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## 7 TRAFFIC SURVEYS AND ANALYSIS

### 7.1 GENERAL

To achieve the desired objectives, the Consultant thoroughly studied the road network during the reconnaissance stage. Keeping in view of the requirements of the TOR, the consultants undertook surveys to assess typical traffic, travel, socio-economic and transport characteristics within the influence area of each survey location. The following traffic surveys were conducted:

- Classified traffic volume count surveys were conducted at Four (4) locations for 7-days using ATCC. (Video graphic Method)
- Origin-destination surveys for passengers and commodity movements at Four (4) locations for one-day (24hrs)
- Axle Load Survey at Four (4) locations for one day (24 hours).
- Turning Movement Count at Twelve (12) Major Junction Locations for one day (24 hours)

Locations for carrying out these surveys were selected after considering the following factors: The locations should cover all the roads from where the traffic is likely to divert to the proposed project corridor.

- The survey location should be outside urban influence.
- The survey location is in a reasonably level terrain with good visibility.
- The location is in a straight section of road and shall facilitate in reducing the speed of vehicles for easy enumeration of data.

Homogeneous sections were identified for carrying out traffic surveys and all locations of traffic surveys are finalized in consultation with the authority. The map of the same is presented in Figure.7-1. The survey schedule is given in Table 7-1

The following key activities were performed before commencement of actual surveys:

- Reconnaissance and an extensive study of existing traffic characteristic were made before finalizing the survey locations.
- Survey formats were prepared keeping in view of guidelines specified in IRC: SP:19-2001
- Necessary permissions were obtained from police personnel of respective districts before commencing the surveys.
- Automatic Traffic Counter and Classifier (ATCC) system was deployed at site to record the mode wise traffic data.
- Trained enumerators were deployed to capture the OD survey data accurately.
- All necessary precautions were exercised during surveys for the safety of enumerators. Enumerators were provided with traffic cones, reflective jackets, electronic gadgets, and accurate measuring equipment(s).

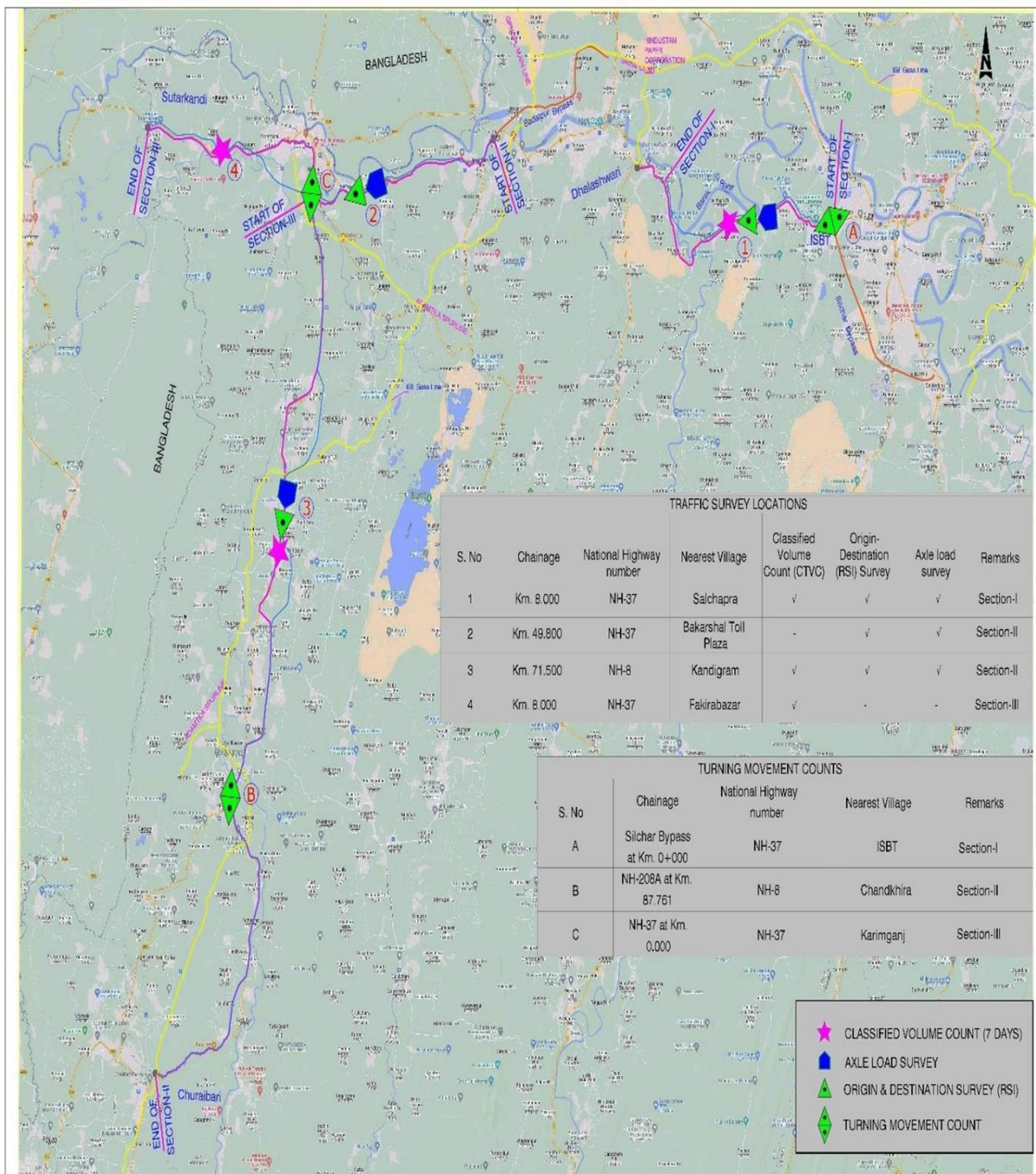



Figure 7-1: Figure Showing Proposed Traffic Survey Locations



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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## 7.2 OBJECTIVE

The primary objectives of these traffic studies are to:

- Determine characteristics of traffic movement and to establish base year traffic demand.
- Identify zones of influence for the project stretch and extent of influence based on O-D Survey.
- Determine travel pattern as well as type and weight of commodities carried by goods vehicles.
- Capacity assessment and recommendation for number of lanes based on demand forecast and evolving suitable design.
- Geometric design of intersections
- Determination of Vehicle Damage Factor as an aid to pavement design
- Cost benefit and financial analysis
- Enable preliminary design of the project facilities.

## 7.3 SCOPE OF THE STUDY


The scope of traffic study includes the analysis of the primary data collected from traffic surveys and collection of secondary sources including petrol sales data, to determine the seasonal variation and truck parking surveys. Vehicle Damage Factor is assessed from the Axle Load Survey to design of pavement layers. To determine the capacity and level of service of the project corridor, the following parameters are assessed:

- Average Daily Traffic, Annual Average Daily Traffic, Peak Hour Factor and Seasonal Correction Factor of the Base Year
- Traffic Growth Rates
- Travel pattern, major origin, and destinations, and influencing zones.
- Axle load survey

## 7.4 NEED FOR TRAFFIC STUDY

A comprehensive traffic and transportation study for a project corridor involves traffic surveys as an integral component. Appreciation of existing traffic and travel characteristics is extremely important for the development of an effective traffic and transportation plan for the proposed expressway. An accurate estimate of the traffic that is likely to use the project road is very important as it forms the basic input in planning, design, operation, and financing. It provides the basis for determining and justifying the number of traffic lanes to be provided for different road sections having regards to volume, composition and other parameters of traffic.

For existing road networks along the project corridor, traffic analysis provides a means of assessing the traffic conditions. Traffic analysis thus helps further in the evaluation of the investment needed for the future expressway improvements. A thorough knowledge of the travel characteristics of the traffic likely to use the project stretch as well as other major roads

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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in the influence area of the study corridor is essential for future traffic estimation. The estimation of revenue through toll collection plays a pivotal role in assessing the financial viability of the project and finalizing the financial covenants for the concession agreement. Thus, accurate assessment of the existing traffic and forecasting attains utmost importance.

## 7.5 OBJECTIVE

The objectives of the current traffic study are listed as under:

- Establish the base year traffic characteristics of existing road networks in and around the project influence area.
- Identify zones of influence for the project stretch and extent of influence based on O-D Survey.
- Determine travel pattern as well as type and weight of commodities carried by goods vehicles.
- Estimate potential traffic diversion from existing road network to project stretch.
- Project the traffic demand on the proposed expressway for a horizon period of 30 years.
- Forecast traffic levels for developing tolling strategies.
- Determine load distribution along proposed expressway and arrive at Vehicle Damage Factors (VDF) to aid in pavement design.
- Benefit-Cost Analysis (BCA) of proposed expressway along with Sensitivity Analysis.


## 7.6 OUTCOME

The following outcome will be derived from the current report:

- Base year traffic demand of existing road network along the project stretch.
- Traffic forecast along the project stretch considering the generated as well as developmental traffic for a horizon period of 30 years.
- Projected traffic on section-wise breakup of project stretch to provide inputs for tolling strategy.
- Vehicle Damage Factor(s) to provide input for pavement design.
- Justification on provision of 4 lane/ 6 lane carriageway

## 7.7 METHODOLOGY

Traffic Surveys were carried out strictly as per TOR and within the time frame given for submission. In general, the Specifications and Standards primarily based on the Guidelines for Expressway by Ministry of Road Transport and Highways (MORT&H) have been followed. Specific Codes and Guidelines of the IRC and publications of the MORT&H including circulars & general/special publications, technical Specifications & Standards have been kept in view.

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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### 7.7.1 Socio-Economic Profile

Socio-economic profile of the influence area is prepared, after study of data on growth of population and density, human settlement pattern, land use, sub-profiles of agriculture and industries, economic base, trends in socio-economic indicators, development scenarios for various sectors, transport infrastructure and its uses such as use of rail transport etc. The relevant data helpful is collected from the following sources:

- State Statistical Abstracts
- State Year Books
- Census Publications – Districts and State
- Handbooks of Statistics of Districts in the area of influence
- Economic Surveys of the State constituting the zone of influence
- Directorate of Economics & Statistics of Andhra Pradesh

### 7.8 FLOW CHART OF WORK PLAN

The work plan adopted for the current study is represented in the form of a flow chart as shown below.




## 7.9 TRAFFIC SURVEYS

To achieve the desired objectives, the Consultant thoroughly studied the road network during the reconnaissance stage. Keeping in view of the requirements of the TOR, the consultants undertook surveys to assess typical traffic, travel, socio-economic and transport characteristics within the influence area of each survey location. The following traffic surveys were conducted:

- The Automatic Classified Traffic Volume Count (ATCC) surveys were conducted at 3 strategic points in 7 days. The surveys were conducted using ATCC(Video graphic) methods.
- Origin-Destination & Commodity Movement Survey by Roadside Interview (RSI) method were conducted at three locations i.e., at Salchapra village on NH-37, at existing toll plaza near Bakarshal on NH-37 and at Nilambazar on NH-8 for 24 hrs.



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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- Axle load Survey were conducted at three locations i.e., at Salchapra village on NH-37, at existing toll plaza near Bakarshal on NH-37 and at Nilambazar on NH-8 for 24 hrs.
- Locations for carrying out these surveys were selected in consultation with the Authority and based on the following factors:
- Each location being selected near the point from where the possibility of diversion of traffic on the proposed alignment of the expressway is expected.
- The survey location should be outside urban influence.
- The survey location is in a reasonably level terrain with good visibility.
- The location is in a straight section of road and shall facilitate in reducing the speed of vehicles for easy enumeration of data.

Mid-block sections were identified for carrying out traffic surveys and all locations of traffic surveys are finalized in consultation with the Authority. The map of the same is presented in Figure-7.1. The survey schedule is given in Table-7.1.


The following key activities were performed before commencement of actual surveys:

- Reconnaissance and an extensive study of existing traffic characteristics were made before finalizing the survey locations.
- Survey formats were prepared keeping in view of guidelines specified in *IRC:SP:19-2001*
- Necessary permissions were obtained from police personnel of respective districts before commencing the surveys.
- Automatic Traffic Counter and Classifier (ATCC) system was deployed at site to record the mode wise traffic data.
- Trained enumerators were deployed to capture the OD survey data accurately.
- All necessary precautions were exercised during surveys for the safety of enumerators. Enumerators were provided with traffic cones, reflective jackets, electronic gadgets, and accurate measuring equipment(s).

## 7.10 TRAFFIC SURVEYS PLANNING SCHEDULE

During the reconnaissance survey, the existing road network was studied. As per the details given in TOR traffic locations sections were identified for carrying out traffic surveys and all other locations of traffic surveys were finalized in consultation with the Authority. Traffic Surveys Planning Schedule is presented in Table below:

- a) Classified Traffic Volume Count, Axle Load, OD-RSI:

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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*Table 7-1: Traffic Survey Schedule*

S. No	Survey Location at	Classified Volume Count (CTVC) – 7 days (24 hours)	Origin-Destination (RSI) Survey-1 day (24 Hours)	Axle load survey-1 day (24 Hours)
1	Nilambazar	12/09/2023 to 18/09/2023	15/09/2023	15/09/2023
2	Bakarshal	-	14/09/2023	14/09/2023

**b) Turning Movement Count:**

S. No	Cross Road	Survey Location/Village Name	Turning Movement Count	Remarks
1	NH-8 & NH-37 Junction	Bakarshal	14/09/2022	24hrs
2	NH-8 & NH-208A Junction	Chandkhira	15/09/2022	






Site Photographs

Figure 7-2: Photographs During Traffic Survey

### 7.11 AVERAGE DAILY TRAFFIC (ADT)

The various vehicle types having different sizes and characteristics were converted into a standard unit called passenger car unit. Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “Guidelines for Capacity of Roads in Rural areas”, IRC:64-1990. The passenger car unit values (PCU) which were adopted are presented in Table below. The information derived from the surveys was utilized to obtain traffic intensity, traffic composition, hourly variation and daily variations and peak hour characteristics.



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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*Table 7-2: Passenger Car Unit Factors for various Vehicle Types*

S. No	Vehicle Type	PCU factors	S.No.	Vehicle Type		PCU factors
1	Two Wheelers	0.5	12	Two Axle		3.0
2	Three Wheelers	1.0	13	Three Axle		3.0
3	Car / Jeep / Van	1.0	14	Multi Axle		4.5
4	Car (Yellow Board)	1.0	15	Heavy Earth Moving		4.5
5	Tata Magic	1.0	16	LCV/ LGV		1.5
6	RTC Bus	3.0	17	Mini LCV		1.0
7	Private Bus	3.0	18	Tractor		1.5
8	School Bus	3.0	19	Tractor with trailer		4.5
9	College Bus	3.0	20	Non-Motorised	Cycle	0.5
10	Minibus	1.5	21		Cycle Rickshaw	2.0
11	Three-Wheeler (Goods)	1.0	22		Animal Drawn	8.0

Source: IRC:64-1990


The Average Daily Traffic (ADT) is obtained from the Classified Traffic Volume Counts to determine the characteristics of traffic movement and to establish base year traffic demand. The data collected from primary and secondary sources were recorded in worksheets, compiled, checked, and corrected before further proceeding for analysis. Traffic data analysis was carried out, to understand the traffic characteristics and travel pattern in the study area and to provide basic input for pavement design. ADT has been worked out in terms of vehicles per day (VPD) and Passenger Car Units (PCU) by averaging 7 days volume counts. Table below gives the average daily traffic at 3 survey locations based on average of 7 days traffic volume count.

*Table 7-3: Average Daily Traffic at Classified Traffic Count Locations*

Survey Location No.	1
Name of Location	Near Nilambazar
Two-Wheeler	2045
Three-Wheeler (Passenger)	1823
Car	2270
Car (Y)	109
Tata Magic	16
RTC Bus	75

Survey Location No.		1
Name of Location		Near Nilambazar
Private Bus		86
Minibus		47
School/ College Bus		3
2 Axle		200
3 Axle		94
Multi Axle		494
HEM		3
LCV		367
Mini LCV		499
Tractor		2
Tractor with Trailer		2
Three-Wheeler (Goods)		45
Bicycle		147
Cycle Rickshaw		15
Animal Drawn		1
Government Exempted		17
		8
		5
Others		0
Vehicles	Motorized	8210
	Non-Motorized	163
	Total Traffic	8373
	Tollable Traffic	4263
PCUs	Motorized	10077
	Non-Motorized	112
	Total Traffic	10189
	Tollable Traffic	7128



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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## 7.12 SEASONAL VARIATION FACTOR

Monthly sales data from the fuel stations located on the project corridor were collected to estimate the Seasonal Variation Factor (SVF) or Seasonal Correction Factor (SCF). Data collected from fuel stations are found to be with fluctuated and hence adopted average Seasonal Variation Factor are presented in Table below. The SVF was applied to the vehicular traffic volume of ADT to obtain the Annual Average Daily Traffic (AADT) and it was later converted to PCU's. The factor is calculated based on the month of survey conducted, i.e., September 2023, was applied to the ADT to determine the AADT.

*Table 7-4: Seasonal Variation Factor*

Survey Location No	1
Name of the Location	Near Nilambazar
Petrol driven	1.06
Diesel driven	1.06


## 7.13 ANNUAL AVERAGE DAILY TRAFFIC (AADT)

The Annual Average Daily Traffic (AADT) at each of the survey location was obtained by multiplying the Average Daily Traffic (ADT) with the Seasonal Correction Factor. The AADT for the year 2023 at survey locations are calculated and tabulated in the below Table below. The AADT values represented in the following table are actual values obtained from the survey.

*Table 7-5: Section wise Annual Average Daily Traffic (AADT)*

Survey Location No.	1
Name of Location	Near Nilambazar
Two-Wheeler	2168
Three-Wheeler (Passenger)	1932
Car	2406
Car (Y)	116
Tata Magic	17
RTC Bus	80
Private Bus	91

Survey Location No.		1
Name of Location		Near Nilambazar
Minibus		50
School/ College Bus		3
2 Axle		212
3 Axle		100
Multi Axle		524
HEM		3
LCV		389
Mini LCV		529
Tractor		2
Tractor with Trailer		2
Three-Wheeler (Goods)		48
Bicycle		147
Cycle Rickshaw		15
Animal Drawn		1
Government Exempted		18
		8
		5
Others		0
Vehicles	Motorized	8703
	Non-Motorized	163
	Total Traffic	8866
	Tollable Traffic	4519
PCUs	Motorized	10676
	Non-Motorized	112

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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Survey Location No.		1
Name of Location		Near Nilambazar
	Total Traffic	10788
	Tollable Traffic	7552

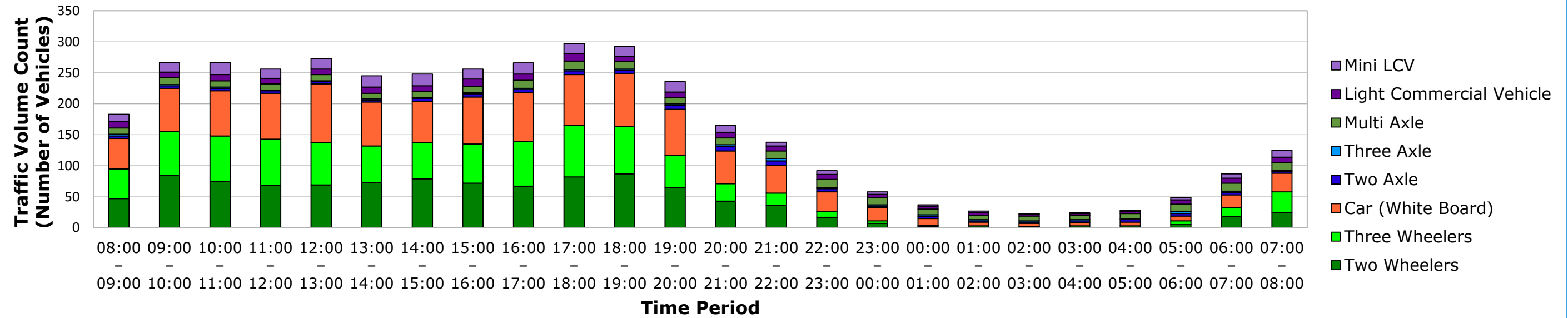
#### 7.14 PEAK HOUR PROPORTION (PHP)

Peak Hour Proportion is defined as Traffic volume during Peak hour expressed as Percentage of AADT. Peak Hour Traffic is obtained as the highest Hourly traffic volume observed during a typical day (24 hours). Peak Hour proportions of all locations are presented in Table. It is observed that Peak Hour Proportion is in between 6.44 & 8.29.

*Table 7-6: Peak Hour Composition*

Survey Location	Peak Hour Volume	Total Volume	Peak Hour Composition (%)	Time
2	739	10719	6.89	11:00 – 12:00

### Mode-wise Hourly Variation of Traffic Volume



### Mode-wise Hourly Variation of Traffic Volume

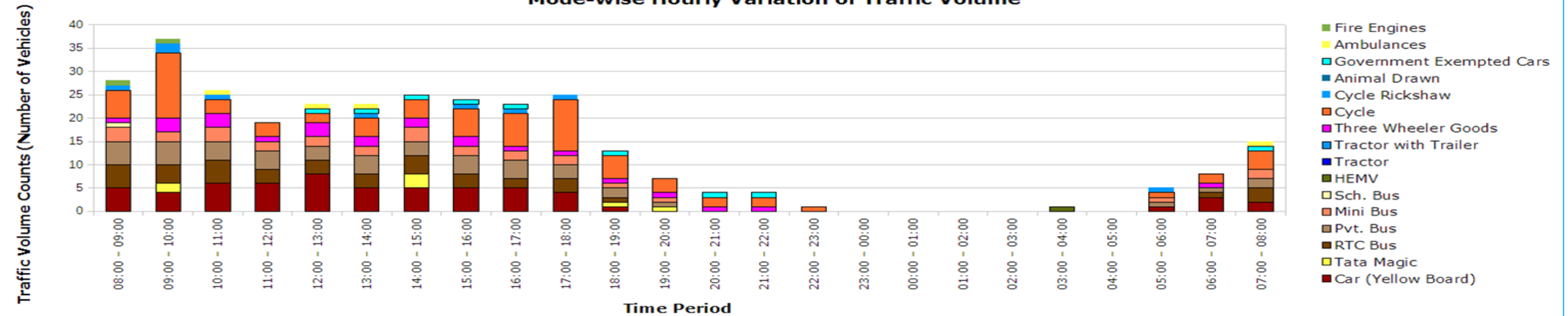


Figure 7-3: Mode-wise Hourly Variation of Traffic Volume at Nilambazar

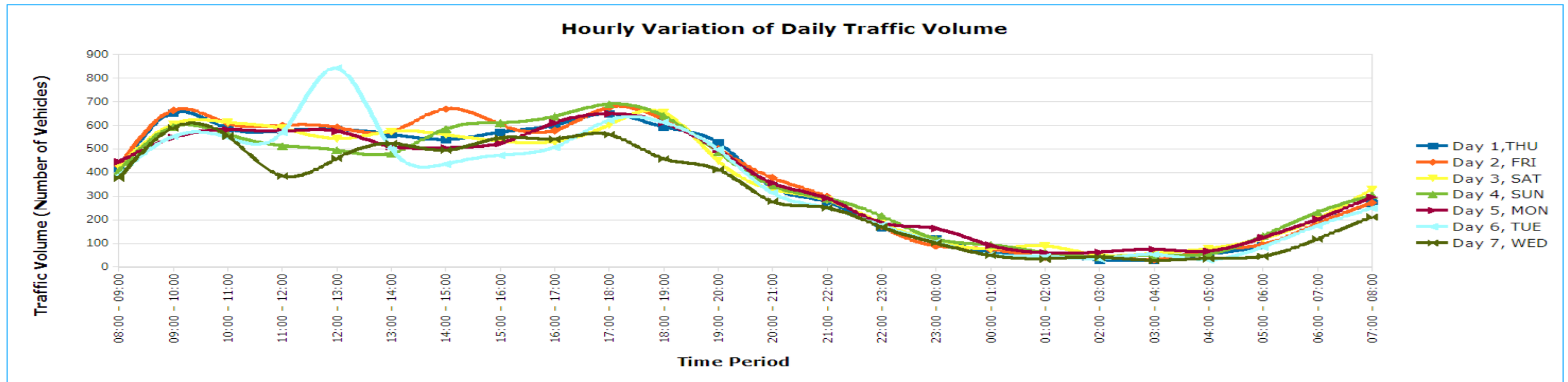


Figure 7-4: Hourly variation of Daily Traffic Volume at Nilambazar



## 7.15 ORIGIN-DESTINATION AND COMMODITY MOVEMENT SURVEY

The origin – destination survey was carried out at the following locations:

- Location 1: on NH-37 at Km. 222.000 near Bakarshal Toll Plaza
- Location 2: on NH-8 near Nilambazar

A well-formatted questionnaire was framed containing information regarding origin, destination, distance, purpose and other various details. Separate queries were made for passenger vehicles and goods vehicles. The analysis of daily flow of classified volume counts has been the basis for fixing the sample size of vehicles by type and direction. At all the survey locations, the number of vehicles interviewed are varying around 30% - 50% as sample size. The expansion factors have been worked out based on the average daily volumes to the sample size at each location separately. Sample size collected at each O-D location is shown in Table below.

*Table 7-7: Sample Size at each OD Survey Location*

Survey Location No	1	2
Name of the Location	Near Bakarshal Toll Plaza	Near Nilambazar
Car	45%	26%
Bus	25%	44%
LCV	50%	62%
2 Axle	78%	54%
3 Axle	24%	49%
MAV	31%	62%

Commercial and passenger traffic traversing between Silchar – Churaibari - Sutarkandi by using the existing road networks are captured and same has been assigned on to the proposed section.

Traffic assignment is a process of capturing all the possible traffic in the existing corridor of two-lane Silchar-Churaibari-Sutarkandi Highway and same are assigned to proposed corridor. OD data forms basic input for the traffic assignment. Traffic that diverts from Existing corridor from the conventional route is studied in detail between origin and destinations. Accordingly, they are divided into various project influencing zones. Zones of influence are identified in Assam, Tripura, Mizoram, Meghalaya, and Manipur states.


In addition to the through traffic, influence of local traffic was identified by conducting traffic surveys at Major Junctions along the project Corridor. Proper care has been taken such that no vehicle is duplicated or captured twice at any locations.

### 7.15.1 Zoning System

For analysis of O-D data collected from the field, it is required to code it for origin and destination of trip. The zoning was done at four levels. In first level, all-important towns located along the proposed project stretch were assigned a zone code. Secondly, immediate influence areas of project road were considered, and nearby areas/towns were defined as zones. In the next level, all nearby districts were grouped in zones. Finally, states beyond the influence area were aggregated broadly in terms of direction of project road. Total 53 traffic zones were considered for the project stretch. List of zone numbers and corresponding zone areas are mentioned in the below Table below.


*Table 7-8: Zones derived from Origin-Destination Studies*

Zone No.	Name of town/city/district/state
1	State of Tripura
2	Hatai Charra, Lowairpoa, Katal Tali, Tibhum, Hatairbond
3	Uttor Chagolmar, Isabheel, Kotamani Bazar, Rangamati, Bazaricherra, Abdullapur
4	Chandkhira, Bairabnagar, Tangibari, Saruchalitha, Baithakhal T.E., Kalkalighat
5	Ramkrishna Nagar, Nayagram, Chamela, Dullabcherra
6	Ratabari, Bazarghat
7	Patharkandi, Ashimganj, Jamirala, Singhariah, Kachubari, Ilashpur
8	Nilambazar, Baraigram, Eragigool, Kayasthagram, Saija Nagar, Barantar
9	Kunapara, Ratanpur, Balirbond, Pankshankar, Barbari, Barkatpur
10	Kanisail, Saidambar, Nagkapan, Humak, Ranigram
11	Medal, Bhatgram, Rampasha, Banamali
12	Karimganj
13	Sarisa, Rarai, Nathupur, Bakarshal
14	Lamajuar, Jabainpur, Arengabad
15	Chargola, Ramkrishna
16	Bhanga, Kandigram malua, Mosli, Kankales, Purbagram
17	Srigouri, Kandigram Chaita, Umapur
18	Bagargool, Khagail, Mahakal
19	Son beel
20	Badarpur, Panchgram, katakhal, Alakulipur, Kalinagar
21	Sutarkhandi, Ullukandi, Jarapata
22	Akbarpur, Fakirabazar, Tazpur
23	Panaragarh, Maizgram
24	Kapnarpur, Chiparsangan, Chandipur, Uttar Kanchanpur

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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Zone No.	Name of town/city/district/state
25	Algapur, Narainpur, Bakri howar
26	Hailakandi, Kanchanpur
27	Matijuri, Bandukmara Grant, Sudorshonpur
28	Lala, Jankibazar
29	Madhabpur, Gharmura, Jamira, Duttapur
30	Anipur Grant
31	Salchapara, Kalinagar, Digorsrikona
32	Srikona, Tarapur
33	Silchar, NIT Silchar, Bhaga, Kabuganj, Sonabarighat
34	Barakhola, Udarband, Sonalmukh, Lakhipur, Bankandi
35	Kumbhirgram
36	Katigora, Rajnagar
37	Berenga, Rongpur, Kasipur, Mathinagar, Sonai
38	Kalain, Kalibari
39	Kamrup Metropolitan (Guwahati)
40	Districts of Kokrajhar, Dhubri, Chirang, bongaigaon, Gopalpara, Barpeta, Baksa, Nalbari, Kampur, Udalguri, Darrang
41	Districts of Majuli, Jorhat, Lakhimpur, Sivasagar, Dibrugarh, Dhemaji, Tinsukia
42	Districts of Dima Hasao, Karbi Anglong, Nagaon, Sonitpur, Golaghat, Morigaon, Hojai
43	State of Meghalaya
44	State of Arunachal Pradesh
45	State of Manipur
46	State of Mizoram
47	State of Nagaland
48	States of West Bengal, Odisha, Bihar, Jharkhand
49	States of Chattisgarh. Madhya Pradesh
50	States of Rajasthan, Gujarat
51	Delhi
52	States of J&k, Himachal, Punjab, Haryana, Uttarakhand, Uttar Pradesh
53	States of Maharastra, Goa, AP, Telangana, Karnataka, Tamil Nadu, Kerela

The O-D data collected has been analysed to study the OD matrix over the entire project stretch at each survey location. The OD matrix of three locations are presented in annexures.

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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The O-D data collected has been analysed to study the trip frequency distribution over the entire project stretch. The mode wise trip frequency distribution at all survey locations is presented in tables and figures.

*Table 7-9: Trip Frequency Distribution at near Bakarshal Toll Plaza*

	Daily Once	Daily Twice	> Daily Twice	Weekly once	Weekly Twice	> Weekly Twice	Monthly Once	Monthly Twice	> Monthly Twice	Yearly Once	Yearly Twice	>Yearly Twice
<b>Car</b>	1.34%	84.30%	0.45%	1.47%	0.51%	0.00%	8.87%	1.91%	0.13%	0.96%	0.06%	0.00%
<b>Bus</b>	4.21%	77.89%	10.53%	1.05%	0.00%	0.00%	6.32%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>MiniBus</b>	6.41%	75.64%	10.26%	0.00%	1.28%	0.00%	6.41%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Tata Magic</b>	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>LCV</b>	17.28%	23.46%	1.23%	3.29%	4.53%	0.00%	19.34%	9.88%	7.82%	13.17%	0.00%	0.00%
<b>2 Axle</b>	7.74%	21.43%	0.00%	2.98%	1.79%	0.60%	19.64%	13.10%	11.31%	21.43%	0.00%	0.00%
<b>3 Axle</b>	13.00%	18.00%	5.00%	1.00%	1.00%	0.00%	24.00%	14.00%	4.00%	20.00%	0.00%	0.00%
<b>Multi Axle</b>	7.00%	14.87%	0.00%	8.75%	1.46%	0.87%	22.45%	10.79%	8.75%	24.78%	0.29%	0.00%



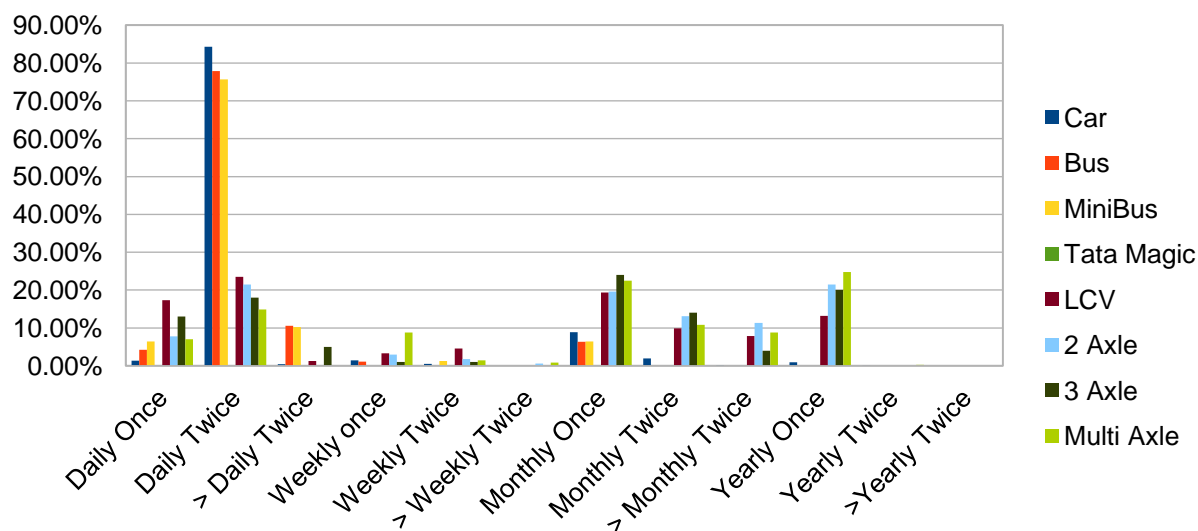


Figure 7-5: Graph Showing Trip Frequency Distribution at Bakarshal Toll Plaza

Table 7-10: Trip Frequency Distribution at Nilambazar

	Daily Once	Daily Twice	> Daily Twice	Weekly once	Weekly Twice	> Weekly Twice	Monthly Once	Monthly Twice	> Monthly Twice	Yearly Once	Yearly Twice	>Yearly Twice
Car	0.72%	33.72%	0.00%	9.11%	0.90%	0.36%	43.28%	7.48%	1.17%	2.98%	0.18%	0.09%
Bus	5.19%	49.35%	0.00%	5.19%	0.00%	0.00%	29.87%	10.39%	0.00%	0.00%	0.00%	0.00%
MiniBus	0.00%	27.78%	0.00%	38.89%	0.00%	0.00%	22.22%	11.11%	0.00%	0.00%	0.00%	0.00%
Tata Magic	10.00%	50.00%	0.00%	20.00%	0.00%	0.00%	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%
LCV	5.75%	24.52%	3.45%	17.62%	0.77%	0.00%	26.44%	7.28%	1.53%	12.64%	0.00%	0.00%

2 Axle	4.03%	17.74%	2.42%	10.48%	0.00%	0.00%	25.81%	12.10%	4.84%	22.58%	0.00%	0.00%
3 Axle	1.82%	14.55%	5.45%	5.45%	0.00%	0.00%	36.36%	18.18%	0.00%	18.18%	0.00%	0.00%
Multi Axle	5.73%	11.47%	2.15%	16.13%	0.72%	0.00%	27.60%	8.96%	3.58%	23.30%	0.00%	0.36%

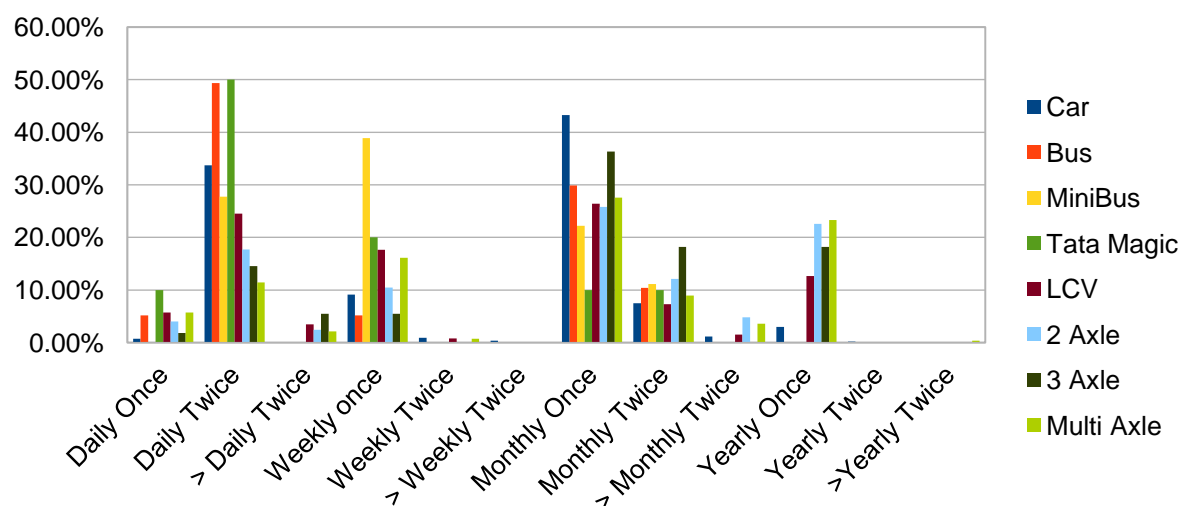



Figure 7-6: Graph Showing Trip Frequency Distribution at Nilambazar

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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The O-D data collected has been analysed to study the commodity distribution over the entire project stretch. The commodity wise distribution at all survey locations is presented in tables and figures.

*Table 7-11: Commodity distribution as per OD at Bakarshah*

S. No	Commodity	Number	Percentage
1	Food grains and pulses	31	3.63%
2	Cash crops	1	0.12%
3	Vegetables and Fruits	73	8.55%
4	Processed Food Items	19	2.22%
5	Packed Food Items	23	2.69%
6	Fishery, Poultry and Animal feed	23	2.69%
7	Building Materials	185	21.66%
8	Industrial Raw Materials	8	0.94%
9	Consumer Goods	13	1.52%
10	Fertilizers, chemicals and Pharmaceuticals	11	1.29%
11	Machinery and Automobiles	15	1.76%
12	Petroleum Products	30	3.51%
13	Parcel Goods	56	6.56%
14	Empty	300	35.13%
15	Industrial Outputs	61	7.14%
16	Liquor and Cooldrinks	5	0.59%

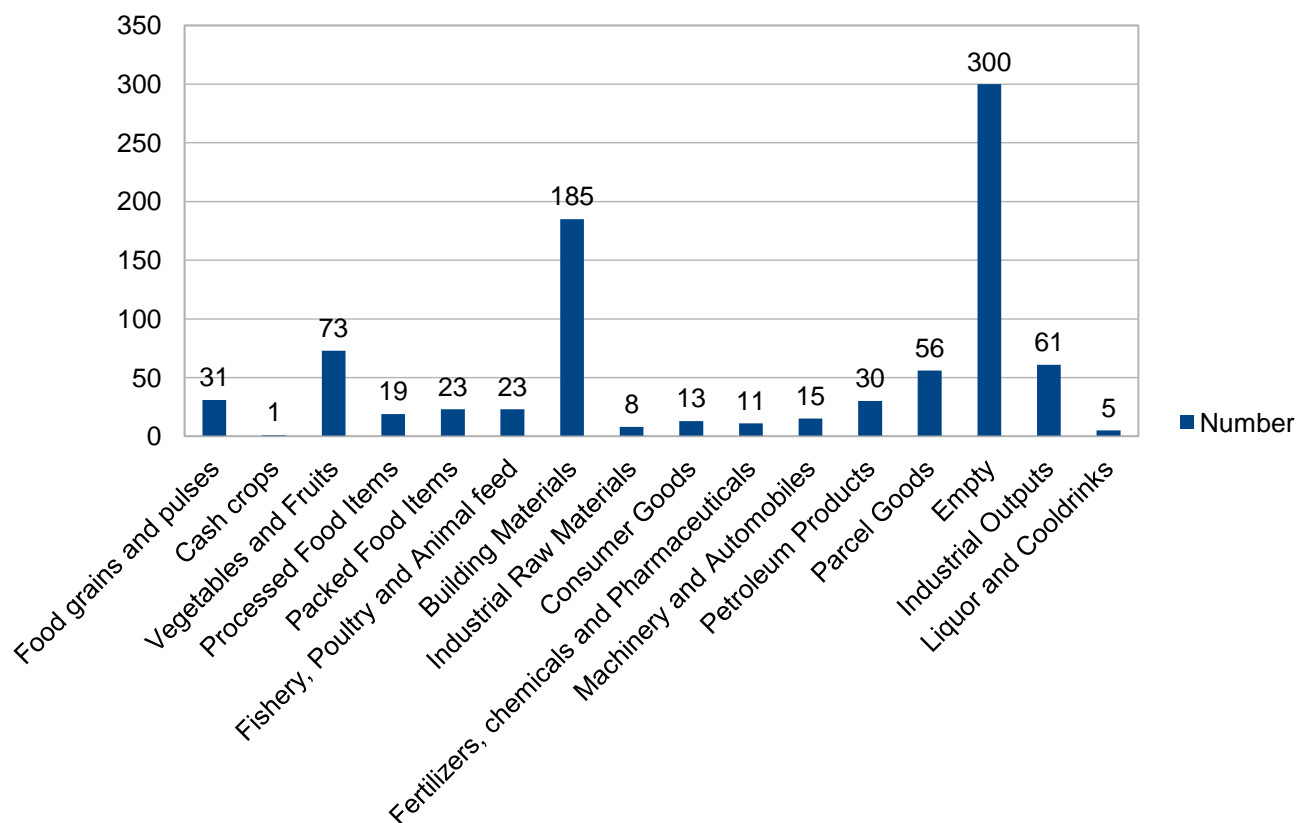


Figure 7-7: Graph showing Commodity distribution as per OD at Bakarshal

Table 7-12: Commodity distribution as per OD at Nilambazar

S. No	Commodity	Number	Percentage
1	Food grains and pulses	11	1.53%
2	Cash crops	1	0.14%
3	Vegetables and Fruits	56	7.79%
4	Processed Food Items	18	2.50%
5	Packed Food Items	19	2.64%
6	Fishery, Poultry and Animal feed	15	2.09%
7	Building Materials	133	18.50%
8	Industrial Raw Materials	7	0.97%
9	Consumer Goods	14	1.95%
10	Fertilizers, chemicals and Pharmaceuticals	3	0.42%

11	Machinery and Automobiles	3	0.42%
12	Petroleum Products	26	3.62%
13	Parcel Goods	70	9.74%
14	Empty	279	38.80%
15	Industrial Outputs	59	8.21%
16	Liquor and Cooldrinks	5	0.70%

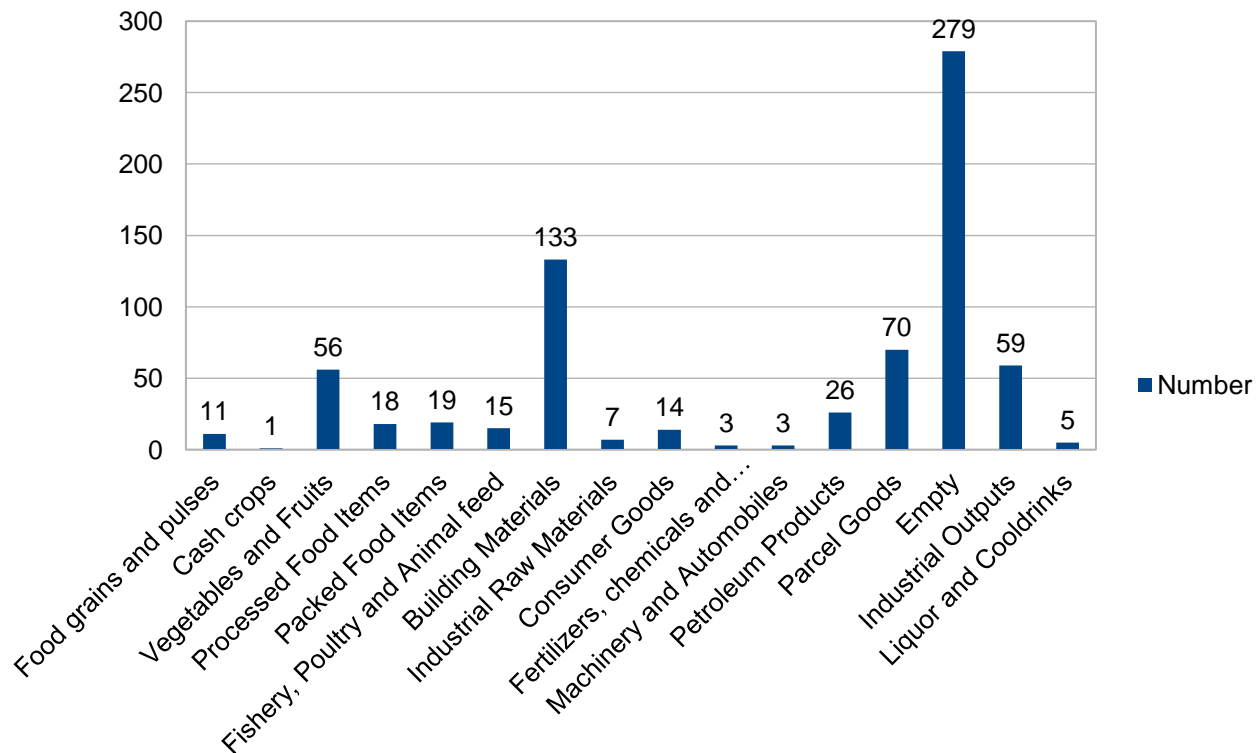



Figure 7-8: Graph showing Commodity distribution as per OD at Nilambazar

## 7.16 AXLE LOAD SURVEYS AND ANALYSIS

Axle load surveys were conducted at locations mentioned in Traffic Schedule. This survey was conducted for 1 normal day in both directions of traffic simultaneously with volume count of commercial vehicles (Trucks and LCV). The random selection of vehicles for axle load measurement was done, ensuring suitable sample for each category of commercial vehicles consisting of overloaded and empty vehicles.

The Vehicle Damage Factor (VDF) is an index characterizing the traffic loading for a highway and is defined as a multiplier for converting the number of commercial vehicles of different axle loads to Standard Axle Loads (SAL). Equivalency factor (EF) is normally worked



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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out by using the Fourth Power Rule derived by AASHTO and approved by CRRI. With the help of equivalency factors and frequency distribution of axle loads, Equivalent Axle Loads (EAL) are computed.

$$\text{VDF} = \text{Total EAL} / \text{Number of vehicles weighed}$$

*Table 7-13: Equivalency Factor*

S. No	Type of Axle	Standard Axle loads (in kN)
1	Single Axle with single wheel on either side	65
2	Single Axle with dual wheel on either side	80
3	Tandem Axle with dual wheel on either side	148
4	Tridem Axle with dual wheel on either side	224

The VDF calculated for different categories of commercial vehicles are as shown in Table below:

*Table 7-14: VDF Values at Survey Locations*

S. No	Mode	Near Bakarshal Toll Plaza		Near Nilambazar	
		Towards Badarpur	Towards Karimganj	Towards Karimganj	Towards Churaibari
1	2 Axle	0.47	1.54	1.54	7.08
2	3 Axle	1.46	5.00	2.58	6.23
3	M axle	3.10	10.20	2.61	9.05
4	LCV	0.11	0.12	0.39	1.16

### 7.17 TURNING MOVEMENT COUNT:

The traffic volume count stations at Toll Plaza locations of project stretch (TVCs) have been located to capture the pattern of the traffic plying on the project stretch. Apart from these traffic volume counts, for the study of the road network around the project corridor, turning movement count was conducted at 12 major junctions along the project corridor. The traffic pattern is considerably influenced by these junctions, either in case of passenger vehicles or goods or both also. The traffic volume levels and their characteristics at these intersections are presented in the below table. The survey was conducted for a period of 8 hours from 8:00 am to 12:00 pm in the morning peak hours and 16:00 pm to 20:00 pm in the evening peak hours.

### 7.17.1 NH-37 & NH-8 Junction



Figure 7-9: NH-8 and NH-37 Junction

Junction of NH-37 & NH-8 is a one of the 3-legged intersection on the project corridor. This intersection is formed by connecting the road from Churaibari (NH-8) and with existing corridor (NH-37).

Based on the Survey Analysis, it has been observed that from 11:15 am to 11:30 am is being the morning peak and evening peak is from 18:15 pm to 18:30 pm, the Peak Hour Factor (PHF) 0.94 is observed during the morning peak and 0.93 in the evening peak respectively.

Summary of intersection traffic each direction wise in-terms of volume in numbers and PCUs are given below.

Table 7-15: NH-37 & NH-8 Junction - Direction wise traffic

TIME		Leg 1- Karimganj		Leg 2- Badarpur		Leg 3-Agartala	
		Vehicles	PCU's	Vehicles	PCU's	Vehicles	PCU's
8:00	9:00	239	282	549	838	591	559
9:00	10:00	273	345	607	899	586	566
10:00	11:00	254	338	587	984	668	653

TIME		Leg 1- Karimganj		Leg 2- Badarpur		Leg 3-Agartala	
		Vehicles	PCU's	Vehicles	PCU's	Vehicles	PCU's
11:00	12:00	202	264	502	802	576	554
12:00	13:00	246	348	581	929	335	1348
13:00	14:00	224	340	473	847	251	1282
14:00	15:00	252	369	494	813	244	1326
15:00	16:00	317	448	550	959	242	1132
16:00	17:00	288	392	531	933	589	546
17:00	18:00	292	396	565	970	652	591
18:00	19:00	293	467	498	862	468	399
19:00	20:00	223	337	372	615	343	285
20:00	21:00	202	343	312	584	286	248
21:00	22:00	149	258	241	459	188	203
22:00	23:00	117	269	160	406	109	142
23:00	0:00	104	174	157	272	81	99
0:00	1:00	77	185	85	249	40	71
1:00	2:00	58	165	66	200	21	37
2:00	3:00	66	177	86	237	42	62
3:00	4:00	73	189	91	246	36	58
4:00	5:00	115	262	157	361	83	99
5:00	6:00	135	272	221	465	183	198
6:00	7:00	161	260	292	559	276	308

TIME		Leg 1- Karimganj		Leg 2- Badarpur		Leg 3-Agartala	
		Vehicles	PCU's	Vehicles	PCU's	Vehicles	PCU's
7:00	8:00	215	287	447	815	542	532
Total		4,575	7,161	8,624	15,299	7,432	11,294

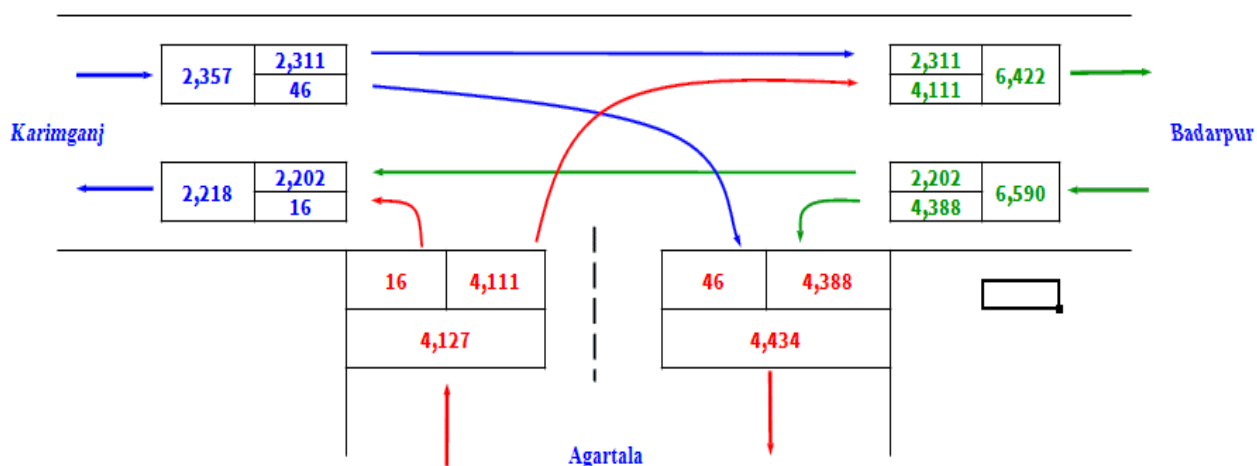


Figure 7-10: Figure Showing Turning Movements at NH-37 & NH-8 Junction

### 7.17.2 Chandkhira Junction

Chandkhira Junction is a one of the 3-legged intersection on the project corridor. This intersection is formed by connecting the road from Kacharigoan (NH-208A) and with existing corridor (NH-8). Based on the Survey Analysis, it has been observed that from 10:45 am to 11:00 am is being the morning peak and evening peak is from 16:00 pm to 16:15 pm, the Peak Hour Factor (PHF) 0.93 is observed during the morning peak and 0.93 in the evening peak respectively. Summary of intersection traffic each direction wise in-terms of volume in numbers and PCUs are given





Figure 7-11: NH-8 and NH-208A Junction

Table 7-16: Chandkhira Junction - Direction wise traffic

TIME		Leg 1- Churaibari		Leg 2- Karimganj		Leg 3-Kacharigaon	
		Vehicles	PCU's	Vehicles	PCU's	Vehicles	PCU's
8:00	9:00	419	612	431	521	248	198
9:00	10:00	400	557	432	504	286	239
10:00	11:00	448	625	423	508	261	212
11:00	12:00	395	582	401	485	272	209
12:00	13:00	356	497	368	433	248	204
13:00	14:00	429	622	447	537	250	200
14:00	15:00	429	600	463	523	272	231
15:00	16:00	473	685	449	577	236	176
16:00	17:00	542	752	502	567	324	229
17:00	18:00	392	566	362	453	188	140
18:00	19:00	289	401	284	350	143	118

TIME		Leg 1- Churaibari		Leg 2- Karimganj		Leg 3-Kacharigaon	
		Vehicles	PCU's	Vehicles	PCU's	Vehicles	PCU's
19:00	20:00	225	301	210	255	111	82
20:00	21:00	147	330	149	306	40	30
21:00	22:00	117	260	114	237	23	18
22:00	23:00	69	128	65	122	18	22
23:00	0:00	80	207	79	192	3	4
0:00	1:00	63	162	58	139	9	10
1:00	2:00	47	134	48	132	3	3
2:00	3:00	42	106	38	97	4	5
3:00	4:00	45	126	50	130	11	9
4:00	5:00	93	228	102	234	33	32
5:00	6:00	149	279	145	264	58	52
6:00	7:00	235	381	240	362	105	84
7:00	8:00	216	332	372	399	314	249
Total		6,100	9,475	6,232	8,321	3,460	2,750



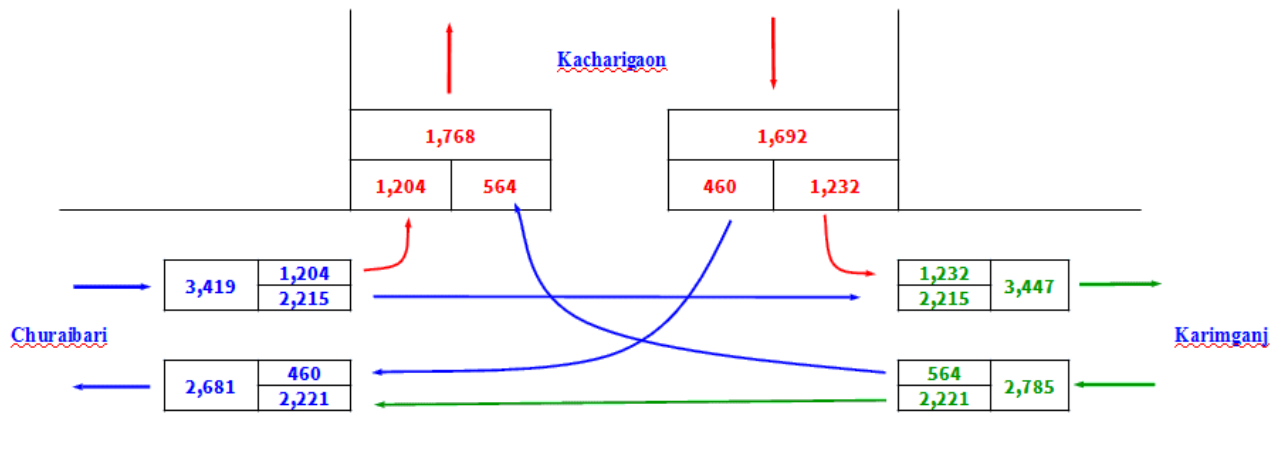



Figure 7-12: Figure Showing Turning Movements at Chandkhira

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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## 7.18 TRAFFIC FORECASTING

### 7.18.1 METHODOLOGY FOR FORECASTING

Investment priorities are governed by 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. An expressway project of this magnitude calls for significant investment. Prediction of traffic demand becomes an important task and has to be carried out as accurately as possible. 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 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. In the absence of historical traffic census data on the project road, the future traffic has been forecasted using transport demand elasticity approach by regression of registered vehicles of Andhra Pradesh with respect to socio-economic parameters *viz.*, population, PCI and NSDP as explained below.

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:


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

Where:

- P = Traffic volume (of any vehicle type)
- EI = Economic Indicator (GDP/NSDP/Population/PCI)
- A<sub>0</sub> = Regression constant;
- A<sub>1</sub> = 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 of registered vehicles of influencing states
- Assessment of future elasticity values for major vehicle groups, namely, cars, buses and trucks
- Study of past performance and assessment of prospective growth rates of state economies of influence area

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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- The growth rates are found using the formulae Eqn (a) & (b).
- For Passenger vehicles,
- $G = \sum [(R_i * E_i * I_i)] \dots \dots \dots \text{Eqn. (a)}$
- Where  $R_i$  = Growth in PCI and Population index of Andhra Pradesh
- $E_i$  = Elasticity Value
- For commercial vehicles,
- $G = \sum [(R_j * E_j * I_j)] \dots \dots \dots \text{Eqn. (b)}$
- Where,  $R_j$  = Growth in Economic index (NSDP) of Andhra Pradesh
- $E_j$  = Elasticity Value
- $I_j$  = Influence factor

### 7.18.2 SECONDARY DATA COLLECTION


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 proposed highway. 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 based on past scenarios, prospective changes in transport demand elasticity and economic growth rates.

#### (a) Growth of Registered Vehicles

To analyze the vehicle growth in the state, the vehicle registration data of Assam has been collected from the state handbook of statistics. The Compounded Average Growth Rate (%) of different vehicle types is shown in the table below.

*Table 7-17: Growth of Registered Vehicles in Assam*

S. No	Year	2 Wheelers	Car	Car (Y)	Goods	Tractor	Tractor with trailer	Mini Bus	Buses	LCV
1	2015	1431933	524793	42024	125215	31180	18288	4324	13202	71233
2	2016	1634157	557364	47759	128684	38787	19595	4502	13674	78496
3	2017	1852067	579082	53490	136807	41310	19667	4622	14633	83908
4	2018	2106900	646534	59909	141718	45796	20289	4882	15511	100202
5	2019	2400197	688919	65096	144896	58112	21008	5523	16442	118255
6	2020	2710763	747980	70509	152141	65874	22007	5808	17429	137586
7	2021	2917380	792871	85522	159748	74438	25079	6156	18475	152894
8	2022	3173011	855731	93075	167735	84115	25885	6525	19584	170140

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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*Source: Statistical HandBook of Assam & further Rationalised the data*

## (b) Economic Growth

The past performance of the economic indicators for Andhra Pradesh was also collected for the same period (2015-22), with the objective of establishing elasticity of travel demand to the different economic indicators. The economic indicators considered for the analysis include:

- Gross/ Net State Domestic Product
- Per Capita Income (PCI)
- Population

Table below gives the growth of Economic indicators for Assam.

*Table 7-18: Growth in Economic Indices of Assam State (2011-12 Prices)*

S.No	Year	GSDP (Rs Cr.)	PCI (Rs.)	Population (Cr.)	NSDP (Rs. Cr)
1	2015	156895	48013	3.12	138387
2	2016	179595	54257	3.27	160724
3	2017	192400	56747	3.31	173050
4	2018	211940	62510	3.35	185667
5	2019	234772	68384	3.38	208035
6	2020	248796	72129	3.42	216243
7	2021	273837	77403	3.46	239373
8	2022	289192	80231	3.50	251688
<b>Annual Average Growth Rate</b>		<b>9.93%</b>	<b>9.38%</b>	<b>11.55%</b>	<b>8.58%</b>


*Source: Statistical Hand Book of AP & further Rationalised the data*

## 7.18.3 TRANSPORT ELASTICITY DEMAND

### 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 dependent variables whereas the economic parameters are independent variables.

### R Square

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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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.

Regression analysis has been carried out by creating econometric models as suggested in IRC: 108–2015, using past vehicle registration data, and economic indicators such as population and PCI for passenger vehicles and NSDP for freight vehicles. All India registered trucks are also regressed with GDP to estimate national level elasticity value for trucks and its growth rate. The elasticity values obtained for each class of vehicle are given in Table below.

The following steps have been adopted to derive the Elasticity and Growth factors:


- Growth rate of registered vehicles of zone of influence (Assam) is found out.
- Growth rates of NSDP/GSDP, GDP, Per Capita Income (at 2011-12 constant prices) and population are obtained.
- For Cars, number of registered vehicles has been regressed with Per Capita Income of Assam State
- For Buses, number of registered vehicles has been regressed with Population of Assam State
- For trucks, the number of registered trucks has been regressed with NSDP of the State for Intra-State movement and GDP for Inter-State movement.
- Mean value of Average growth rate of registered vehicles and the growth rate obtained by Regression Analysis for all categories were found out both at State level and at National level (For trucks only)
- For Cars and Buses, the mean growth rate of registered vehicular growth rate and growth rate from regression analysis is adopted.

### Recommended Elasticity Values

Vehicle registration data represents all vehicles registered in the state but does not indicate actual number of vehicles plying on the road owing to vehicles taken off the road due to lack of fitness certificate. Consequently, the elasticity values based on registration data are usually higher than those based on actual traffic.

Hence, there is a need to moderate values obtained from registration data. In order to arrive at realistic future elasticities for the project road; various factors relating to vehicle technology changes besides 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 lifestyle, growing personal incomes, desire to own a vehicle facilitated by availability of

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loans/financing schemes on easy terms, etc. have all contributed to the rapid growth in ownership of cars. However, such a trend would slow down and elasticity can be expected to decline. The elasticity obtained by using registered vehicles is an overestimate for the traffic moving on suburban and inter-city routes. In view of all this, combined with the travel pattern of vehicles moving on the road, elasticity value obtained by using registration data has been moderated for future years.

Over the years, there is a change in passenger movement with more and more persons shifting towards personalized modes. Moreover, buses usually plying on fixed pre-decided routes and thus elasticity values for buses have been considered accordingly. With the changing freight vehicle mix in favor of LCV for short distance traffic and 3-axle/MAV 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 started taking place in different parts of the country.

Considering the economic indicators of Andhra Pradesh, the projected elasticity values for various vehicle types are presented in, which have been used to estimate the growth rates of each vehicle type. The 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. The same is also clear from the relationships of the economy and transport demand elasticity over time nationally and internationally.

*Table 7-19: Adopted Elasticity Values for Assam*

Mode	Variable	Elasticity	R-Square
Car/Jeep	PCI	1.02	0.99
Bus	POP	2.08	0.97
Truck	NSDP	2.00	0.99

The estimated traffic growth rates are arrived at by multiplying elasticity values and projected growth in economic factors.



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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*Table 7-20: Projected Traffic Growth Rates for Assam*

Projected Growth Rates of Assam							
S. No	Period	2W	Car	Truck	Bus	Tractor	Tractor with trailer
1	2023 - 2027	13.5%	14.5%	8.50%	6.5%	12.0%	10.5%
2	2028 – 2032	13.5%	14.5%	7.50%	6.0%	11.0%	9.5%
3	2033 – 2037	13.0%	14.0%	7.0%	5.5%	10.5%	9.0%
4	2038 - 2042	12.5%	13.0%	6.5%	5.0%	10.0%	8.5%
5	Beyond 2043	12.0%	12.0%	6.0%	5.0%	9.0%	8.0%

#### 7.18.4 RECOMMENDED GROWTH RATES


Against this 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. Final growth rates were obtained for horizon years by considering the projected economic trend of the State. Table below shows the growth rates, which are adopted in finding the future traffic demand estimates.

*Table 7-21: Traffic Growth Rates*

Projected Growth Rates of Assam							
S. No	Period	2W	Car	Truck	Bus	Tractor	Tractor with trailer
1	2023 - 2027	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
2	2028 – 2032	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
3	2033 – 2037	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
4	2038 - 2042	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
5	Beyond 2043	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

#### 7.19 PROJECTED TRAFFIC ON PROJECT CORRIDOR

The project stretch has been divided into 3 homogeneous traffic sections. In view of the same, section-wise (*leg-wise*) traffic is considered for forecasting.

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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## 7.20 CAPACITY STANDARDS

The leg wise projected Traffic volume/Design service volume has been compared against the respective capacities of 2/4/6 lanes as per IRC standards and with the 4/6lane manuals and the year during which the projected volume reaches its capacity and the year of requirement of lane upgradation has been given in Tables below.

Land port Authority of India, Sutarkandi has stated that due to some road/bridge repair works in Bangladesh, there are no commodity movement and hence truck movement has reduced in HS-3. They have shared details of approximate truck movement in the section when the repair works is completed.

*Table 7-22: Truck data shared by LPI*

S. No	Vehicle Movement	Approximate number
1	Total vehicle movement in Day	350-400
2	Total vehicle movement in Night	300-350

So, an average of 375 vehicles during day and 325 vehicles during night time are considered on our section. A total of 700 vehicles are considered to ply on road everyday.


Section wise, year of lane upgradation has been analysed with calculated growth rates and 5% growth rates

Table 7-23: Projected Traffic along HS-II on Project corridor at 5% growth rate

Year	PASSENGER TRAFFIC									GOODS TRAFFIC								3w Goods	Non Motorised			TOLL EXEMPTED			Total Traffic volume in numbers	Total tollable traffic volume in numbers	Total Traffic in PCU's	Allowable Traffic in PCU's
	2W	3W	Car / Jeep	Car / Jeep (YB)	Tata Magic	RTC Bus	Private Bus	Mini Bus	School	2 Axle	3 Axle	Multi Axle	Over sized	LGV/ LCV	Mini LCV	Tractor	Tractor with trailer/ Others		Cycle	Cycle Rickshaw	Animal Drawn	car	MINI BUS	TRUCKS				
2023	2045	1823	2270	109	16	75	86	47	3	200	94	494	3	367	499	2	2	45	147	15	1	17	8	5	8373	4263	10184	7126
2024	2147	1914	2384	114	17	79	90	49	3	210	99	519	3	385	524	2	2	47	154	16	1	18	8	5	8792	4476	10646	7482
2025	2255	2010	2503	120	18	83	95	52	3	221	104	545	3	405	550	2	2	50	162	17	1	19	9	6	9231	4700	11179	7856
2026	2367	2110	2628	126	19	87	100	54	3	232	109	572	3	425	578	2	2	52	170	17	1	20	9	6	9693	4935	11738	8249
2027	2486	2216	2759	132	19	91	105	57	4	243	114	600	4	446	607	2	2	55	179	18	1	21	10	6	10177	5182	12325	8661
2028	2610	2327	2897	139	20	96	110	60	4	255	120	630	4	468	637	3	3	57	188	19	1	22	10	6	10686	5441	12941	9094
2029	2740	2443	3042	146	21	101	115	63	4	268	126	662	4	492	669	3	3	60	197	20	1	23	11	7	11221	5713	13588	9549
2030	2878	2565	3194	153	23	106	121	66	4	281	132	695	4	516	702	3	3	63	207	21	1	24	11	7	11782	5998	14267	10026
2031	3021	2693	3354	161	24	111	127	69	4	295	139	730	4	542	737	3	3	66	217	22	1	25	12	7	12371	6298	14981	10528
2032	3172	2828	3522	169	25	116	133	73	5	310	146	766	5	569	774	3	3	70	228	23	2	26	12	8	12989	6613	15730	11054
2033	3331	2969	3698	178	26	122	140	77	5	326	153	805	5	598	813	3	3	73	239	24	2	28	13	8	13639	6944	16516	11607
2034	3498	3118	3882	186	27	128	147	80	5	342	161	845	5	628	853	3	3	77	251	26	2	29	14	9	14321	7291	17342	12187
2035	3673	3274	4077	196	29	135	154	84	5	359	169	887	5	659	896	4	4	81	264	27	2	31	14	9	15037	7656	18209	12796
2036	3856	3438	4280	206	30	141	162	89	6	377	177	932	6	692	941	4	4	85	277	28	2	32	15	9	15789	8039	19120	13436
2037	4049	3609	4494	216	32	148	170	93	6	396	186	978	6	727	988	4	4	89	291	30	2	34	16	10	16578	8440	20076	14108
2038	4251	3790	4719	227	33	156	179	98	6	416	195	1027	6	763	1037	4	4	94	306	31	2	35	17	10	17407	8862	21079	14813
2039	4464	3979	4955	238	35	164	188	103	7	437	205	1078	7	801	1089	4	4	98	321	33	2	37	17	11	18277	9306	22133	15554
2040	4687	4178	5203	250	37	172	197	108	7	458	215	1132	7	841	1144	5	5	103	337	34	2	39	18	11	19191	9771	23240	16332
2041	4922	4387	5463	262	39	180	207	113	7	481	226	1189	7	883	1201	5	5	108	354	36	2	41	19	12	20151	10259	24402	17148
2042	5168	4607	5736	275	40	190	217	119	8	505	238	1248	8	927	1261	5	5	114	371	38	3	43	20	13	21158	10772	25622	18006
2043	5426	4837	6023	289	42	199	228	125	8	531	249	1311	8	974	1324	5	5	119	390	40	3	45	21	13	22216	11311	26903	18906
2044	5697	5079	6324	304	45	209	240	131	8	557	262	1376	8	1022	1390	6	6	125	410	42	3	47	22	14	23327	11877	28248	19851
2045	5982	5333	6640	319	47	219	252	137	9	585	275	1445	9	1074	1460	6	6	132	430	44	3	50	23	15	24493	12470	29661	20844
2046	6281	5599	6972	335	49	230	264	144	9	614	289	1517	9	1127	1533	6	6	138	452	46	3	52	25	15	25718	13094	31144	21886
2047	6595	5879	7321	352	52	242	277	152	10	645	303	1593	10	1184	1609	6	6	145	474	48	3	55	26	16	27004	13749	32701	22980
2048	6925	6173	7687	369	54	254	291	159	10	677	318	1673	10	1243	1690	7	7	152	498	51	3	58	27	17	28354	14436	34336	24129
2049	7271	6482	8071	388	57	267	306	167	11	711	334	1757	11	1305	1774	7	7	160	523	53	4	60	28	18	29772	15158	36053	25336
2050	7635	6806	8475	407	60	280	321	175	11	747	351	1844	11	1370	1863	7	7	168	549	56	4	63	30	19	31260	15916	37855	26603
2051	8017	7146	8899	427	63	294	337	184	12	784	368	1937	12	1439	1956	8	8	176	576	59	4	67	31	20	32823	16712	39748	27933
2052	8417	7504	9344	449	66	309	354	193	12	823	387	2033	12	1511	2054	8	8	185	605	62	4	70	33	21	34464	17547	41736	29330


Table 7-24: Projected Traffic along HS-II on Project corridor at calculated growth rate

Year	PASSENGER TRAFFIC									GOODS TRAFFIC									Non Motorised			TOLL EXEMPTED			Total Traffic volume in numbers	Total tollable traffic volume in numbers	Total Traffic In PCU's	Allowable Traffic in PCU's
	2W	3W	Car / Jeep	Car / Jeep (YB)	Tata Magic	RTC Bus	Private Bus	Mini Bus	School	2 Axle	3 Axle	Multi Axle	Over sized	LGV/ LCV	Mini LCV	Tractor	Tractor with trailer/ Others	3w Goods	Cycle	Cycle Rickshaw	Animal Drawn	car	MINI BUS	TRUCKS				
	0.50	1.00	1.00	1.00	1.00	3.00	3.00	1.50	3.00	3.00	3.00	4.50	4.50	1.50	1.00	1.50	4.50	1.00	0.50	2.00	8.00	1.00	1.50	3.00				
2023	2045	1823	2270	109	16	75	86	47	3	200	94	494	3	367	499	2	2	45	147	15	1	17	8	5	8373	4263	10184	7126
2024	2321	2069	2599	124	17	80	92	50	3	217	102	536	3	398	541	2	2	51	148	15	1	19	9	5	9407	4763	11269	7862
2025	2634	2348	2976	140	19	85	98	54	3	235	111	582	4	432	587	3	2	58	150	15	1	22	9	6	10575	5326	12533	8681
2026	2990	2665	3408	159	20	91	104	58	4	255	120	631	4	469	637	3	3	66	151	15	1	26	10	6	11896	5960	13949	9592
2027	3394	3025	3902	181	22	96	111	62	4	277	130	685	4	509	692	3	3	75	153	16	1	29	10	7	13390	6674	15538	10607
2028	3852	3434	4467	205	24	102	117	66	4	298	140	736	4	547	743	3	3	85	154	16	1	33	11	7	15055	7454	17257	11676
2029	4372	3897	5115	233	26	108	124	70	4	320	151	791	5	588	799	4	4	96	156	16	1	38	12	8	16939	8335	19185	12865
2030	4962	4423	5857	264	28	115	132	74	5	344	162	850	5	632	859	4	4	109	158	16	1	44	13	9	19070	9328	21348	14191
2031	5632	5021	6706	300	30	122	140	79	5	370	174	914	6	679	924	5	4	124	159	16	1	50	13	9	21483	10448	23776	15668
2032	6392	5698	7678	341	32	129	148	84	5	398	187	983	6	730	993	5	5	141	161	16	1	58	14	10	24216	11715	26504	17318
2033	7223	6439	8753	385	34	136	156	89	6	426	200	1052	6	781	1062	6	5	159	162	17	1	66	15	11	27191	13088	29439	19074
2034	8162	7276	9979	435	36	144	165	95	6	456	214	1125	7	836	1137	6	6	180	164	17	1	75	16	11	30549	14634	32727	21031
2035	9223	8222	11376	492	39	152	174	101	6	487	229	1204	7	894	1216	7	6	203	166	17	1	85	17	12	34338	16378	36412	23212
2036	10422	9291	12969	556	42	160	183	107	7	522	245	1288	8	957	1301	8	7	229	167	17	1	97	18	13	38615	18344	40546	25646
2037	11777	10499	14784	628	45	169	194	113	7	558	262	1379	8	1024	1392	9	7	259	169	17	1	111	19	14	43445	20563	45186	28365
2038	13250	11811	16706	703	48	177	203	119	8	594	279	1468	9	1091	1483	10	8	292	171	17	1	125	20	15	48608	22888	50093	31186
2039	14906	13288	18878	787	51	186	213	126	8	633	298	1564	9	1162	1579	11	8	328	172	18	1	141	21	16	54404	25494	55572	34319
2040	16769	14949	21332	882	54	195	224	133	8	674	317	1665	10	1237	1682	12	9	369	174	18	1	160	23	17	60913	28414	61693	37800
2041	18865	16817	24105	988	57	205	235	140	9	718	337	1773	11	1317	1791	13	10	415	176	18	1	181	24	18	68226	31688	68533	41671
2042	21223	18919	27239	1106	61	215	247	148	9	765	359	1889	11	1403	1908	14	11	467	178	18	1	204	25	19	76441	35361	76181	45978
2043	23770	21190	30508	1228	65	226	259	155	10	811	381	2002	12	1487	2022	15	12	523	179	18	1	228	26	20	85150	39166	84220	50410
2044	26622	23732	34169	1363	69	237	272	163	10	859	404	2122	13	1577	2144	17	13	586	181	18	1	256	28	21	94877	43401	93158	55310
2045	29817	26580	38269	1513	73	249	286	171	11	911	428	2249	14	1671	2272	18	14	656	183	19	1	287	29	23	105744	48117	103101	60728
2046	33395	29770	42861	1679	77	262	300	179	11	965	454	2384	14	1771	2409	20	15	735	185	19	1	321	31	24	117884	53369	114164	66725
2047	37403	33342	48004	1864	82	275	315	188	12	1023	481	2527	15	1878	2553	22	16	823	187	19	1	360	32	26	131448	59219	126477	73364
2048	41891	37343	53765	2069	87	289	331	198	13	1085	510	2679	16	1990	2706	24	17	922	189	19	1	403	34	27	146607	65737	140185	80719
2049	46918	41824	60217	2297	92	303	348	208	13	1150	540	2840	17	2110	2869	26	19	1032	190	19	1	451	35	29	163548	73003	155452	88869
2050	52548	46843	67443	2550	97	318	365	218	14	1219	573	3010	18	2236	3041	28	20	1156	192	20	1	505	37	30	182484	81102	172458	97906
2051	58854	52465	75536	2830	103	334	383	229	15	1292	607	3191	19	2371	3223	31	22	1295	194	20	1	566	39	32	203651	90133	191408	107930
2052	65916	58760	84600	3141	110	351	402	240	15	1369	644	3382	21	2513	3417	33	23	1450	196	20	1	634	41	34	227315	100205	212528	119055

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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*Table 7-25: Capacity Calculations for the Homogeneous Sections (With calculated Growth rate)*


Year	HS-1	HS-2	HS-3	HS-3 (with LPI data)
2023	4 lane)	4 lane	2 lane with PS	2 lane with PS
2024				
2025				
2026				6 lane
2027				
2028				
2029				
2030				
2031				
2032				
2033				
2034				
2035				
2036				
2037				
2038				
2039				
2040				
2041				
2042				
2043				
2044				
2045				
2046				
2047				
2048				

	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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*Table 7-26: Capacity Calculations for the Homogeneous Sections (With 5% Growth)*

Year	HS-1	HS-2	HS-3	HS-3 (with LPI data)
2023	4 lane	4 lane	2 lane with PS	2 lane with PS
2024				
2025				
2026				
2027				
2028				
2029				
2030				
2031	6 lane	4 lane	2 lane with PS	4 lane
2032				
2033				
2034				
2035				
2036				
2037				
2038				
2039				
2040				
2041				
2042				
2043		6 lane	4 lane	6 lane
2044				
2045				
2046				
2047				
2048				



	<b>Consultancy services for preparation of DPR and Pre-Construction services from (i) Silchar ISBT (Start point of Silchar Bypass) to junction of NH-37 &amp; NH-6 at Dhaleshwari, (ii) End of proposed Badarpur bypass to Churaibari (Assam-Tripura border), (iii) Spur from NH-8 near Karimganj to Sutarkandi (Package-V)</b>	<b>TRAFFIC SURVEYS &amp; ANALYSIS</b>
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## 7.21 CONCLUSIONS

- As per the capacity standards mentioned in the Bharatmala Pariyojana Guidelines, for adopted traffic features the project corridor requires 4 lane configurations by the year of COD for HS – I & II.
- For HS-III, 4 lane configurations can be reached by 2029.
- If we adopt 5% growth rates, as per Bharatmala guidelines, for adopted traffic features the project corridor required 4 lane configurations by the year of COD for HS-I & II and for HS-III, it can be reached by 2036.
- Requirement of 4 laning of project stretch after including data received from LPI is also included.
- Considering the time required for completion of construction, it is recommended that the corridor may be developed with 4 lane capacity for HS-I, II and for HS-III 2 laning may be adopted.