

INTERSECTION IMPROVEMENT AT FORESHORE ESTATE ALONG DGS DINAKARAN SALAI IN CHENNAI

Submitted in partial fulfilment of the requirements for the
award of Bachelor of Technology degree in Civil Engineering

By

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SCHOOL OF BUILDING AND ENVIROMENT ENGINEERING**

**SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Siva Surya. P. A (Reg No.37200071) and Naresh Kumar. D (Reg. No. 37200046) who carried out the project entitled **“INTERSECTION IMPROVEMENT AT FORESHORE ESTATE ALONG DGS DINAKARAN SALAI IN CHENNAI”** under my Supervision from June 2020 to September 2020.

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DECLARATION

We **Siva Surya. P. A (Reg No.37200071)** and **Naresh Kumar. D (Reg. No. 37200046)** hereby declare that the Project Report entitled **“INTERSECTION IMPROVEMENT AT FORESHORE ESTATE ALONG DGS DINAKRAN SALAI IN CHENNAI”** done by us under the guidance of **Dr. V. SAMPATHKUMAR** at Sathyabama University, Chennai is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Civil Engineering.

1.

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SIGNATURE OF THE CANDIDATE

ABSTRACT

Urban development generates enormous traffic which leads to congestion. Assessment of traffic provides measure for safe and efficient flow of traffic. Foreshore Estate intersection in south of Chennai city along beach road has been selected for the study. The road inventory survey has been carried out to collect the width of the road, median, footpath, etc. The vehicle volume has been collected by performing the survey at four arms of Foreshore Estate intersection. The traffic accumulation graphs are developed for the traffic volume at Foreshore Estate intersection and the peak hour traffic has been assessed. Short and long term measures are suggested to manage the traffic congestion. As short term and as long term measure re-construction of broken bridge from Pattinambakkam to Besant Nagar, which will ease the traffic at Foreshore Estate Intersection.

Keywords: *Traffic congestion, intersection study, traffic survey, pavement surface evaluation, management measures*

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CHAPTER 1 - INTRODUCTION

1.1 GENERAL

- Owing to the exponential increase in the volume of traffic and the constant contradiction between traffic demand and traffic supply, congestion occurs oftentimes. Estimate their influence to the entire road network study area; and how to improve the connectivity and accessibility of the whole road network through local traffic reformation, have become important issues to transportation planners and managers. Traffic congestion can be characterized by the decrease in speed, the increase in travel time and the increase of vehicle's queue on the road. In addition, traffic congestion happens when the road demand exceeds the road capacity. The road intersection is not sustainable if its capacity exceeds the volume, but this condition exists only in certain intersections and it has dominated over entire city. DGS Dinakaran Salai and Santhome High Road is a hub connecting Triplicane, Mandaveli, Parry's, North Madras, Alwarpet from the South and Adyar, Besant Nagar, Foreshore Estate, OMR, ECR roads from the North. This is also the route our State CM takes whilst traveling from house located at Greenways Road to Secretariat (St. George Fort). Foreshore state Link road is along the Marina Shore. The volume of traffic on the Santhome High Road and DGS Dinakaran Salai can be as high as 2L vehicles on weekdays. To reduce the frequency and severity of intersection conflicts through geometric design improvements.

1.2 ROAD

A long narrow sketch with a smoothed and paved surface, made for travelling by motor vehicle, carriage, etc., between two or more points; street or highway.

1.2.1 TYPES OF ROADS

- Freeways,
- express ways,
- high ways,
- Arterials,
- Local streets,

- Collector streets.

1.3 INTERSECTIONS

An intersection is a road junction where two or more roads either meet or cross at grade. An intersection may often be controlled by traffic lights, and may have a roundabout or an island.

1.3.1 TYPES OF INTERSECTION

Intersections are classified as

- 3-way intersection
- 4-way intersection
- 5-way intersection
- 6-way intersection

Depending on the number of road segments that come together at the intersection.

1.4 INTERSECTION IMPROVEMENT

Intersections are crucial to a street's performance; they control a road's speed, safety, cost, and efficiency. Accommodation of turning movements directly affects safety and efficiency, making left turns the key design factor in intersection improvement and operation. As such, intersection turn lanes are discussed as a separate strategy. However, other improvements can also be made to increase safety and capacity, thus reducing congestion on the road. The most common strategies include improving signal timing, removing elements that hinder sight distance, making drivers aware that they are approaching an intersection, and improving bicycle or pedestrian facilities at the intersection.

1.4.1 TRAFFIC:

Traffic on roads consists of road users including pedestrians, ridden or herded animals, vehicles, streetcars, buses and other conveyances, either singly or together, while using the public way for purposes of travel.

1.4.2 TRAFFIC FLOW:

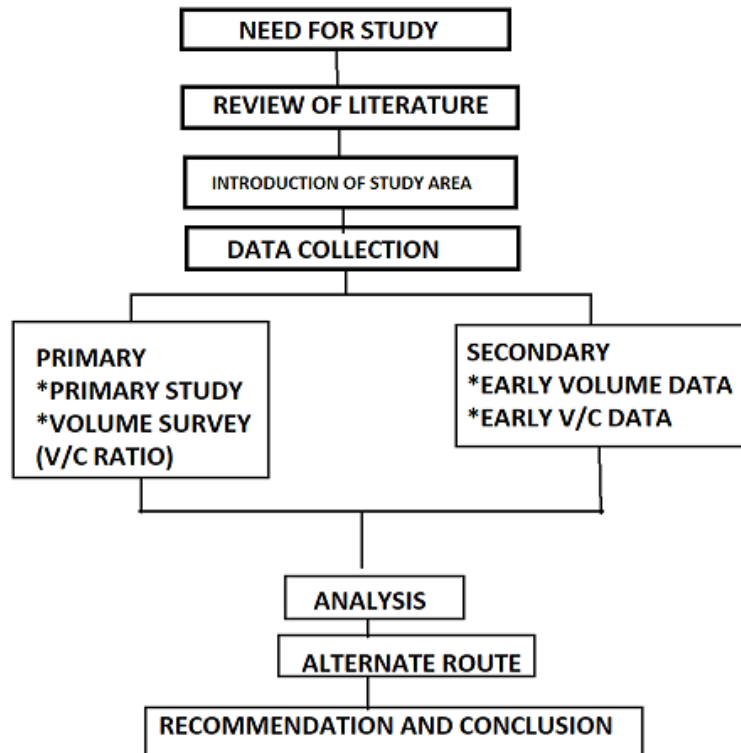
traffic flow is the study of interactions between travelers (including pedestrians, cyclists, drivers, and their vehicles) and infrastructure (including highways, signage, and traffic

control devices), with the aim of understanding and developing an optimal transport network with efficient movement of traffic and minimal traffic congestion problems.

1.4.3 TRAFFIC IMPROVEMENT:

Temporary measures free up road capacity that is soon filled by induced demand: people adapt their lifestyles to prevailing road conditions.

1.5 METHODOLOGY



CHAPTER 2 – OBJECTIVE AND LITERATURE REVIEW

2.1 OBJECTIVE

- To assess the existing traffic flow at a study area.
- To survey the number of vehicles passing through the study area.
- To analyze the traffic data.
- To suggest improvements in traffic flow at the intersection.

2.2 SCOPE OF THE STUDY

- To minimize the traffic accidents and traffic congestion.

- The safety, as well as the smooth flow of traffic.
- To ensure the safety of passengers, drivers and pedestrians.
- To create and implement a model which would enable vehicles to reach their destination in the shortest possible time using the maximum roadway capacity.

2.3 REVIEW OF LITERATURE

- Kazunori Hokao & Shihana Sulaiha Mohamed (1998): The purpose of this paper is to review the various measures that are being taken to and to make Mitigate the traffic impact of developments suggestions for the wider and more effective implementation of these measures.
- Dr. Santosh A. Jaliha, Kayitha Ravinder & Dr. Reddy T.S. (2000): The revolution in automobile industry and liberalized economy has led to tremendous increase in the vehicle ownership levels. An attempt has been made to analyze by changing the traffic composition trends, speed characteristics and travel patterns by taking few case studies.
- Frolov Y.S Konkov A.N. Larionov A.A. (2009): The introduction in St. Petersburg of new efficient designs and construction methods allows raising the pace of construction along with the reduction of the material structures. The idea requires comprehensive research, including the theoretical rationale, the model research and field observations at construction sites. The practical significance of these findings is confirmed when introducing new designs of columned and vaulted stations including the design solutions adjustment of unique two-level combined transfer station “Sportivnaya”. Significant scientific work in reducing negative.
- Morteza Abdi Cherlo et al (2009): In recent years, in reaction to the increasing usage of urban areas, the excavation of underground spaces has been developed. One of the most challenging issues encountered by engineers is the construction of subway stations as large underground spaces at shallow depth with soft surrounding soils. In this paper, Naghshe Jahan Square subway station located in Isfahan, Iran, has been simulated by geomechanical finite difference method (FDM). This station is located

under important historical structures. Therefore, the ground displacement and surface settlement induced by the excavation of the subway station should be strictly controlled. Many of such problems are affected by selected excavation method. For these reasons, different underground excavation methods associated with construction have been studied. In this study, sequential excavation method and large-diameter curved pipe roofing method are used and the numerical results of the two methods are compared. The presence of groundwater table obliges us to choose special techniques for the stability of the ground around the subway station during construction; hence compressed air and ground freezing techniques are utilized in the simulations of the subway station. Finally, after choosing appropriate support systems, the large-diameter curved pipe roofing method with 1.5 m spacing between curved pipes is proposed.

- Vladimir Maslak and Dmitry Boytsov (2009) : The modern high rates of design and construction, innovative technologies and progress in up-to-date engineering equipment employed at subway facilities lead to developing unified hubs where all the problems connected with building technologies, performance of structures, and engineering equipment functioning and operation will be maximally correctly elaborated. One of the most topical ways of subway evolution under the above-mentioned conditions is to design the subway facilities by the “large-block assembling” method in which each facility (station complex, vestibule, near-tunnel structures) can be constructed from multifunctional blocks (modules).
- Geethu lal, nithin K.J, divya L.G (2010) : The spectacular increase of number of motor vehicles on the road is mainly attributed in generation of traffic problems like accidents, congestions, delays etc., especially in the urban premises of developing countries. This paper examines the traffic problems and sustainable improvement of road intersection at Ettumanoor, India. Analysis of the collected data revealed that the improper planning of the junctions, lack of traffic signals and unauthorised parking are the major factors contributing to the traffic congestions.

- Zhi-Feng Zhang et al (2010): With rapid economic growth and urbanization in recent two decades, the development of underground space in Chinese cities has made great progress, and the characteristics and development trends need to be re-examined. Though the existing urban development evaluation system is advanced, there is no commonly recognized underground space development evaluation index system. The correlations between urban indicators and underground space development, as well as between each underground indicator and the other, have not been comprehensively studied. Based on summarizing underground space evaluation indicators and the city indicators that affect underground space development, 12 indicators from categories of economy, society and underground are chosen to assess urban underground space (UUS) development. The 7 urban indicators that may affect the development of UUS include population density, per capita GDP, proportion of tertiary industry, industrial density, urbanization rate, investment in real estate development and car ownership. The 5 underground space indicators are underground space per capita, underground space per built-up area, underground parking proportion, proportion of service space in underground space, and underground space social dominant proportion. The data of 56 representative cities at different levels in 2015 is collected, normalized, shown in radar chart, and the correlation analysis are summarized. Based on sample analysis and other detailed works, four main conclusions of UUS developments in Chinese cities are put forward, including (1) the distribution can be broadly divided into three levels, and the structure is described as three cores, two axes, and one belt; (2) China is at the forefront of UUS development on aspects of UUS amount, Metro construction, underground complex construction, equipment and technologies and related industries; (3) the development is stimulated and promoted by urban development problems such as traffic problems, resource shortages and city resilience needs; (4) the development has a close relationship to city character and industrial structure. Three trends are concluded as new promoting roles in urban development in depth, new characterized development features, and increasing influence on urban forms. The paper provides a reference for scientific understanding and evaluation of the development of UUS in China, as well as for the promotion and regulation of UUS development through urban means.

- Sampathkumar V., Vanjinathan J., Pemmaraju Vaishnavi Rao (2012): To improve the traffic flow at the Moolakadai intersection along Grant Northern Trunk road of north Chennai, traffic survey is conducted which include road inventory and volume count along the various arms towards the intersection. Volume accumulation curves are developed and peak volume and peak time is obtained. From the analysis it is found that the peak volume is of 9556 passenger car equivalence during 18 to 19 hours at this intersection. Volume to capacity ratio is found greater than one which makes high level of congestion and poor level of service. To manage this Transport System Management concepts are suggested in various scenarios which may reduce the volume lesser than the capacity.
- Anastasios Kallianiotis and Dimitrios Kaliampakos (2012): As the need for the construction of underground spaces is growing, the need to integrate human behavior analysis into their design studies is obvious. In order to make this happen, the current belief that subterranean structures are unsafe needs to be altered. Increasing the safety of these spaces is the key factor that will achieve the most comfortable and effective utilization by the public. The purpose of this paper is to evaluate underground spaces as regards to their evacuation effectiveness and to compare them with similar above-ground buildings. To accomplish this, on one hand the factors that affect the evacuation effectiveness have been defined and on the other hand a tailor cut evaluation system has been developed. Among the factors influencing the evacuation effectiveness, the location of the exit doors/routes is of primary importance. Therefore, the evacuation evaluation methodology is based on the location of the exit doors design. The developed software, apart from checking the compliance of a given underground space with the evacuation regulations regarding the exit door location, assesses and evaluates all possible combinations of exit door's location based on the evaluation system developed. The grading for each combination results from the value of the variables that affect the evacuation procedures (i.e., exit door distance), according to the evaluation function developed. The evaluation system developed can give the evacuation safety profile of any space (under and above ground), helping a lot not only to check the safety of a given space, but also to design safer structures as well. The results of the comparative study of various areas prove that underground

structures are quite safe in reference to evacuation procedures even in case where only two exits are available.

- Sampath Kumar V. (2013): As a short-term remedial measure, by restricted the right turn movements at Sholinganallur intersection, diverted two and four wheelers to alternate routes and Provided additional link roads near Perungudi, Chemmencherry and Sirucherry. As a long-term remedial measure, a grade separator along the centre of road toward north & south as IRC recommendation.
- Larionov A.A. et al (2013): The introduction in St. Petersburg of new efficient designs and construction methods allows raising the pace of construction along with the reduction of the material structures. The idea requires comprehensive research, including the theoretical rationale, the model research and field observations at construction sites. The article highlights the experience of carrying out comprehensive studies with the purpose of scientific justification of the progressive design and technology solutions for the underground construction of the St. Petersburg subway. The results of research using engineering and mathematical models of the stress-strain state of complex Underground station structures are given. The practical significance of these findings is confirmed when introducing new designs of columned and vaulted stations including the design solutions adjustment of unique two-level combined transfer station “Sportivnaya”. Significant scientific work in reducing negative symptoms in the process of underground structures construction is a complex research related to the implementation of excavation technologies without the sediment of the surface. The article provides information about comprehensive research to justify the feasibility of the excavation of the station tunnels and auxiliary tunnels with the application of fore poling of the roof and brow.
- Sampathkumar V, Siva Shankar S, Vishaka Murty P. (2014): Intersection Improvement at Sholinganallur in Rajiv Gandhi Road is studied. It is one of the major junctions in CMA which need attention to decongest. It is supported just by roadways. The increase in traffic volume with lack of road geometry results in congestion. Rajiv Gandhi Road has IT companies with lakhs of employees travelling

along this road. This intersection has roads along north to south and east to west which connects to the major regions. It struggles with more volume than the capacity which leads delay and queuing of vehicles. This static delay will increase journey time. Traffic system management is suggested by avoiding right turn movements and diverting the vehicles will decrease the volume. As a long-term measure, a grade separator is suggested as per standards along north- south will control the volume and sustain for the coming years.

- M de Souza, Celso ARL Brennand, Roberto S Yokoyama, Erick A Donato, Edmundo RM Madeira, Leandro A Villas (2017): Traffic management systems: A classification, review, challenges, and future perspectives. Traffic management systems are composed of a set of application and management tools to improve the overall traffic efficiency and safety of the transportation systems.
- Valeriy Kapitanov, Valentin Silyanov, (2018): methodology for traffic management in cities provides for extensive use of computer technologies. Modern international experience shows that traffic management in the urban street and road network, first of all, requires a city-wide management system (intelligent transportation system, ITS). Development of a social process model is a complicated task that can be solved under rather severe restrictions. Therefore, most traffic management tasks are not formalized but solved empirically.
- Eduard Zadobrischi, Lucian-Mihai Cosovanu, Mihai Dimian (2020): Traffic congestion is becoming a major and common problem in more and more countries, and especially in developed cities with an increased population density, the number of cars is automatically high. This has a negative impact on a region's economy and social development. In the case of those who travel, traffic jams not only increase the time and costs of the trip but also the quality. From the point of view of traffic management, the results of road congestion increase operating costs and decrease the efficiency of traffic networks.

- Tanzina Afrin and Nita Yodo (2020): A Survey of Road Traffic Congestion Measures towards a Sustainable and Resilient Transportation System. Traffic congestion is a perpetual problem for the sustainability of transportation development.

CHAPTER 3 – STUDY AREA

STUDY AREA AND PRIMARY DATA COLLECTION

3.1 STUDY AREA

Intersection is as an area where two or more roadways cross each other. This area is designated for the vehicles to turn to different directions to reach their destination. The study of intersections is very important for the traffic engineers especially in the case of urban scenario. The study is from Pattinambakkam intersection.

1. Direction North: MARINA BEACH ROAD
2. Direction East: FORESHORE ESTATE LINK ROAD
3. Direction South: ADYAR
4. Direction west: MYLAPORE

To consist the intersection vehicle traffic flows and the volumes consider.

The Foreshore Estate intersection is the connecting hub of various places like mylapore, Pattinambakkam and Santhome

Apart of DGS Dhinakaran salai and Santhome high road is located between the foreshore estate intersection in the southern part of Chennai. This road is lined up with official's residence of ministers of Tamil Nadu state government. This foreshore estate intersection comes under mylapore constitution this road carries the main purpose of connecting people from southern part of Chennai to the northern part of Chennai and the people from the north to south. In the southern side of intersection, a lush green park, memorial named after Ambedkar, the TN Dr Ambedkar law university, TN human right commission, Dr MGR Janaki college of arts and science and Meenakshi cine tone (one of the oldest cinema studio). In the northern part of intersection, we have places mylapore, triplicane and royapettah etc.

Mylapore is present in the central part of Chennai, India. It has one of the oldest residential part of the city. Mylapore is known for its famous religious center like sai baba temple, kapaleeshwara temple, Ramakrishna mutt and word famous St Thomas basilica which is present in the Santhome high road.

Santhome has some premier educational institutions. Hence, it became an administrative capital locality of the Archdiocese of Madras-Mylapore. These include Rosary Matriculation School, St. Bedes A. I. Hr. Sec. School, Santhome Higher Secondary school, St. Raphel's School and Dominic Savio Matric. School. The official residence of the Archbishop of the Madras - Mylapore Archdiocese is in Santhome adjacent to the Basilica. The consulates of Russia and Spain are also in this area. The Santhome High Road stretches from the light house side of the famous Marina beach and goes through in front of St. Thomas basilica towards Adyar.

Marina Beach is a natural urban beach in Chennai, Tamil Nadu, India, along the Bay of Bengal. The beach runs from near Fort St. George in the north to Foreshore Estate in the south, a distance of 6.0 km (3.7 mi), making it the longest natural urban beach in the country. The Marina is primarily sandy, unlike the short, rocky formations that make up the Juhu Beach in Mumbai. The average width of the beach is 300 m (980 ft) and the width at the widest stretch is 437 m (1,434 ft). Bathing and swimming at the Marina Beach are legally prohibited because of the dangers, as the undercurrent is very turbulent. It is one of the most crowded beaches in the country and attracts about 30,000 visitors a day during weekdays and 50,000 visitors a day during the weekends and on holidays. During summer months, about 15,000 to 20,000 people visit the beach daily.

BUSES:

The area is easily accessible by Metropolitan Transport Corporation (MTC) buses and has a sprawling bus terminus. The MTC Chennai 12B route city bus runs about 72 trips every day(one-way) and goes through 20 bus stops during the one-way trip. It also goes through Foreshore Estate to Vadapalani terminus. The bus stand at Foreshore Estate is an important bus stand which is used frequently. There are various buses that stop here including M12BET,6DET,27GDG,27D,6D,32A to name a few.

ROAD:

It is a Long road from Adyar to Parrys Corner. This Road is along the Marina Seashore which is the second largest beach in the world. This road houses several Government Offices, Vivekananda House, IG office , Iyappan Temple, All India Radio, Queen Mary's College, Madras University, MGR Memorial, Santhome Church and Anna Memorial. This is also one of the predominant routes connecting Adyar.

Fig: 3.1: Location of Foreshore Estate intersection



Fig: 3.2: Foreshore Estate Intersection

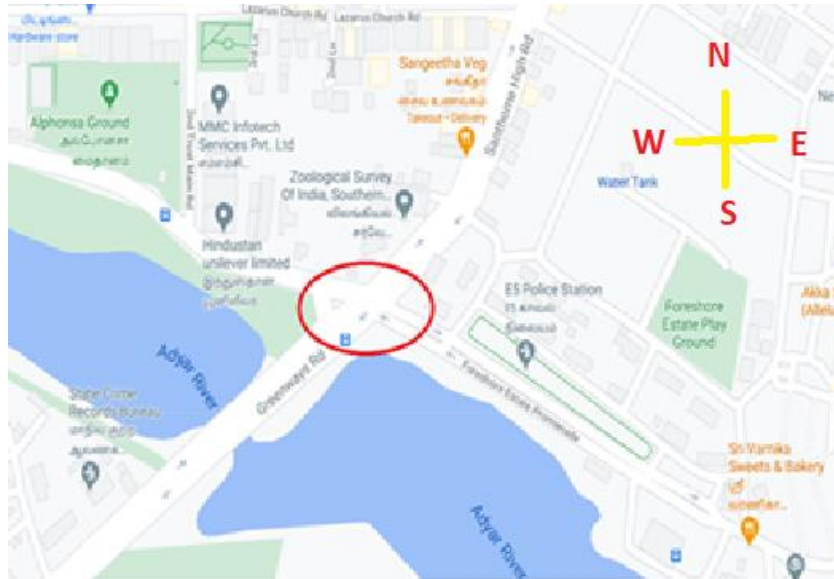


Fig: 3.3: Foreshore Estate Intersection



Fig: 3.4: Traffic Congestion at Foreshore Estate intersection



Fig: 3.5: Traffic Congestion at Foreshore Estate intersection



Fig: 3.6: Figure of Foreshore Estate intersection



3.2 DATA COLLECTION

Data Collection is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes.

The data needed for the analysis of the traffic flow at the study area is done by:

- **Geometric Surveying**
- **Traffic Volume Count Surveying**

3.2.1 GEOMETRIC SURVEYING

This surveying is used to find the dimensions of the place which has to be surveyed, length and breadth of road lanes, dividers, foot path, bus stops, pedestrian path, parking space etc., are measured.

At Foreshore Estate intersection the vehicles moving in different directions want to occupy same space at the same time. 1800 pedestrians per hour also seek same space for crossing. Foreshore Estate Link Road with **19.8m** width, DGS Dinakaran Salai with **17m** width, Santhome high Road with **16m** width and South Canal Bank road with **15m** width make the intersection. (Representing in Fig 3.4; Geometry of Foreshore Estate intersection.)

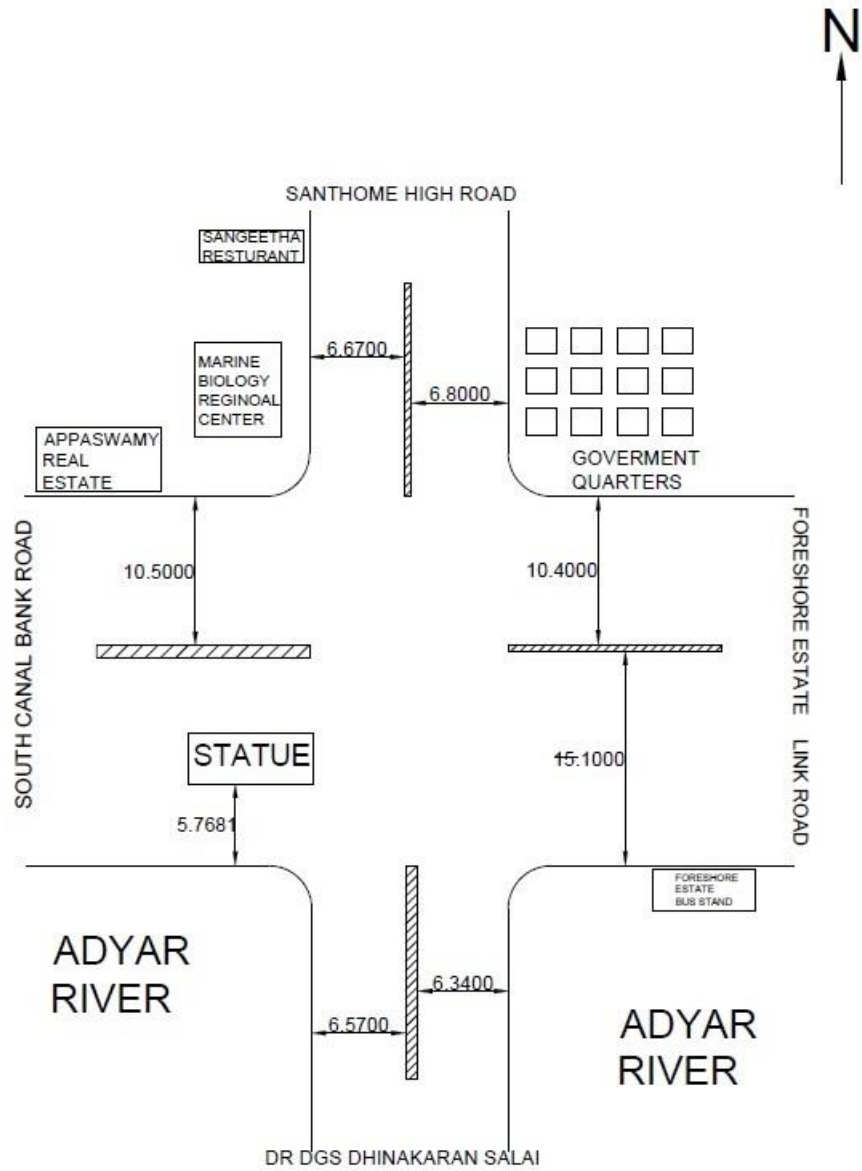


Fig: 3.4: ROAD GEOMETRY AT FORESHORE ESTATE SIGNAL INTERSECTION

3.2.2 TRAFFIC VOLUME COUNT SURVEYING

Traffic Surveying is carried out to analysis the traffic characteristics. It helps in geometric design and traffic control, which tends to a safe and efficient traffic movement.

The traffic studies for collection of data are also known as **Traffic Census**.

Types of Traffic Studies:

- Traffic Volume Study
- Speed Study
- Origin and Destination study
- Traffic flow characteristics study
- Traffic capacity study
- Accident study

➤ **TRAFFIC VOLUME STUDY:**

- Traffic volume study is the quantity of vehicles crossing a section of road per unit time at any selected period.
 - ❖ The uses of traffic studies are as follows:
- Planning
- Traffic operation and control
- Traffic pattern
- Structural design of pavement
- Regulatory measures

➤ **METHODS OF TRAFFIC VOLUME STUDY:**

- Automatic Volume study
- Manual volume study

➤ **Automatic Volume study:**

Automatic counters are also known as Mechanical counters. They can automatically record the total numbers of vehicles crossing a section of the road in desired period of time.

- **Advantages:**

It can work throughout the day and night for desired period, which is impractical in manual

- **Disadvantages:**

It doesn't give the detail of the traffic like various classes, stream and turning movement.

Manual Volume Study:

The manual method is the method in which a group of peoples are trained to record the total number of vehicles crossing a section of the road in desired period of time on record sheets manually.

- **Advantages:**

It gives the full detail of the traffic like various classes, stream and turning movement etc., of the vehicles.

- **Disadvantages:**

It cannot work throughout the day and night for all days of year.

Table 3.1 TRAFFIC VOLUME SURVEY DATA SHEET



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FIELD DATA SHEET FOR TRAFFIC CENSUS

Date: _____
Time: From: _____ To: _____ Location: _____
Road Junction: _____ Place : Sterling

Types of Hour Count	CARS, JEEPS, VANS & Three Wheelers	BUSES	TWO WHEELERS
1	2	3	4
VEHICLES TURNING LEFT			
VEHICLES PROCEEDING STRAIGHT			
VEHICLES TURNING RIGHT			
TOTAL			

Traffic volume count survey is done on a sheet in which the volume of traffic is being counted and written at specific time duration at equal interval of time.

- Details about the direction of road, intersection of road and number of two wheelers, autos and cars, buses and trucks going in that particular direction is counted and written on this sheet. Signal time cycle is also noted.
- The traffic flow at particular section will increase with time and decrease after a particular time interval.
- The time where the traffic flow is most, is known as PEAK TIME.
- Traffic volume count survey is done for all directions and mean traffic volume is calculated.

TRAFFIC COUNT SURVEYING

The traffic count surveying is done at each direction at each intersection and the flow of traffic is written on the traffic count data sheet, respectively graphs are made according to the values.

This fig 3.4 consists of overall view of Foreshore Estate junction, which shows DGS Dinakaran Salai, Santhome High Road, South Canal Bank Road, Foreshore Estate Link Road. The traffic control has been studied for an hour to hour from morning 7 a.m to 9p.m. The study was made for 2wheelers, 3wheelers, 4wheelers, Buses and Trucks.

3.3 PASSENGER CAR EQUIVALENT (PCE)

In British practice it is usual to express capacity in terms of “**passenger car Equivalent**”. This system is also being followed in India. The basic consideration behind this practice is that different types of vehicles offer different degrees of interference to other traffic and is necessary to bring all types to common units. The common unit adopted is the passenger car unit (PCE) as shown in bellow table 2.1

Table 3.2 Conversion Factors of Car Equivalent (PCE)

Vehicle type	PCE Equivalency factor
Two-wheeler	0.5
Three-wheeler, Car	1
Bus, Truck	3.0

CHAPTER 4 - DATA COLLECTION AND TRAFFIC ANALYSIS

4.1 DEFINITION

One of the important functions is to organize and implement various services and studies aimed at collection of data pertaining to traffic characteristics. Such study includes origin and destination survey, volume count, speed, travel time and delay measurements, accident statistics, parking characteristics, pedestrian behavior and use of streets, capacity studies, economic loss caused by inferior traffic facilities etc.

4.2 DATA

- Traffic volume count
- Traffic Flow Diagram and Road Geometry
- Plan of intersection

4.2.1 TRAFFIC VOLUME COUNT

One of the fundamental measures of traffic on a road system is the volume of traffic using the road in a given interval of time. It is also termed as flow and it is expressed in vehicles per day. When the traffic is composed of a number of types of vehicles it is the normal practice to convert the flow into equivalent passenger car per unit (PCE), by using certain equivalency factors. The flow is then expressed as PCE per day as shown in table 4.1, 4.2, 4.3 and 4.4.,

**Table 4.1 Traffic Volume Survey at DR.DGS Dinakaran Salai IN
FORESHORE ESTATE INTERSECTION (ON Date: 18/02/2021)**

Hour	Two- wheeler	Car / Three- Wheeler	Bus /Truck	Volume In PCE	Volume/ Hour
7.00 -7.30	926	443	28	990	2099
7.30-8.00	1004	487	40	1109	
8.00-8.30	1092	577	63	1312	2421
8.30-9.00	1181	612	73	1420	2732
9.00-9.30	1193	683	91	1553	2974
9.30-10.00	1218	737	105	1661	3215
10.00-10.30	1235	764	112	1718	3379
10.30-11.00	1224	746	40	1477	3195
15.00-15.30	920	470	35	1035	2512
15.30-16.00	932	434	26	977	2013
16.00-16.30	1009	523	49	1175	2153
16.30-17.00	1051	531	51	1210	2385
17.00-17.30	1081	532	52	1229	2439
17.30-18.00	1140	534	61	1286	2515
18.00-18.30	1123	595	68	1361	2647
18.30-19.00	1239	669	75	1514	2874
19.00-19.30	1110	639	80	1432	2946
19.30-20.00	1021	523	49	1181	2614
20.00-20.30	962	480	38	1075	2256
20.30-21.00	902	422	23	942	2017

**Table 4.2 Traffic Volume Survey at FORESHORE ESTATE LINK
ROAD IN FORESHORE ESTATE INTERSECTION (ON Date:
18/02/2021)**

Hour	Two-wheeler	Car / Three-Wheeler	Bus /Truck	Volume In PCE	Volume/ Hour
7.00 -7.30	299	118	12	304	723
7.30-8.00	365	182	18	419	
8.00-8.30	529	341	19	663	1081
8.30-9.00	857	659	24	1161	1823
9.00-9.30	1021	818	26	1406	2567
9.30-10.00	1037	834	26	1430	2836
10.00-10.30	939	739	25	1283	2714
10.30-11.00	775	580	24	1038	2321
15.00-15.30	463	277	16	557	1595
15.30-16.00	332	150	13	355	912
16.00-16.30	660	468	15	843	1199
16.30-17.00	690	497	19	899	1742
17.00-17.30	693	500	23	916	1814
17.30-18.00	742	548	23	989	1905
18.00-18.30	461	275	25	581	1570
18.30-19.00	925	725	21	1251	1831
19.00-19.30	1087	882	26	1504	2754
19.30-20.00	660	468	23	866	2370
20.00-20.30	503	316	21	631	1498
20.30-21.00	290	109	17	305	936

**Table 4.3 Traffic Volume Survey at SANTHOME HIGH ROAD IN
FORESHORE ESTATE INTERSECTION (ON Date: 18/02/2021)**

Hour	Two- wheeler	Car / Three-Wheeler	Bus /Truck	Volume In PCE	Volume/ Hour
7.00 -7.30	870	596	44	1163	2383
7.30-8.00	913	625	46	1220	
8.00-8.30	958	663	48	1286	2506
8.30-9.00	1005	589	50	1242	2528
9.00-9.30	1243	737	64	1551	2792
9.30-10.00	1156	872	59	1627	3178
10.00-10.30	1089	756	72	1517	3144
10.30-11.00	1056	703	55	1396	2913
15.00-15.30	804	530	44	1064	2460
15.30-16.00	884	583	48	1169	2233
16.00-16.30	972	641	52	1283	2452
16.30-17.00	1069	705	57	1411	2694
17.00-17.30	1175	775	62	1549	2959
17.30-18.00	1005	656	56	1327	2875
18.00-18.30	1043	852	63	1563	2889
18.30-19.00	967	688	49	1319	2881
19.00-19.30	1113	805	74	1584	2902
19.30-20.00	1031	715	60	1411	2994
20.00-20.30	1018	689	58	1372	2783
20.30-21.00	987	602	42	1222	2594

**Table 4.4 Traffic Volume Survey at SOUTH CANAL BANK ROAD IN
FORESHORE ESTATE INTERSECTION (ON Date: 18/02/2021)**

Hour	Two-wheeler	Car / Three-Wheeler	Bus /Truck	Volume In PCE	Volume/ Hour
7.00 -7.30	88	64	0	108	230
7.30-8.00	103	67	1	122	
8.00-8.30	118	71	2	136	258
8.30-9.00	133	74	2	147	283
9.00-9.30	178	85	4	186	333
9.30-10.00	181	85	5	191	377
10.00-10.30	184	86	5	193	385
10.30-11.00	169	82	4	179	373
15.00-15.30	73	60	0	97	276
15.30-16.00	91	64	0	110	207
16.00-16.30	127	73	2	143	253
16.30-17.00	145	77	3	159	301
17.00-17.30	148	78	3	161	320
17.30-18.00	151	78	3	163	324
18.00-18.30	170	83	2	174	337
18.30-19.00	127	73	4	149	323
19.00-19.30	184	86	5	193	342
19.30-20.00	145	77	3	159	352
20.00-20.30	133	74	2	147	306
20.30-21.00	103	67	1	122	269

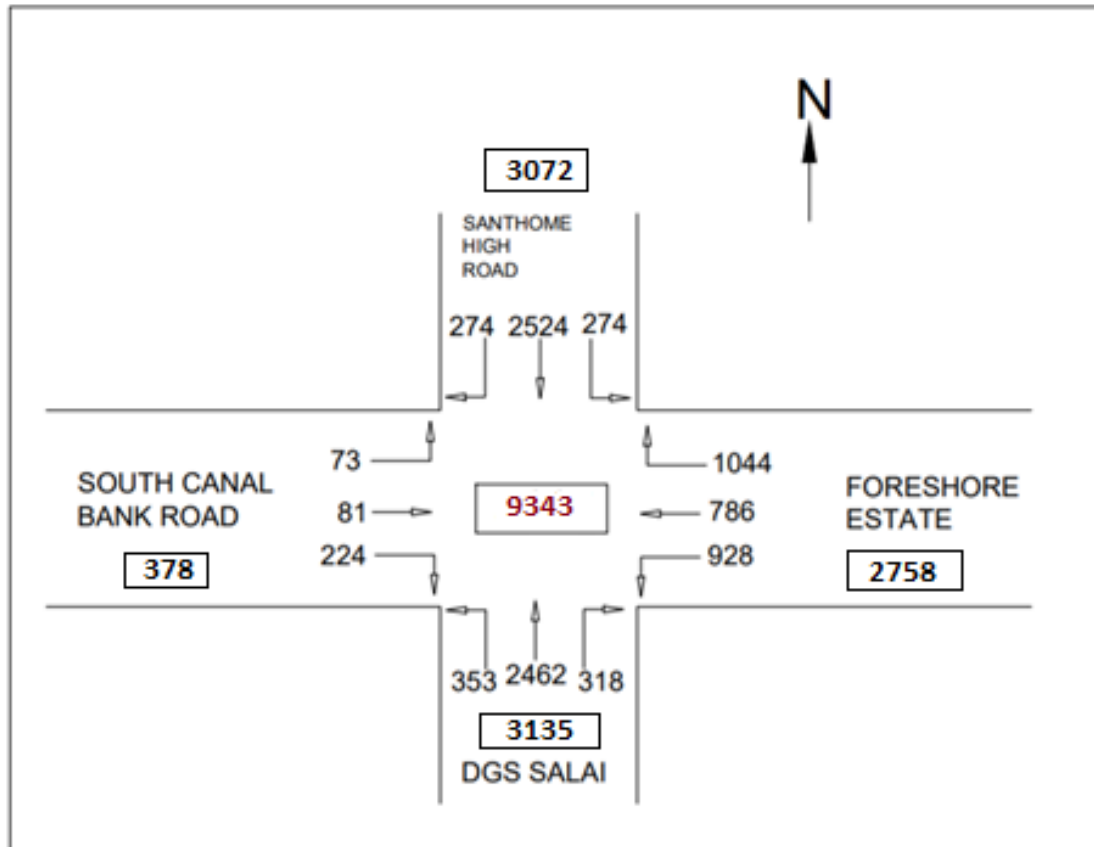
**Table 4.5 Total traffic Volume Survey at FORESHORE ESTATE
INTERSECTION (ON Date: 18/02/2021)**

Hour	Two-wheeler	Car Three- Wheeler /	Bus /Truck	Volume In PCE	Volume/ Hour
7.00 -7.30	2183	1221	84	2566	5434
7.30-8.00	2385	1362	105	2869	
8.00-8.30	2697	1652	132	3397	6266
8.30-9.00	3176	1935	149	3969	7366
9.00-9.30	3635	2323	185	4696	8665
9.30-10.00	3592	2529	195	4910	9606
10.00-10.30	3447	2345	214	4711	9621
10.30-11.00	3224	2111	123	4091	8802
15.00-15.30	2260	1338	95	2753	6844
15.30-16.00	2239	1232	87	2612	5365
16.00-16.30	2768	1705	118	3444	6056
16.30-17.00	2955	1810	130	3678	7122
17.00-17.30	3097	1885	140	3854	7532
17.30-18.00	3038	1816	143	3765	7619
18.00-18.30	2797	1805	158	3678	7443
18.30-19.00	3258	2155	149	4231	7909
19.00-19.30	3494	2412	185	4713	8944
19.30-20.00	2857	1784	135	3617	8330
20.00-20.30	2616	1559	119	3225	6842
20.30-21.00	2282	1201	83	1222	4447

4.3 TRAFFIC FLOW DIAGRAM

The traffic volume in terms of PCE from each leg is dissipated in in PCE at Peak hour (09.30-10.30hrs) at **FORESHORE ESTATE SIGNAL intersection**

Fig 4.1 TRAFFIC FLOW DIAGRAM at FORESHORE ESTATE SIGNAL intersection



4.4 TRAFFIC ANALYSIS

The various survey and studies aimed to collection of data retaining to Traffic characteristics. Such studies include. Origin destination survey, volume count, accident statistics,

- Peak hour
- Peak hour factor
- Volume to Capacity ratio
- Mode of share

4.4.1 Peak hour

The max PCE value in the hour per day.

FIGURE 4.2 VOLUME ACCUMULATION AT DGS DINAKARAN SALAI IN PCE

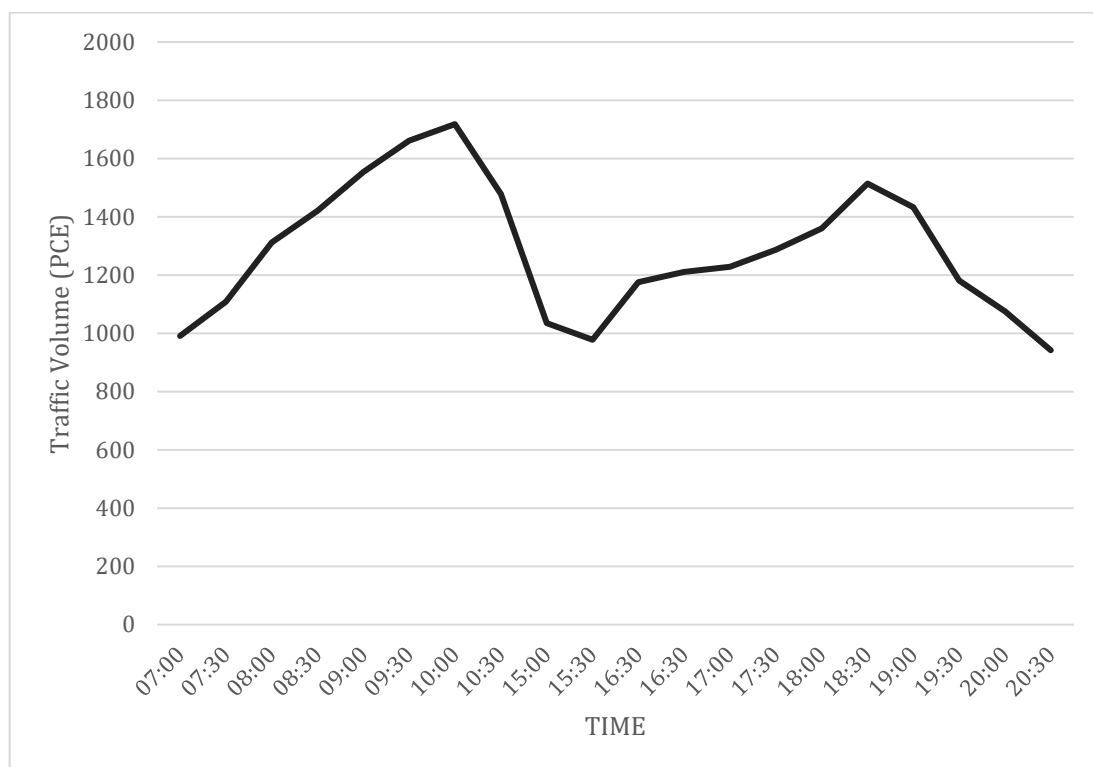


FIGURE 4.3 VOLUME ACCUMULATION AT FORESHORE ESTATE LINK ROAD IN PCE

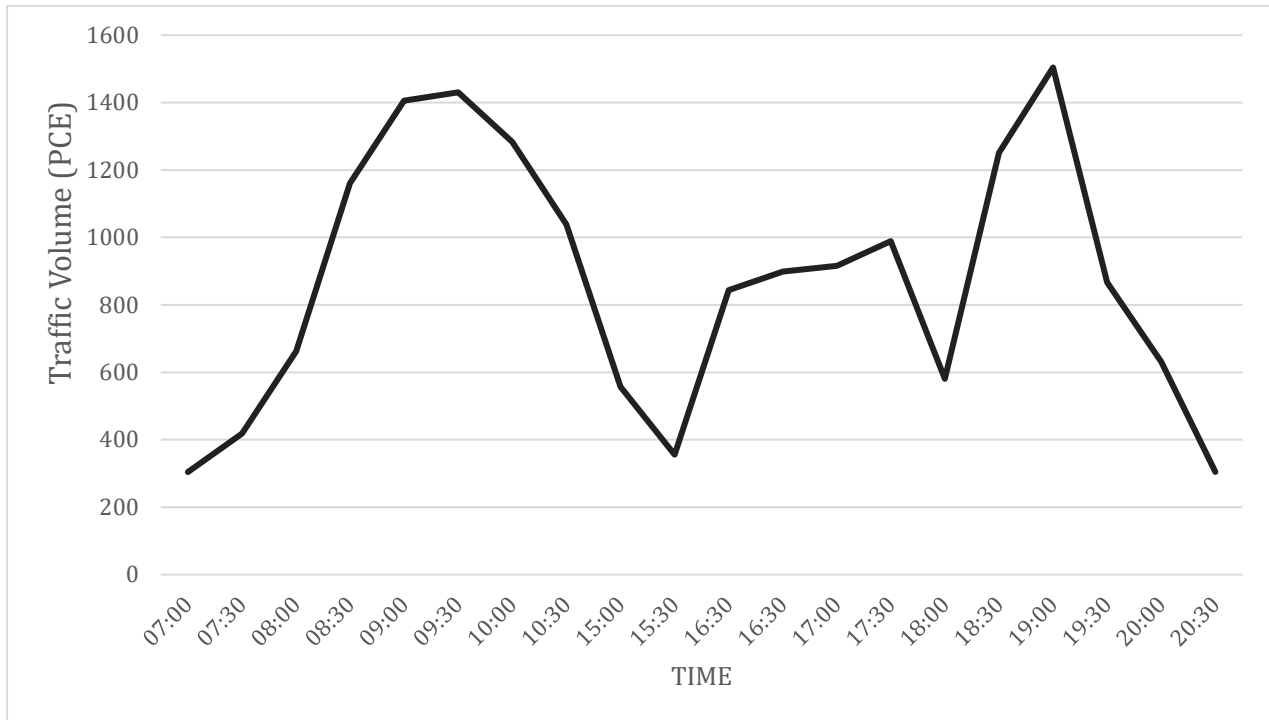


FIGURE 4.4 VOLUME ACCUMULATION AT SANTHOME HIGH ROAD IN PCE

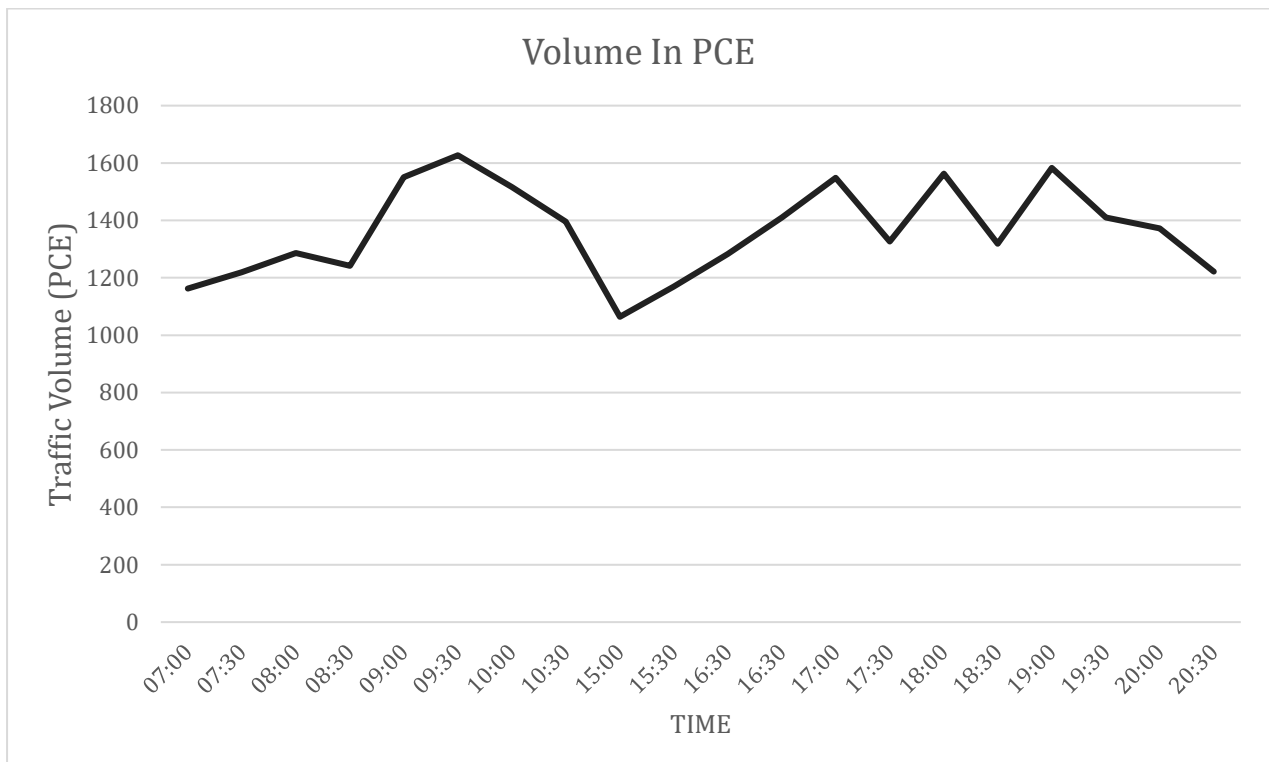


FIGURE 4.5 VOLUME ACCUMULATION AT SOUTH CANAL BANK ROAD IN PCE

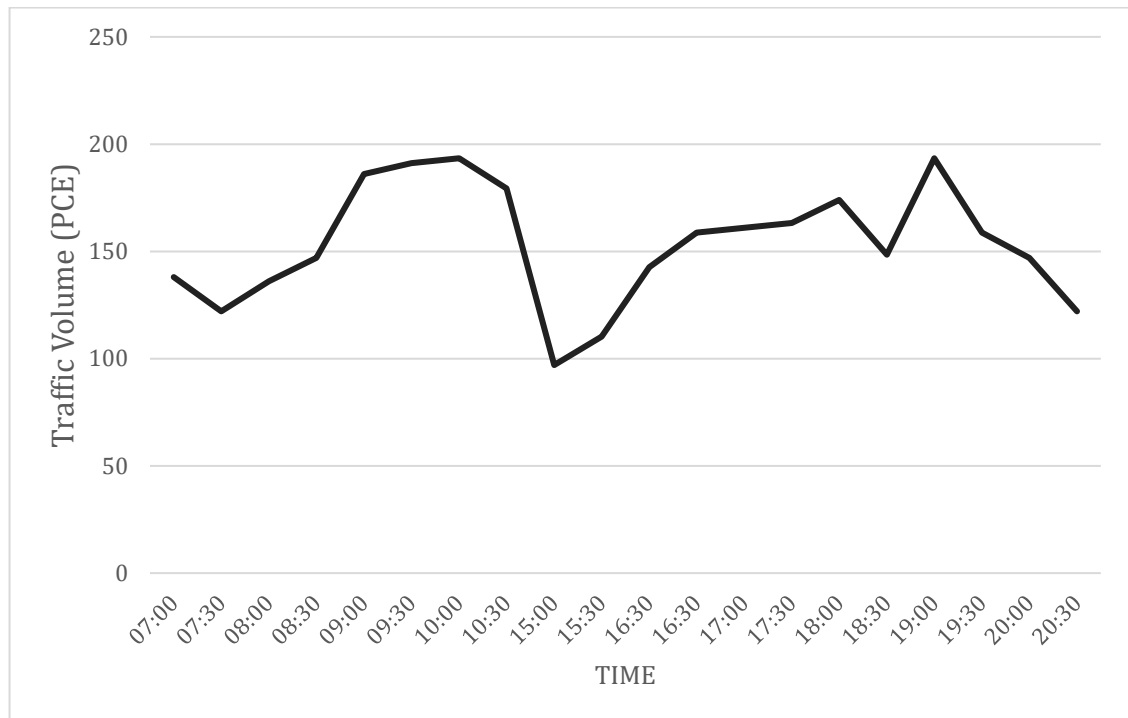
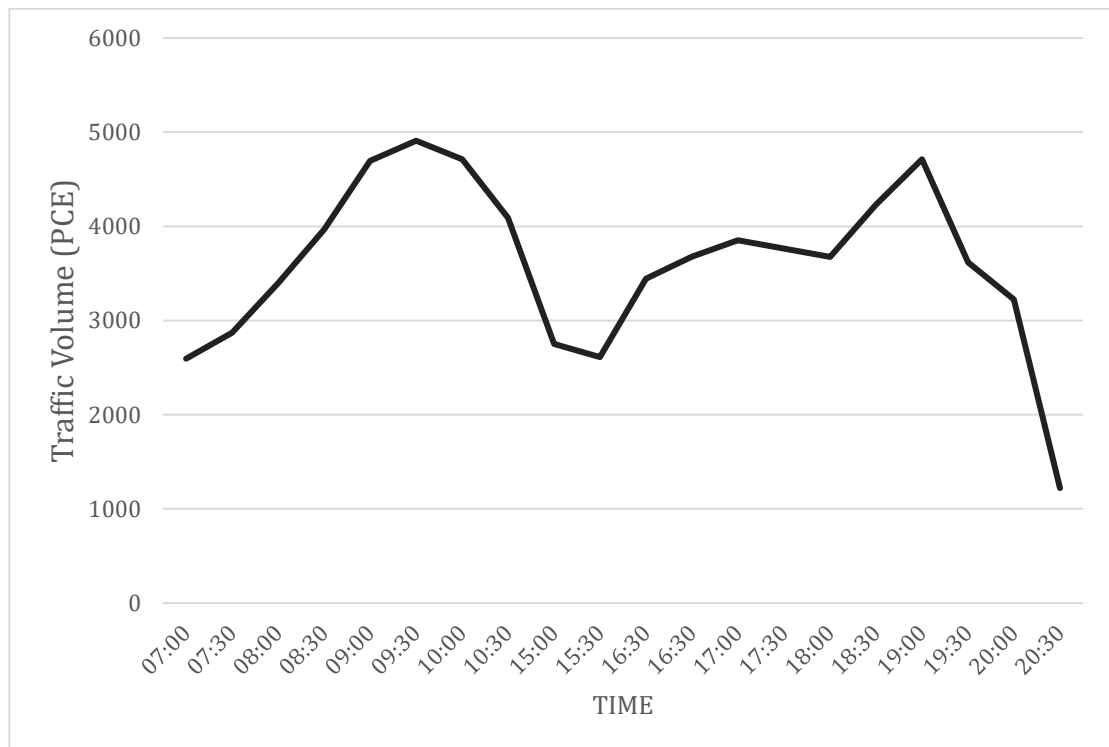


FIGURE 4.6 VOLUME ACCUMULATION AT FORESHORE ESTATE INTERSECTION IN PCE.



4.4.2 Peak Hour Factor

It is a measure of the variation in demand during the peak hour and defined as the ratio between the number of vehicles counted during the peak hour and four times the number counted during the highest 30 consecutive mins. It can range from 0.25 to 1.00

4.4.3 Volume to Capacity Ratio

The ratio of the service volume to capacity.
Peak of peak time: (09.30 to 10.30hrs)

Table 4.6 Volume to Capacity at Study Intersection

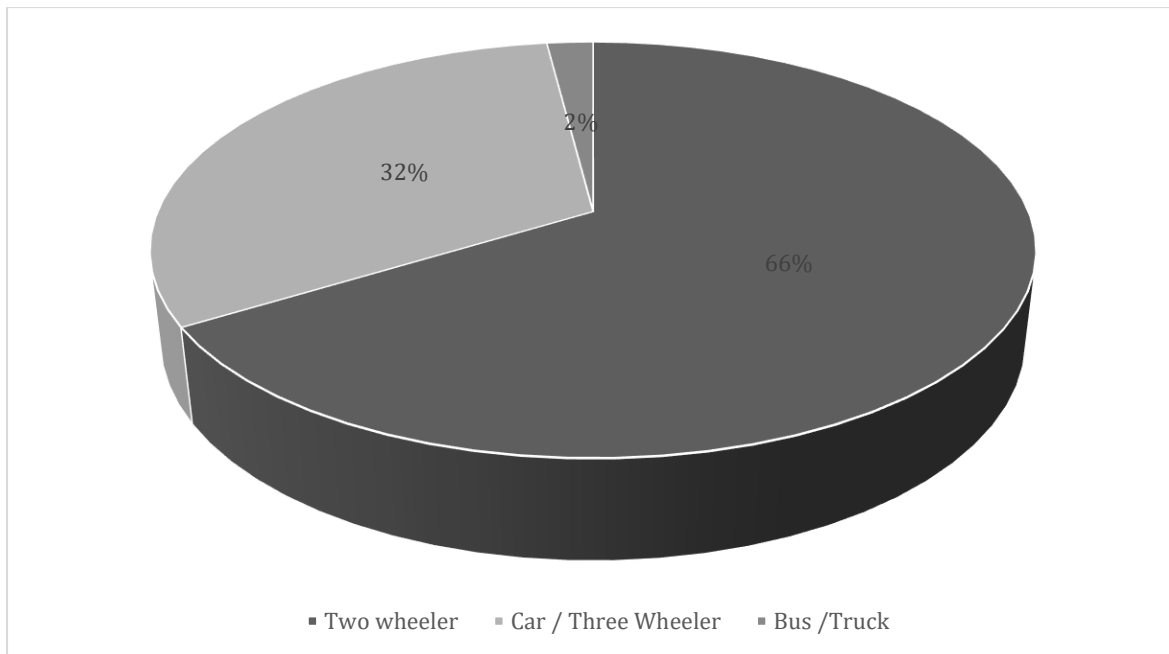
S.No	Intersection	Volume (V) in PCE	Capacity © in PCE	V/C
1	DGS DINAKARAN SALAI SIGNAL	6925	2800	2.47
2	LOOP ROAD SIGNAL	3537	2800	1.62
3	SANTHOME HIGH ROAD SIGNAL	6641	2800	2.37
4	SOUTH CANAL BANK ROAD SIGNAL	1791	2800	0.63

Source:

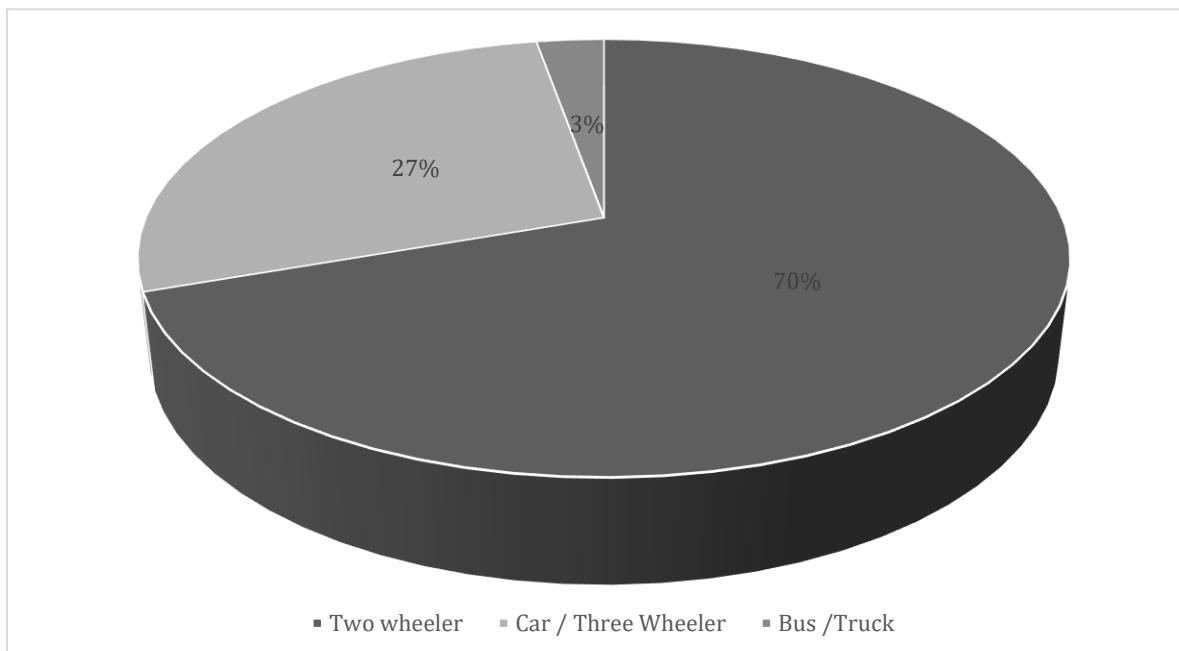
For capacity ref: Table 21.19 Practical capacities of two-way roads, p535, Chapter 21, Section 11, Highway capacity, “Traffic engineering and transportation planning” by L.R.Kadiyali, Khanna publishers, 8th Edition 2013, ISBN 81-7409-220-X.

4.4.4 Mode Share

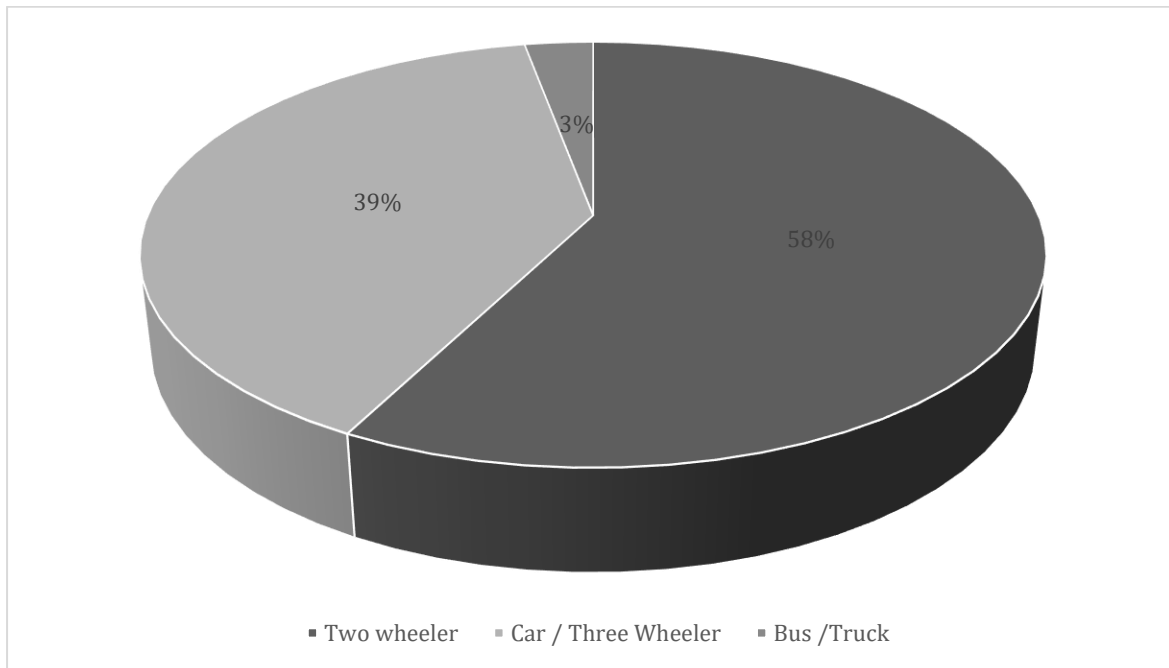
Process of separating the person-travel by the mode of travel in Peak hours



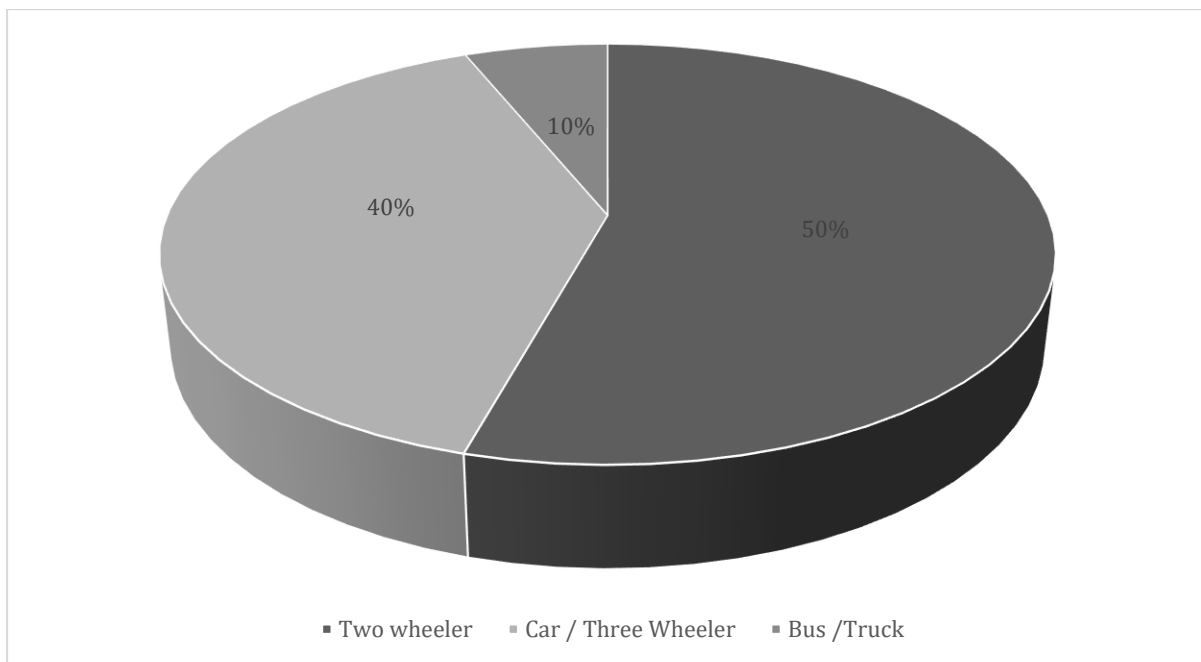
❖ VEHICLE COMPOSITION TOWARDS DGS DHINAKARAN SALAI AT 9:30 TO 10:30 HRS.



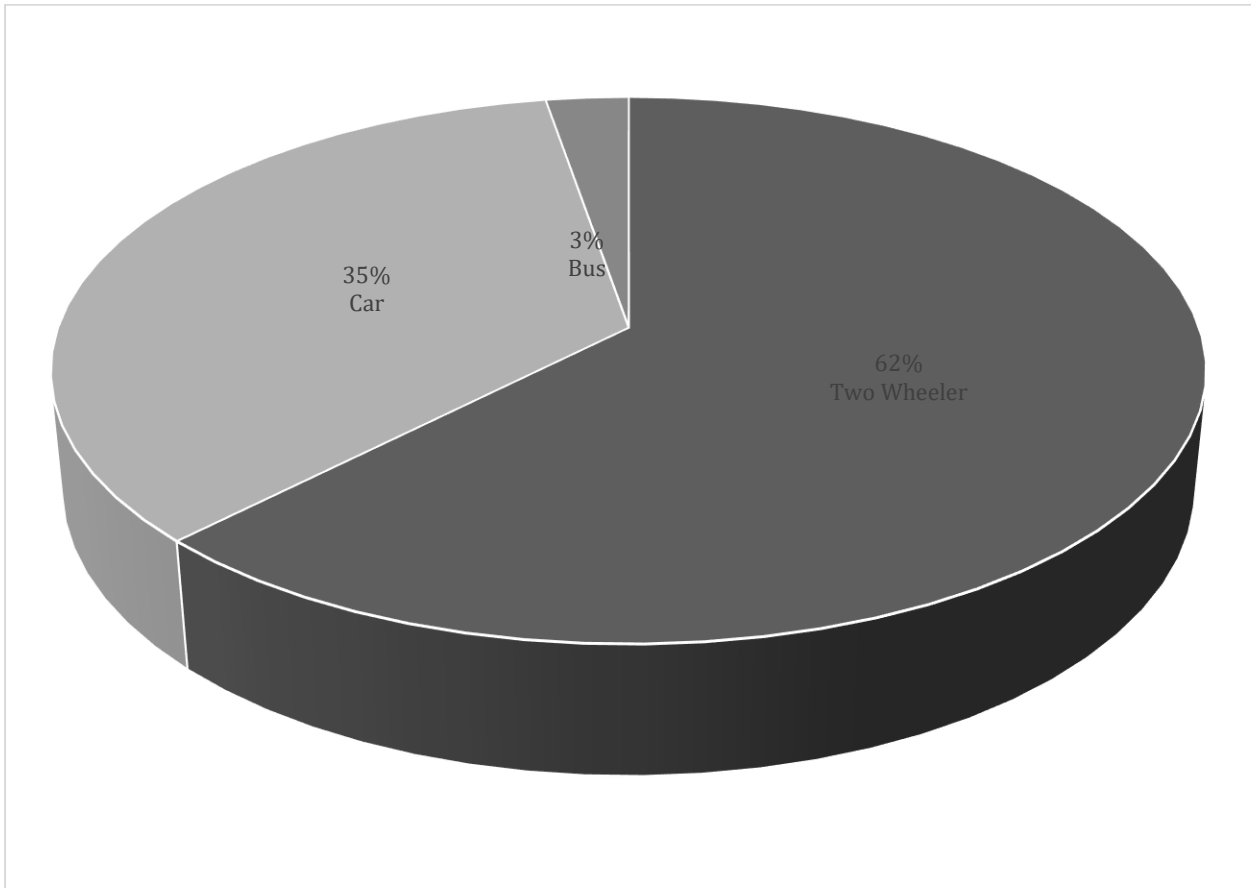
❖ VEHICLE COMPOSITION TOWARDS FORESHORE ESTATE LINK ROAD AT 9:30 TO 10:30 HRS.



❖ VEHICLE COMPOSITION AT SANTHOME HIGH ROAD AT 09.30 TO 10.30 HRS.



❖ VEHICLE COMPOSITION AT SOUTH CANAL BANK ROAD AT 09:30 TO 10:30 HRS.



❖ **TOTAL VEHICLE COMPOSITION TOWARDS FORESHORE ESTATE INTERSECTION AT 9:00 TO 10:30 HRS.**

CHAPTER 5 - TRAFFIC FLOW MANAGEMENT

5.1 GENERAL

As the traffic on the existing road system in cities grows, congestion becomes a serious problem. Simple and inexpensive solution can tide over the crisis for some time. As our Traffic Flow studies state that the Traffic volume is very much high at DGS Dinakaran Salai and Santhome High Road. For our study area we have made short term management and long-term management

To improve the flow in the Intersection, we may have to cut off the right at Santhome high road signal and the left from Santhome High road signal.

5.2 IMPROVEMENT AT SANTHOMME HIGH ROAD SIGNAL

Fig 5.2.1 Flow Improve at Santhome High Road Signal

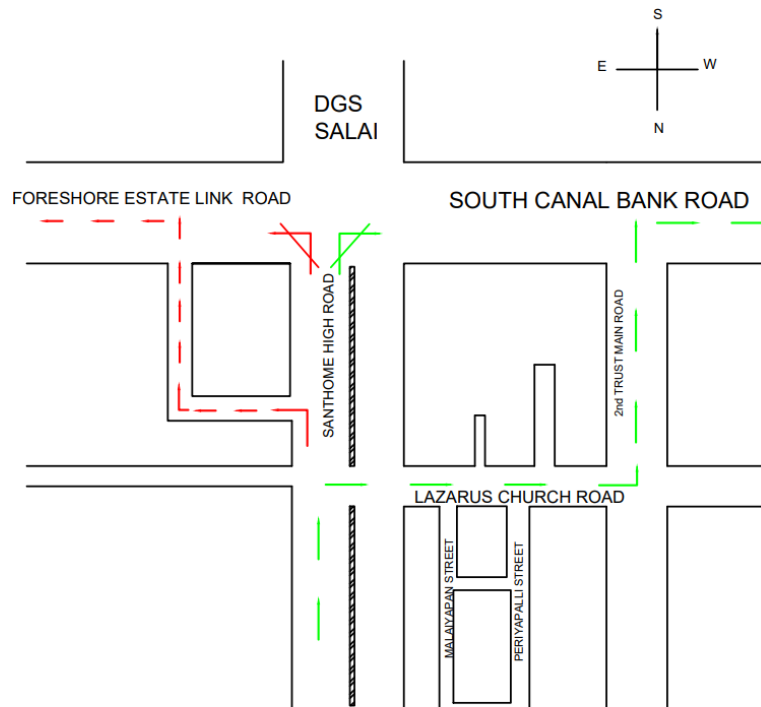


Fig 5.2.2 Flow Improve at Santhome High Road (Google Maps)



Alternative route no: 1 (Green)

+ As a short-term management measure, by allowing a right turn at Lazarus Church road intersection will further reduce 6641 PCEs and the peak volume will come down to 5900 PCE. Diversion of the flow towards north to west direction at the Foreshore Estate intersection has to go forward (south), left(east) and no right turn.

As a management measure, by diverting the vehicles north to west direction through **Lazarus Church road** and then taking **2nd Trust Main Road** (left) which connects to **South Canal Bank Road** that leads to Mylapore.

Alternative route no: 2 (Red)

As a short-term management measure, by allowing to pass through Police Quarters road will further reduce 6641 PCEs and the peak volume will come down to 6000 PCE. By diverting the traffic from Santhome High Road to Foreshore Estate Link Road through Police Quarters Road we can avoid taking the left turn at the intersection.

Alternate Route 1 and 2:

When this alternate route 1 and 2 comes under use we can reduce the PCE value from 6641 to 5500 PCE. This alternate route is considered as a short-term management.

5.4 Transportation management at Santhome high road

Fig 5.4.1 Transportation management at Santhome High Road Signal

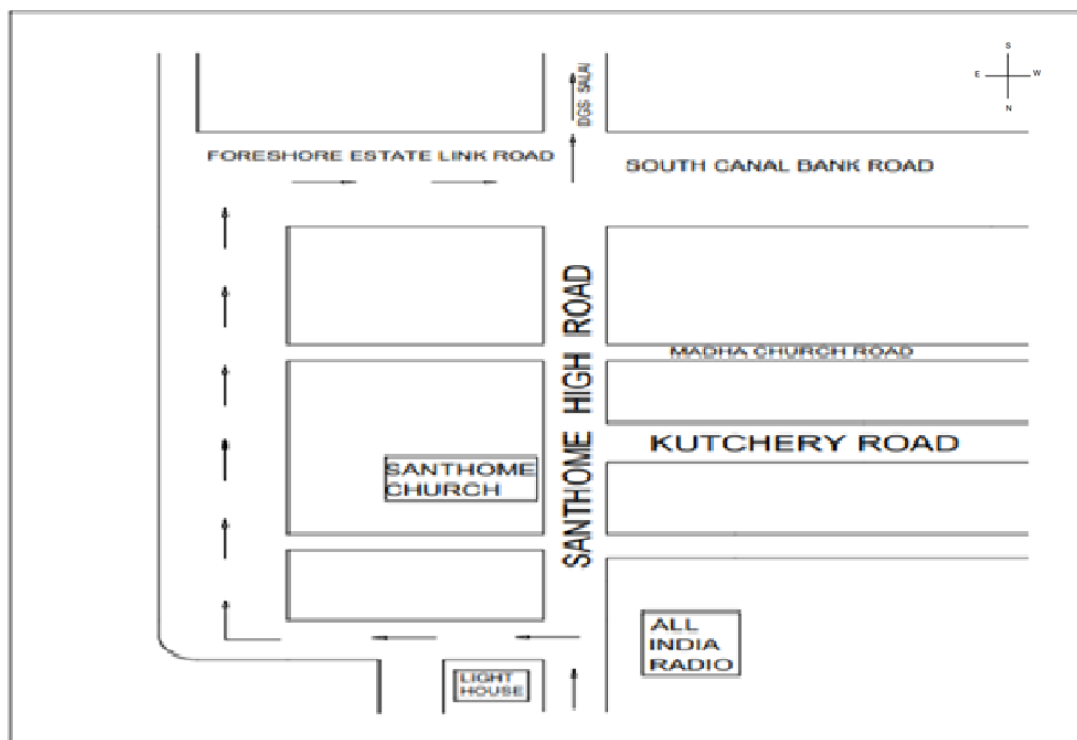
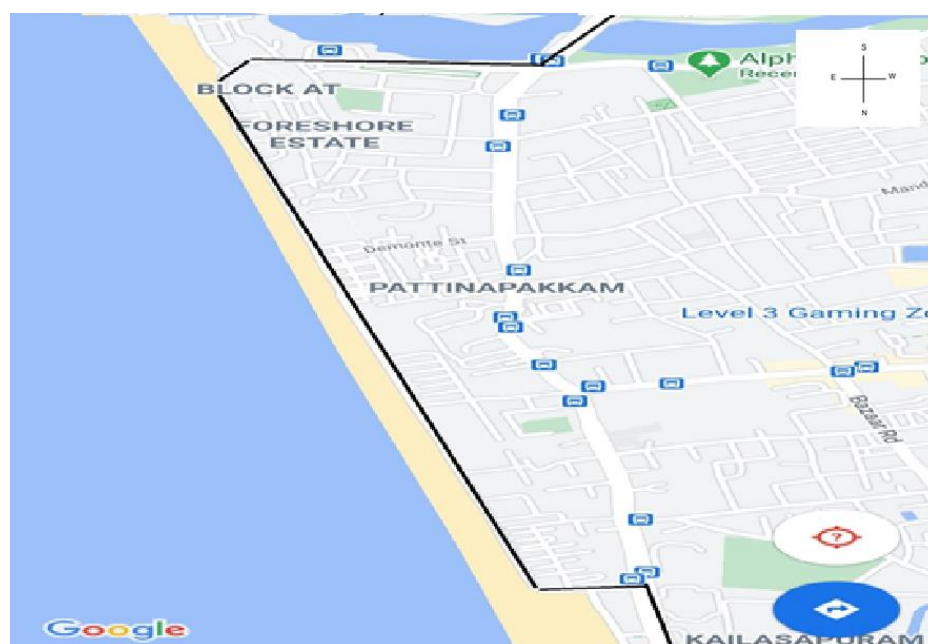


FIG 5.4.2 Transportation management at Santhome high road



As transportation management the heavy vehicles (Truck, Bus, Water tanker etc.) coming from north through the beach road can use foreshore estate link road to reach foreshore intersection. When this route comes to use, we may avoid traffic congestions and accidents at Santhome high road. The vehicles coming from the Northern Part of Chennai can use the Foreshore Estate Link Road to join DGS Dinakaran Salai. By taking the Foreshore Estate Link Road the volume of traffic depreciates considerably. In addition to being a faster route, this road is considerably wider compared to the narrow Santhome High Road allowing for faster passage of traffic volume.

5.5 Improvement at Foreshore Estate Intersection

Fig 5.5.1 Flow Improvement at Foreshore Estate Intersection

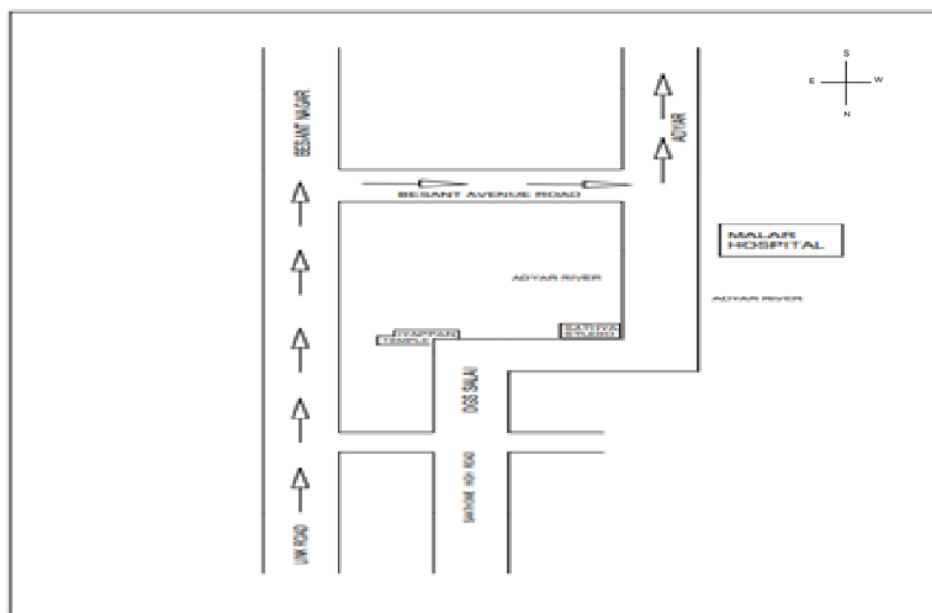


Fig 5.5.2 Transportation management at Foreshore Estate Intersection



Urban development generates which leads to congestion. Assessment of traffic provides measure for safety and efficient flow of traffic.

The long-term management measure to reduce traffic volume at Foreshore Estate Intersection would be to reconstruct the broken bridge and allow 4-Way Passage for vehicles. Broken bridge is located in Chennai south india was constructed in the year 1977 the bridge partly collapsed due to strong currents of the river and never been repaired the bridge across the adyar estuary, bordering the backend of the theosophical society.

CHENNAI: The 'Broken Bridge' that once connected Srinivasapuram in Foreshore Estate with MRC Nagar and Adyar holds the key to decongest an entire stretch of Santhome High Road and Greenways Road, right up to Besant Nagar beach.

An entry and exit ramp at Foreshore Estate junction join the main section and continues as a 4-lane road till Elliot's Beach. It runs for a distance of 1.7 km and joins Besant Nagar 5th Avenue Road at Elliot's Beach. It crosses Adyar River and passes to the west of Broken Bridge.

This reconstruction also allows swift passage and connectivity to OMR and ECR. This would serve as an Expressway between Marina Beach and Elliot's Beach in Besant Nagar and it connects through Besant Avenue Road to join Adyar. If the bridge is reconstructed the volume of traffic can be reduced by fifty percentage at foreshore estate intersection.

CHAPTER 6 - SUMMARY & CONCLUSION

6.1 SUMMARY

Traffic intersections are problem spots on any highway, which contribute to a large share of accidents. For safe operation, these locations should be kept under some level of control depending upon the traffic quantity and behavior. Based on this, alternative routes were suggested at intersections and interchanges. This is studied and analyzed at Foreshore Estate intersection.

6.2 CONCLUSION

The conclusion of this work is to provide congestion less traffic movement. This is done by diverting the routes.

- This provides us less journey time with more satisfaction. This ensures safety and reduces accidents.
- This provides a uniform flow of traffic with no chaos and congestion.
- In this project, from the above survey of traffic volume for each area, the highest peak traffic volume was attained at the area of Foreshore Estate intersection from DGS Dinakaran Salai to Santhome High Road.
- To improve the traffic flow at the intersection, long term measures can be suggested as reconstruction of the broken bridge (from Foreshore Estate to Besant Nagar) allowing 4-Way Passage for vehicles.
- As a short-term measure, by restricting straight, left and right turn traffic from **Santhome High Road** permitting them as left turn to connect towards Foreshore Estate Link Road through the Police Quarters Road and by restricting the right turn at Santhome High Road Signal we can divert the two-wheeler and four-wheeler through Lazarus Church Road to connect South Canal Bank Road.
- Another short-term measure for reducing traffic volume is to divert buses and trucks from Kamarajar Salai to Foreshore Estate Link Road to reach DGS Dinakaran Salai in a much swifter time period.
- From the suitable growth perspective all the above intersection improvement will efficiently work only for short period and this particular intersection in the study.

6.3 SCOPE OF THE PROJECT

- The alternate routes have given much advantage, where they can reach destination at a specific time without any troubles like traffic or any obstacles occur on the main road. By the use of these routes we are suggesting, the traffic can be reduced, transport can be increased, time can be saved and most importantly the accident can be avoided.
 - i. The solutions stated in the project are short-term local and long term solutions.
 - ii. In a larger perspective the root of the problem has to be identified, analyzed and solution should be formulated.
 - iii. The intersection may be receiving more traffic in future years due to the rapid urban development in its neighborhood areas.
 - iv. The ultimate solution to the intersection would only be reconstructing the broken bridge from Foreshore Estate sea shore to Besant Nagar Sea shore.
 - v. This gives a express way from light house to Besant Nagar and it can ease the traffic at Foreshore Estate Intersection.
 - vi. But it is to be clearly understood that the solution is only for this particular intersection and not to the entire area (Santhome high Road signal and DR.DGS Dinakaran Salai).
 - vii. This in turn triggers the necessity to analyze the transportation planning of the whole area.
 - viii. The study can be further extended as an area level traffic and transportation planning project.

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