12.74	31.40
Dundigal	3.01	2.76	20.00	25.00
Medchal	3.12	3.01	17.92	25.02
Shamirpet	2.95	2.97	20.06	40.73
Ghatkesar	3.19	3.27	12.65	20.25
Pedda Amberpet	3.25	3.51	12.68	22.50

1.8 AXLE LOAD ANALYSIS

Axle load survey was carried out in both directions for 24 hours on a random sample basis simultaneously with O-D survey using Axle Load Pads. The axle load surveys were conducted at

three locations along project corridor. The spectrum of axle loads and the numbers of equivalent 8.16 t standard axles for the different categories of commercial vehicles have been determined on the basis of the axle load survey.

1.8.1 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 8.16 tons equivalent standard axles (ESA) that will pass over during the 20-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 axles (CSA) are calculated in accordance with the guidelines provided in IRC: 37-2018 and IRC: 81 - 1997. The overloaded vehicles have serious adverse impact on 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. The equivalency factors are derived for each axle load category from the fourth power rule.

The equations for computing equivalency factor for single, tandem and Tridem axles given below is used as directed in the IRC:37 -2018 for converting different axle load repetitions into equivalent standard axle load repetitions;

- Single axle with single wheel on either side = {axle load in KN / 65} ^4
- Single axle with dual wheel on either side = {axle load in KN / 80} ^4
- Tandem axle with single wheel on either side = {axle load in KN / 148} ^4
- Tridem axle with dual wheel on either side = {axle load in KN / 224} ^4

The product of frequency of axles for each axle load category and corresponding equivalency factors gives the ESAL for corresponding axle load category. The VDF is calculated by dividing the total number of ESAL by the number of vehicles weighed. The VDF values are summarized in Table 1-44 and Table 1-45.

Table 1-44: Vehicle Damage factor for Pedda Amberpet Location

Vehicle Type	Direction 1	Direction 2	Maximum	Adopted
LCV-6	0.70	0.59	0.70	0.70
2 Axle	3.53	3.43	3.53	3.53
3 Axle	6.45	7.00	7.00	7.00
MAV	10.62	12.42	12.42	12.42
Bus	0.84	0.43	0.84	0.84

Table 1-45: Vehicle Damage factor for Patancheru Location

Vehicle Type	Direction 1	Direction 2	Maximum	Adopted
LCV-6	1.00	0.79	1.00	1.00
2 Axle	3.18	3.02	3.18	3.18
3 Axle	4.30	5.75	5.75	5.75

Vehicle Type	Direction 1	Direction 2	Maximum	Adopted
MAV	12.93	13.85	13.85	13.85
Bus	0.83	0.65	0.83	0.83

1.8.2 Design Traffic Volumes (MSA)

As per IRC 37-2018, the design traffic volumes were calculated using vehicle damage factor in terms of Million Standard Axles. The Year wise design traffic is presented below.

Where,

$$N = \{365 * [(1 + r)^n - 1] * A * D * F\} / r$$

N = The cumulative number of standard axles to be catered for in the design in terms of MSA (Million standard axle)

A = Initial Traffic, in the year of completion of construction, in terms of the number of commercial vehicles per day

r = Annual growth rate of commercial vehicles

D = Lane Distribution Factor

n = Design life in year

F = Vehicle damage factor

The period implementation including necessary land acquisition and construction period is 2 years has been assumed for proposed road and will be opened to traffic. Therefore, the traffic in the year of completion is estimated using the formula given in clause 4.6.1 of IRC: 37-2018.

A = P x

P = Number of commercial vehicles as per last count

x = Number of years between the last count and the year of completion of construction.

Table 1-46: Design MSA for Complete corridor

S. No	Year	Bus	LCV	2 Axle	3 Axle	MAV	Total	Direction wise	MSA	Remarks
	2021	0.1	0.3	0.4	1.3	5.7	7.8	Construction period		
	2022	0.1	0.3	0.5	1.4	6.0	8.2			
	2023	0.1	0.4	0.5	1.4	6.3	8.6			
	2024	0.1	0.4	0.5	1.5	6.6	9.0			
	2025	0.1	0.4	0.5	1.6	6.9	9.5			
1	2026	0.1	0.4	0.6	1.6	7.2	9.9	5.0	5.0	O & M Period
2	2027	0.1	0.4	0.6	1.7	7.6	10.4	5.2	10.2	
3	2028	0.1	0.4	0.6	1.8	8.0	10.9	5.5	15.6	
4	2029	0.1	0.5	0.6	1.9	8.4	11.5	5.7	21.4	
5	2030	0.1	0.5	0.7	2.0	8.8	12.1	6.0	27.4	
6	2031	0.1	0.5	0.7	2.1	9.2	12.7	6.3	33.7	
7	2032	0.1	0.5	0.7	2.2	9.7	13.3	6.6	40.4	
8	2033	0.1	0.6	0.8	2.3	10.2	14.0	7.0	47.4	
9	2034	0.1	0.6	0.8	2.4	10.7	14.7	7.3	54.7	
10	2035	0.1	0.6	0.9	2.5	11.2	15.4	7.7	62.4	
11	2036	0.1	0.7	0.9	2.7	11.8	16.2	8.1	70.5	
12	2037	0.1	0.7	1.0	2.8	12.4	17.0	8.5	79.0	
13	2038	0.2	0.7	1.0	2.9	13.0	17.8	8.9	87.9	
14	2039	0.2	0.8	1.0	3.1	13.6	18.7	9.4	97.2	

S. No	Year	Bus	LCV	2 Axle	3 Axle	MAV	Total	Direction wise	MSA	Remarks
15	2040	0.2	0.8	1.1	3.2	14.3	19.6	9.8	107.1	
16	2041	0.2	0.8	1.2	3.4	15.0	20.6	10.3	117.4	
17	2042	0.2	0.9	1.2	3.6	15.8	21.7	10.8	128.2	
18	2043	0.2	0.9	1.3	3.8	16.6	22.7	11.4	139.6	
19	2044	0.2	1.0	1.3	3.9	17.4	23.9	11.9	151.5	
20	2045	0.2	1.0	1.4	4.1	18.3	25.1	12.5	164.1	
21	2046	0.2	1.1	1.5	4.4	19.2	26.3	13.2	177.2	
22	2047	0.2	1.1	1.5	4.6	20.2	27.6	13.8	191.1	
23	2048	0.2	1.2	1.6	4.8	21.2	29.0	14.5	205.6	

As per calculations, the MSA is 164.1 for 20 years of design period. The above section shall be designed for 170 MSA.

1.8.3 Loading Pattern

The loading pattern at count stations are presented below.

Table 1-47: Loading pattern at Patancheru location

Single Axle		Tandem Axle		Tridem Axle	
Axle Load Class KN	Frequency (% of single axles)	Axle Load Class KN	Frequency (% of Tandem axles)	Axle Load Class KN	Frequency (% of Tridem axles)
185 - 195	0.0%	380 - 400	0.0%	530 - 560	0%
175 - 185	0.0%	360 - 380	0.0%	500 - 530	0%
165 - 175	0.0%	340 - 360	0.0%	470 - 500	0%
155 - 165	0.0%	320 - 340	0.0%	440 - 470	0%
145 - 155	0.0%	300 - 320	0.0%	410 - 440	4%
135 - 145	1.2%	280 - 300	0.2%	380 - 410	25%
125 - 135	6.0%	260 - 280	11.7%	350 - 380	21%
115 - 125	14.3%	240 - 260	22.8%	320 - 350	23%
105 - 115	15.7%	220 - 240	21.2%	290 - 320	9%
95 - 105	13.6%	200 - 220	13.3%	260 - 290	0%
85 - 95	10.6%	180 - 200	12.7%	230 - 260	2%
<85	38.5%	<180	18.1%	<230	18%
Total	100%		100%		100%

Table 1-48: Loading pattern at Pedda Amberpet location

Single Axle		Tandem Axle		Tridem Axle	
Axle Load Class KN	Frequency (% of single axles)	Axle Load Class KN	Frequency (% of Tandem axles)	Axle Load Class KN	Frequency (% of Tridem axles)
185 - 195	0.4%	380 - 400	0.0%	530 - 560	0%
175 - 185	0.1%	360 - 380	0.0%	500 - 530	0%
165 - 175	0.3%	340 - 360	0.2%	470 - 500	0%
155 - 165	0.8%	320 - 340	1.8%	440 - 470	0%
145 - 155	1.3%	300 - 320	4.7%	410 - 440	1%
135 - 145	3.0%	280 - 300	9.9%	380 - 410	6%
125 - 135	2.2%	260 - 280	16.1%	350 - 380	13%
115 - 125	4.9%	240 - 260	16.1%	320 - 350	24%
105 - 115	7.0%	220 - 240	16.3%	290 - 320	24%
95 - 105	12.6%	200 - 220	9.9%	260 - 290	18%

Single Axle		Tandem Axle		Tridem Axle	
Axle Load Class KN	Frequency (% of single axles)	Axle Load Class KN	Frequency (% of Tandem axles)	Axle Load Class KN	Frequency (% of Tridem axles)
85 - 95	16.9%	180 - 200	8.6%	230 - 260	4%
<85	50.4%	<180	16.3%	<230	10%
Total	100%		100%		100%

1.9 ALTERNATIVE ROUTE ANALYSIS

Alternative routes

Two alternative roads between two major settlements Sanga Reddy to Choutuppal were identified. The comparison is shown in

Alternative route 1: Sangareddy -Narsapur – Tupran -Gajwel – Bhongir -Choutuppal (SH 17)

Alternative route 2: Sanga Reddy – Northern part of Hyderabad Outer Ring Road- Pedda Amberpet – Choutuppal.

The map of alternative routes with proposed Hyderabad Regional Ring Road is presented in the below Figure 1-10.

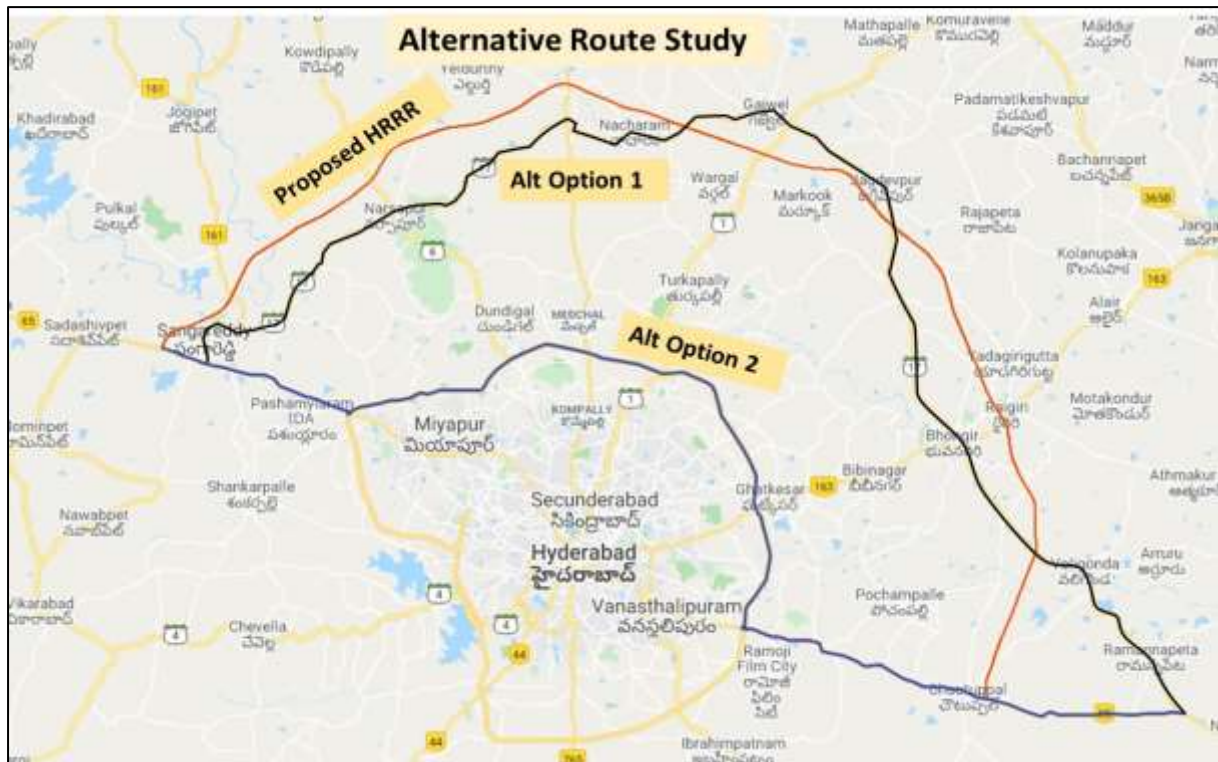


Figure 1-10: Alternative Routes map

The comparison details of alternative routes are presented in

Table 1-49.

Table 1-49: Alternative Routes comparison parameters

Description	Option 1	Option 2	Regional Ring Road
Length in Kms	177.00	151.00	157.60

Description	Option 1	Option 2	Regional Ring Road
Design Speed	60/80	80 - 120	120
Average Speed in KMPH	40 – 45	60 - 65	100
Travel Time in Hrs	4.10	2.40	1.60
Geometrics	Poor	Good	Good
Access Controlled	No	74 kms access controlled	Fully Access Controlled
No. of Lanes	2 Lane	4 & 8 Lane	4 Lane Expressway

Alternative 1: SH 17 and HRRR Comparison

Cost Ratio and Generalized cost were determined to analyze the impact of diversion due to change in length and speed parameters when compared with alternative routes.

Table 1-50: VOC & VOT Comparison for Alternative 1 & Project road

Mode	VOC + VOT in Rs.	
	SH 17	Project Road
Car	2976.456	3695.158
Bus	9070.028	8117.233
LCV	6534.034	6523.767
2Axle	7998.134	7659.317
3Axle	12743.63	10907.85
MAV	2976.456	3695.158

Table 1-51: Cost Ratio and Generalized Cost Comparison

Mode	Generalized Cost (in Rs.)		Cost Ratio	
	SH 17	Project Road	SH 17	Project Road
Car	2976.456	3945.158	0.43	0.57
Bus	9070.028	8617.233	0.51	0.49
LCV	6534.034	7323.767	0.47	0.53
HCV Trucks	7998.134	8859.317	0.47	0.53
MAV	12743.63	12607.85	0.50	0.50

From VOC & VOT analysis, the chances of traffic diversion from SH 17 is high when compared to project road. The total cost of travelling on SH 17 from Sanga Reddy to Choutuppal for car is low when compared with travelling on project alignment. The cost of travelling on project road for Buses, LCV's and MAV trucks is low when compared with travelling cost on SH 17.

From the above analysis, it is assumed some percent of commercial traffic shall be diverting to Proposed greenfield section from existing SH 17.

Alternative 2: North part of Outer Ring Road and HRRR Comparison

The potential diverted traffic from Northern part of ORR is worked out from OD matrix and the results are presented below.

1.10 PROPOSED INTERCHANGE LOCATIONS

The proposed Interchange locations on the Northern part of Hyderabad Regional Ring Road is presented in below Figure 1-10.



Figure 1-11: Proposed Interchange Locations on Northern Part of HRRR

Table 1-52: Diverted traffic in numbers& PCU's from I/c to I/c

	Vehicle Count											
	I/C	IC 1	IC 2	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11
PCU Count	IC 1	0	0	0	496	0	207	0	0	989	0	4072
	IC 2	0	0	0	0	0	9	0	0	17	0	210
	IC 3	0	0	0	0	0	0	0	0	0	0	0
	IC 4	928	0	0	0	0	0	0	0	360	0	1399
	IC 5	0	0	0	0	0	0	0	0	0	0	0
	IC 6	399	24	0	0	0	0	0	0	7	0	21
	IC 7	0	0	0	0	0	0	0	0	0	0	0
	IC 8	0	0	0	0	0	0	0	0	0	0	0
	IC 9	2407	23	0	480	0	14	0	0	0	0	0
	IC 10	0	0	0	0	0	0	0	0	0	0	0
	IC 11	10093	234	0	2300	0	37	0	0	0	0	0

In the above table the above triangle represents the potential diverted traffic in Vehicles from one Interchange to Other Interchange and the below triangle represents the potential diverted traffic in PCU's from one Interchange to other.

The OD analysis states that the traffic from Girmapur village (start of NRRR section on NH 65) to Choutuppal (End point of NRRR section on NH 65) is 5,873 Vehicles and 14,767 PCU's. The detailed traffic breakup from each Interchange (To & fro Movements of Traffic) is presented below.

Table 1-53: Diverted Traffic from Interchange 1 (starting Point)

PCU Factor	Vehicle Type	IC 2	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11
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PCU Factor	Vehicle Type	IC 2	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11
1	Car	0	0	274	0	84	0	0	201	0	1031
1	Taxi	0	0	0	0	5	0	0	10	0	92
1.5	Mini Bus	0	0	0	0	0	0	0	0	0	5
3	Bus	0	0	8	0	2	0	0	3	0	10
1	LMV	0	0	5	0	32	0	0	130	0	256
1.5	LCV- 4 W	0	0	5	0	0	0	0	19	0	49
1.5	LCV - 6 W	0	0	58	0	17	0	0	176	0	571
3	2 Axle Trucks	0	0	42	0	11	0	0	78	0	413
3	3 Axle Trucks	0	0	43	0	28	0	0	96	0	598
4.5	MAV	0	0	62	0	29	0	0	276	0	1048
Total Vehicles		0	0	496	0	207	0	0	989	0	4072
Total PCU's		0	0	928	0	399	0	0	2407	0	10093

Table 1-54: Diverted Traffic from Interchange 2

PCU Factor	Vehicle Type	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11
1	Car	0	0	0	5	0	0	12	0	191
1	Taxi	0	0	0	0	0	0	0	0	0
1.5	Mini Bus	0	0	0	0	0	0	0	0	1
3	Bus	0	0	0	0	0	0	0	0	1
1	LMV	0	0	0	0	0	0	0	0	4
1.5	LCV- 4 W	0	0	0	0	0	0	0	0	0
1.5	LCV - 6 W	0	0	0	0	0	0	2	0	4
3	2 Axle Trucks	0	0	0	0	0	0	2	0	6
3	3 Axle Trucks	0	0	0	0	0	0	0	0	3
4.5	MAV	0	0	0	4	0	0	0	0	0
Total Vehicles		0	0	0	9	0	0	17	0	210
Total PCU's		0	0	0	24	0	0	23	0	234

Table 1-55: Diverted Traffic from Interchange 4

PCU Factor	Vehicle Type	IC 5	IC 6	IC 7	IC 8	IC 9	IC 10	IC 11
1	Car	0	0	0	0	231	0	859
1	Taxi	0	0	0	0	16	0	29
1.5	Mini Bus	0	0	0	0	0	0	3
3	Bus	0	0	0	0	0	0	4
1	LMV	0	0	0	0	16	0	103
1.5	LCV- 4 W	0	0	0	0	0	0	6
1.5	LCV - 6 W	0	0	0	0	58	0	90
3	2 Axle Trucks	0	0	0	0	6	0	64
3	3 Axle Trucks	0	0	0	0	22	0	82
4.5	MAV	0	0	0	0	10	0	157
Total Vehicles		0	0	0	0	360	0	1399
Total PCU's		0	0	0	0	480	0	2300

Table 1-56: Diverted Traffic from Interchange 6

PCU Factor	Vehicle Type	IC 7	IC 8	IC 9	IC 10	IC 11
1	Car	0	0	0	0	10

PCU Factor	Vehicle Type	IC 7	IC 8	IC 9	IC 10	IC 11
1	Taxi	0	0	0	0	0
1.5	Mini Bus	0	0	0	0	0
3	Bus	0	0	0	0	0
1	LMV	0	0	0	0	0
1.5	LCV- 4 W	0	0	0	0	0
1.5	LCV - 6 W	0	0	4	0	7
3	2 Axle Trucks	0	0	0	0	2
3	3 Axle Trucks	0	0	3	0	0
4.5	MAV	0	0	0	0	2
Total Vehicles		0	0	7	0	21
Total PCU's		0	0	14	0	37

1.11 TRAFFIC FORECAST

1.11.1 Approach

The investment priorities are governed by the traffic demand, assessed benefits and cost of the project. Demand plays the important role, which governs which type of facility / infrastructure to be created. This in turn determines likely benefits and costs to develop the same. Projects of this nature calls for significant investment. Prediction of traffic demand becomes an important task and has to be carried out near accurately. Recognizing this, efforts are 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 are estimated using Elasticity method as per IRC-108-2015. 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.

1.11.2 Past Trend in Traffic Growth

Time series data of past traffic census is not available hence alternate method of calculation of elasticity values has been considered. Registered vehicles data was used for estimating the Elasticity and growth rates. A study of the socio-economic profiles of the regions comprising the project influence area (PIA) provides an overview of the factors likely to influence the pattern of economic development and hence the flows and volumes of traffic on the project roads. The details include population, Per-capita Income, NSDP, GDP, and targeted growth rates of the economy. The profiles help to generate basic inputs for the estimation of future growth in transport demand on the basis of past scenarios, perspective changes in transport demand elasticity's and economic growth rates.

1.11.3 Past Growth of Economy

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. The time series data of State Domestic Product at constant (2011-12) prices, Per-capita Income have been collected from Ministry of Statistics and program Implementation, Govt. of India and studied to assess the past performance of influencing state economies. Table 1-57 gives the growth of Economic indicators of Telangana State. The state income has grown at 6.0% and 5.87% whereas the State Per-capita income has grown at 4.93% in the past.

Table 1-57: Growth in Economic Indices at 2011-12 Constant Prices of Telangana

Year	Gross State Domestic Product (in Rs. Crore)	Net State Domestic Product (in Rs. Crore)	Per Capita State Income (in Rupees)	Population (in Thousands)
2011-12	359433	325139	91121	35682
2012-13	370113	334205	92732	36040
2013-14	389957	349593	96039	36401
2014-15	416332	372897	101424	36766
2015-16	464542	416892	112267	37134
2016-17	507946	455731	121512	37505
2017-18	557410	498145	131503	37881
2018-19	603897	538250	140682	38260
2019-20	651655	582108	150641	38642
2020-21	643459	575247	147397	39027
CAGR	6.00%	5.87%	4.93%	0.90%

Source: *Socio-Economic Outlook -2021- Telangana State*

1.11.4 Traffic Demand Forecasting as per IRC 108

The exercise of traffic growth rate estimation has been carried out by us using the elasticity approach. The elasticity method relates traffic growth to changes in the related economic parameters. According to IRC-108, 2015, elasticity based econometric model for highway projects could be derived in the following form:

$$\text{Loge (P)} = A_0 + A_1 \text{ Loge (EI)}$$

Where:

P = Traffic volume (of any vehicle type)

EI = Economic Indicator (GDP/NSDP/Population/PCI)

A₀ = Regression constant;

A₁ = Regression co-efficient (Elasticity Index)

The main steps followed are:

Defining the Project Influence Area from OD analysis of travel pattern

Estimating the past elasticity of traffic growth from time series data of registered vehicles of influencing state.

Assessment of future elasticity values for major vehicle groups, namely, car, bus and truck and two wheelers

Study of past performance and assessment of perspective growth rates of state economies of influence area.

The growth rates are found using the formulae Eqn. (a) & (b).

For Passenger vehicles,

$$G = R_i \times E / 100 \dots\dots\dots \text{Eqn. (a)}$$

Where R_i = Growth in PCI and Population index of Telangana state

E = Elasticity Value

For commercial vehicles,

$$G = R \times E \times \text{inf luencefactor}/100 \dots\dots\dots \text{Eqn. (b)}$$

Where,

R= Economic index (NSDP/GDP)

E = Elasticity Value

1.11.5 Demand Assessment

Background

Traffic demand forecasting is to be done for future traffic volumes the project road is supposed to cater. This is primarily based on the present-day traffic volume and likely traffic growth rates periodically during the forecasting period of 20 years for the proposed road improvements. The traffic growth rates are dependent on various factors such as growth in national economy, changes in socio-economic conditions of the people etc.

Forecasted traffic forms the basis for determining the requirements for capacity augmentation by way of widening of existing carriageway, pavement design and also economic / financial deciding viability of project. A minimum growth rate of 5% is considered for this project.

Traffic on the project corridor will comprise of normal, diverted and induced/generated components.

1. Normal Traffic

The normal is the traffic presently plying on the project road.

2. Diverted Traffic

This represents the traffic attracted to the improved project road or lost to alternative routes when the improvements are completed. Diverted traffic is expected from/to the project roads as there are competing routes within the prevailing road network.

➤ Potential Diverted Traffic

Potential diverted traffic of each vehicle type is calculated from Origin and Destination Matrix. For determining the final diverted traffic based on VOC and VOT values are obtained from IRC code books by applying with suitable factor.

Table 1-58: Potential Traffic diversion from SH 17

Vehicle Type	AADT in No's	PCU factor	AADT in PCU's
Mini Bus	17	1.5	26
Bus	231	3	693
LCV - 4W	87	1.5	131
LCV - 6 W	138	1.5	207
MAV	207	4.5	932
Total	680		932

3. Induced Traffic

Induced traffic is the additional vehicle travel on a roadway that occurs when roadway capacity is increased or travel conditions are improved. Trips would induce on the project road due to lowering of transport costs and quicker transit times.

Induced traffic is expected on the project road after the road construction (2 years of construction period). The Percentage of Induced traffic is calculated based on equations suggested by IRC/CRRRI using Vehicle Operating Cost and Value of Time cost factors.

4. Total corridor traffic

Total corridor traffic is the diverted traffic from the parallel routes and Induced traffic after the Construction period in the present case.

The thru traffic from Start to End point is around 4,072 vehicles and 10,093 PCU's and the traffic diversion from SH 17 is 680 Vehicles and 932 PCU's. The total traffic that shall ply on the corridor is 4,752 Vehicles and 11,025 PCU's.

1.12 TRAFFIC PROJECTIONS

The year wise traffic projections in terms of Vehicles and PCU's are presented below.

Table 1-59: Traffic Projections

Year	Vehicles	PCU's
2021	4752	11025
2022	4990	11576
2023	5239	12155
2024	5501	12763
2025	6051	14039
2026	6354	14741
2027	6671	15478
2028	7005	16252
2029	7355	17065
2030	7723	17918
2031	8109	18814
2032	8515	19754
2033	8940	20742
2034	9387	21779
2035	9857	22868
2036	10349	24012
2037	10867	25212
2038	11410	26473
2039	11981	27796
2040	12580	29186
2041	13209	30646
2042	13869	32178
2043	14563	33787
2044	15291	35476
2045	16055	37250
2046	16858	39112
2047	17701	41068
2048	18586	43121
2049	19516	45277
2050	20491	47541

Year	Vehicles	PCU's
2051	21516	49918
2052	22592	52414
2053	23721	55035
2054	24907	57787
2055	26153	60676
2056	27460	63710
2057	28833	66895
2058	30275	70240
2059	31789	73752
2060	33378	77440
2061	35047	81312
2062	36799	85377