Identify the Level of Service in Major Intersections of Sher-e-Bangla National Cricket Stadium by Estimating Traffic Volume

A Project and Thesis submitted in partial fulfillment of the requirements for the Award of Degree of Bachelor of Science in Civil Engineering

Submitted By

Azmain Mahatab

(ID: 193-47-1103)

Piya Chakma

(ID: 193-47-1107)

Supervised by

Kazi Obaidur Rahman

Assistant Professor
Department of Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING

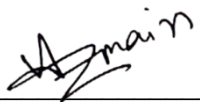
DAFFODIL INTERNATIONAL UNIVERSITY

February 2024

DECLARATION

The thesis entitled "**Identify the Level of Service in Major Intersections of Sher-e-Bangla National Cricket Stadium by Estimating Traffic Volume**" submitted by Azmain Mahatab (193-47-1103) and Piya Chakma (193-47-1107), has been approved and recognized as meeting the criteria for the Bachelor of Science degree in Civil Engineering in 12th February 2024.

Signature of the candidates



Name: Azmain Mahatab

ID No: 193-47-1103

Name: Piya Chakma

ID No: 193-47-1107

Supervisor's Approval

The research titled "**Identify the Level of Service in Major Intersections of Sher-e-Bangla National Cricket Stadium by Estimating Traffic Volume**" documented in this thesis was conducted under the guidance of Kazi Obaidur Rahman, Assistant Professor in the Department of Civil Engineering at Daffodil International University. I certify that, to the best of my knowledge and belief, the thesis does not contain any material previously published or authored by another person, except where proper references have been cited within the thesis itself.

Kazi Obaidur Rahman
Supervisor and Assistant Professor
Department of Civil Engineering
Faculty of Engineering
Daffodil International University

The project and thesis titled " **Identify the Level of Service in Major Intersections of Sher-e-Bangla National Cricket Stadium by Estimating Traffic Volume**" submitted by Azmain Mahatab, ID No: 193-47-1103, Piya Chakma, ID No: 193-47-1107, Session: Fall 2019, has been accepted as satisfactory. This work fulfills, in part, the requirements for the degree of Bachelor of Science in Civil Engineering. Date of Acceptance: 12th February 2024

BOARD OF EXAMINERS

Kazi Obaidur Rahman
Assistant Professor
Department of CE, DIU — Supervisor

17/02/2024
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Professor
Department of CE, DIU — Chairman

Kazi Obaidur Rahman
Assistant Professor
Department of CE, DIU — Internal Member

Ahad Ullah
Sr. Lecturer
Department of CE, DIU — Internal Member

Dr. Muhammad Mukhlesur Rahman
Deputy Secretary
Ministry of Textile for Jute — External Member

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ABSTRACT

This research examines the traffic characteristics and determines the level of service (LOS) at a significant non-signalized intersection. The goal is to analyze the traffic patterns in a commercial area and evaluate the intersection's performance. The traffic statistics were gathered via video camera throughout three distinct time in three different days (Bpl Final Match Day, Thursday, Friday).

The LOS was determined using the volume capacity ratio and Peak Hour Factor (PHF) approach. Comprehensive data analysis reveals that the traffic at this intersection exhibits heterogeneity and is not organized by lanes. The Rickshaw is the most prevalent vehicle, followed by motorcycles and cars in terms of overall traffic volume in Regular Thursday and Weekend Day (Friday). But in peak day Car is the most dominating vehicle comparatively other vehicle. The Mirpur 1-Mirpur 2 approach has the most unfavorable Level of Service (LOS), whereas the Posika Mor approach demonstrates superior performance in comparison to the other two approaches.

Mirpur 2 intersection's LOS during the BPL Final Match Day is founded in the "F" category at the evening peak. The findings contribute valuable insights to urban planners, traffic engineers, and event organizers, aiding in the development of strategies to enhance the intersection's performance and user experience during major events.

Keywords: Traffic Volume; Passenger Car Unit; peak hour factor; Level of service; Intersection; Mirpur; Dhaka

Abbreviations: LOS: Level of Service; DNCC: Dhaka North city corporation; Sher-e-Bangla National Cricket Stadium (SBNCS); PHF: peak hour factor; PCU: Passenger car unit; V/C ratio: Volume capacity ratio. BPL: Bangladesh Premier League.

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CHAPTER 1

Introduction

1.1 Background

In the new century, Bangladesh has a shared cricket culture with the subcontinental Big Three—India, Pakistan, and Sri Lanka—in South Asia (Bandyopadhyay, 2013). Bangladesh ranks fourth in terms of popularity for the game of cricket. The Sher-e-Bangla National Cricket Venue (SBNS) is the biggest and most renowned cricket venue in Bangladesh. Occasionally, it is referred to as Mirpur Stadium. The location is in Mirpur 2, which is a part of Dhaka. The capacity of the venue is 26,000 people simultaneously. (Wikipedia,2012). The primary intersection next to Sher-e-Bangla National Cricket Stadium is often referred to as the Mirpur 2 intersection. Cricketers and most fans have to use the Mirpur 2 intersection to reach the stadium. Next to the stadium, there are three major hospitals and educational institutes in Bangladesh, which are the National Heart Foundation, Kidney Foundation Hospital, Dr. MR Khan Children's Hospital and Children's Health Institute, National Bangla High School, Mirpur College, Monipur High School and College. Most of the patients and students have to use the Mirpur 2 intersection to go to those hospitals and educational institutes. Most of the time, everyone is in a hurry when they pass the Mirpur 2 intersection. This is the cause of congestion at unsignalized T intersections. An efficient transportation infrastructure is crucial for economic growth (Saha et al., 2013). Urban transportation systems must be modified to meet the demands of residents while minimizing their adverse externalities, particularly those related to the environment, road deterioration, accidents, traffic congestion, and reliance on oil (Santos et al., 2010).

1.2 Purpose of the Study

The Traffic Volume Survey is an important tool for assessing the current state and projecting the future state of traffic volume. Furthermore, traffic volume data is essential since it enables the calculation of a road's capacity and level of service (LOS), regardless of the prevailing traffic circumstances, at any time of the day.

Accurate knowledge of the degree of congestion is necessary in order to address the situation effectively (Shila et al., 2023).The level-of-service (LOS) of a traffic facility is a concept used to assess the performance and quality of traffic service provided at a certain flow rate *(Mathew DTV, 2014).* The Level of Service (LOS) is a metric that measures the quality of operating conditions within a traffic flow, particularly in relation to the service provided by the road to the user (Gireesh Kumar et al., 2020). Levels of service are classified into six categories, ranging from A to F. A denotes the optimal working state, whereas F signifies the least favorable one. (LOS Standard and Measurements, 2016). The escalating problems in Dhaka City include the surge in traffic volume and the resulting congestion. Currently, it is customary to see congested traffic at the intersections of Mirpur 2 during peak hours in the morning and evening. A cricketer must start their preparations in the early hours of the morning. However, even if they embark on their travel before 5:00 am, there is no assurance that they will arrive at the location prior to the commencement of the match at 9:30 am. (The Daily Star, 2018). This is a matter of utmost importance as a consequence. Analyze the volume of traffic and monitor the quality of transportation services at the important intersections of Dhaka North City Corporation (DNCC). By analyzing the evaluation findings, traffic authorities may identify specific strategies and plans that optimize both the effectiveness of improvement measures and the allocation of limited budgets. (Li et al., 2004)

1.3 Specific Objectives

The primary objectives of this study are to find out the level of service in major intersection of SBNCS Mirpur, Dhaka, Bangladesh in three different days may include the following:

1. To analyze the volume of traffic and composition during three different peak time (Morning peak = 8am-10am; Afternoon peak = 12pm-2pm); Evening peak= 4pm-6pm)
2. To check the traffic flow, congestion pattern and general efficiency of operations in three different directions (Mirpur 10 – Mirpur 2; Porsika Mor – Mirpur 2; Mirpur 1 – Mirpur 2).
3. To provide valuable insights into the performance of the intersection, facilitating informed decision-making for prospective enhancements and

optimizations to improve overall traffic management and passenger experience in different vehicle.

To provide a comprehensive report detailing the findings of the level of service assessment for short-term and long-term improvements to enhance traffic flow and overall intersection performance.

All objectives can be useful for further traffic flow at Mirpur 2 intersection to provide better experience for both national and international people. Also, this survey may helpful for reduce the travel time for student and patient.

1.4 Thesis Structure

1. Chapter one of the thesis covers the background and significance of the Mirpur 2 intersection, as well as the purpose of the study, goals, and thesis structure.
2. Chapter two covers the concept of the level of service, the concept of PHF, related works in foreign countries, related work in Bangladesh, and related work in the study area.
3. Chapter three includes the study area description, where information, location, time, and road geometry for intersections are also included.
4. Chapter four covers methodology, general data collection methods, traffic volume count and signal analysis, data analysis tables, and equations.
5. Chapter five includes traffic volume estimation results, an overview of data collection, traffic volume parameters, and the BPL final match day. regular Thursday, Friday (holiday).
6. Chapter six covers discussion, congestion reasons at the Mirpur 2 intersection, the effect of congestion at the intersection, challenges, conclusions, recommendations, and limitations.

CHAPTER 2

Literature Review

2.1 Concept of the Level of Service

Level of Service (LOS) defines how well vehicle traffic flows along a street or road. LOS is one of the most influential metrics in planning, with critical relevance for both land use and transportation planning (Brasuell, 2023). A fairly efficient method for determining the current traffic situation at any intersection is LOS. Several scholars have undertaken several studies in which they outline the process for calculating the LOS using various methodologies (Engineering, 1991). The term "Level of Service" (LOS) in transportation engineering pertains to a qualitative assessment used to evaluate the operating conditions and effectiveness of transportation infrastructure. LOS, abbreviated from Level of Service, is determined by assigning letter grades from "A" to "F" based on many parameters like traffic volume, speed, capacity, and congestion. A higher grade, such as "A," suggests unrestricted traffic conditions, while a lower grade, such as "F," denotes traffic congestion and diminished service quality. LOS, or Level of Service, is a statistic that is influenced by several variables, such as the time of day and the occurrence of special events, resulting in fluctuations. It is an essential tool for transportation planners and engineers to make educated choices on infrastructure enhancements, traffic control, and overall network optimization to accommodate the needs of a rapidly expanding and dynamic transportation system.

2.2 Concept of the PHF

The peak hour factor (PHF) is a vital measure in traffic engineering, especially in relation to signalized intersections. The metric measures the extent of variation in traffic flow during the peak hour, offering insights into the level of evenness or unevenness in the distribution of traffic during this crucial time frame. The PHF factor is determined by dividing the volume during the peak 15 minutes by the volume during the highest 15 minutes of the day. It may be represented as a decimal or a percentage. A PHF value below 1.0 indicates an even distribution of traffic throughout the peak hour, while values near or higher than 1.0 imply concentration and the possibility of congestion during certain time periods. This notion plays a crucial role in creating efficient signal timing for intersections, enabling traffic engineers to optimize the distribution of green

time to handle fluctuating traffic demand during peak hours. The PHF factor essentially enhances intersection capacity and enhances overall traffic flow efficiency.

2.3 Related Works in Foreign Countries

Pooja, Kalaanidhi, Gowri, and Ravi Shankar conducted estimations for PCU, LOS, and saturation flow. They assessed all these terms for signal design. (Raj et al., 2019). Masamitsu Mori and Hiroshi Tsukaguchi developed a novel approach to assess the degree of service specifically for pedestrians. The authors of the study are Rao et al. (Mori & Tsukaguchi, 1987). Employed the HCM (highway capacity manual) 2000 to evaluate the capacity, control delay, and Level of Service (LOS) of vehicle streams at three uncontrolled crossings in India. Videography was used to derive traffic characteristics. (Someswara Rao et al., 2017). Ankit N Mahidadiya and Prof. Jayesh Juremalani endeavor to calculate the passenger Car unit (PCU) in an urban crossroads (Mahidadiya & Juremalani, 2016). Jamil et al. Conducted research in Malaysia using the aasidra intersection version 5.1 program to examine the capacity and level of service at unsignalized intersections. The primary objective was to examine the elements that influence the degree of service at a junction (Jamil & Wan Ibrahim, 2013).

Mithun Mohan and Satish Chandra suggested three approaches to estimate the Passenger Car Units (PCU) at Urban Intersections (UI) in the presence of very diverse traffic situations. The first method is PCU calculation based on the duration of occupancy, the second method is PCU calculation based on the maximum capacity, and the final method is PCU calculation based on the pace at which queues are cleared(Mohan & Chandra, 2018)

2.4 Related Work in Bangladesh

Numerous research programs have been established in foreign nations, however, there have been very few studies conducted on this specific issue in Bangladesh. Chisty, Islam, and Mishuk conducted a study to determine the current level of service on the Agrabad to CEPZ Road in Chittagong city. To compute LOS, a traffic survey was carried out to evaluate traffic volume, capacity, and speed of the current route (Chisty et al., 2014). Foysal, Rashidul and Partha determine LOS at Ashulia Bazar and calculate PCU. Their main objective was evaluate the effectiveness of that intersection (Engineering, 1991). Dipa, Ariful,Salehin and Noor studied about congestion of volume

count, inflow capacity on traffic congestion in Dhaka city. The studied on Mirpur 10 – New market link road (Sarker et al., 2022)

2.5 Related work in study area

So far, no research has been found about LOS and PCU on Mirpur 2 intersection. No one has found out the level of service and calculate the PCU for future smooth traffic on Mirpur 2 intersection.

CHAPTER 3

Study Area Description

3.1 Information

The Mirpur 2 Intersection Stand is strategically located in the heart of the neighborhood, providing easy accessibility from all parts of Mirpur 2 and its environs. The Mirpur 2 junction is located at the southern corner of the 2nd Mirpur Stadium, also known as SBNCS. The close proximity of this site to notable landmarks such as educational institutions, the national stadium, markets, and residential areas greatly enhances its importance. The platform is conveniently located near many roads, most notably the busy Mirpur Road, ensuring easy connectivity to different parts of Dhaka. The Mirpur 2 crossroads has a vital role in shaping the social and economic dynamics of the town. It provides affordable and convenient transportation options for residents, enabling them to visit different parts of the city where sports, education, job opportunities, healthcare, and other essential services are located. The intersection at Mirpur 2 Stadium (SBNCS) is of great importance to the cricketers who regularly visit the sports field, as it offers them easy connectivity to other parts of Dhaka, facilitating their engagement in sporting activities

3.2 Location and Time

This case study was conducted at the Mirpur 2 intersection in the morning peak (8 a.m.–10 a.m.), afternoon peak (12 p.m.–2 p.m.), and evening peak (4 p.m.–6 p.m.) To estimate the amount of traffic and identify the traffic behavior on the different days. Mirpur 2 is a vital intersection located in the central area of Mirpur, Dhaka, Bangladesh. It functions as a prominent transportation hub, linking many crucial routes throughout the city.

3.3 Road geometry for Intersections

Three road intersected at Mirpur 2 intersection. One from Porsika Junction, one from Mirpur 10 Circle, and one from Mirpur 1(Sony). The type of intersection is T. (Mirpur 10 – Mirpur 2) and (Mirpur 1 – Mirpur 2) both roads are 6 lane with both side footpath and Porsika Junction to Mirpur 2 road is 4 lane road with both side footpath. All roads are flexible pavement roads made of hot mix asphalt.

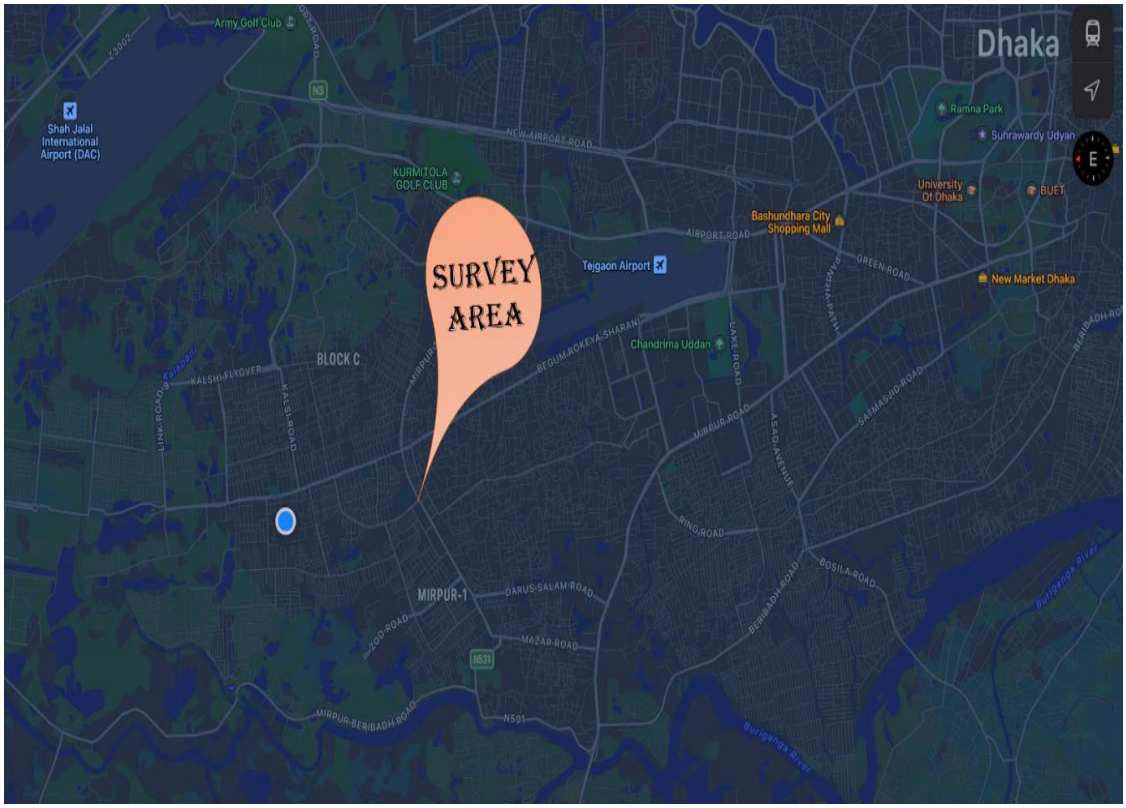
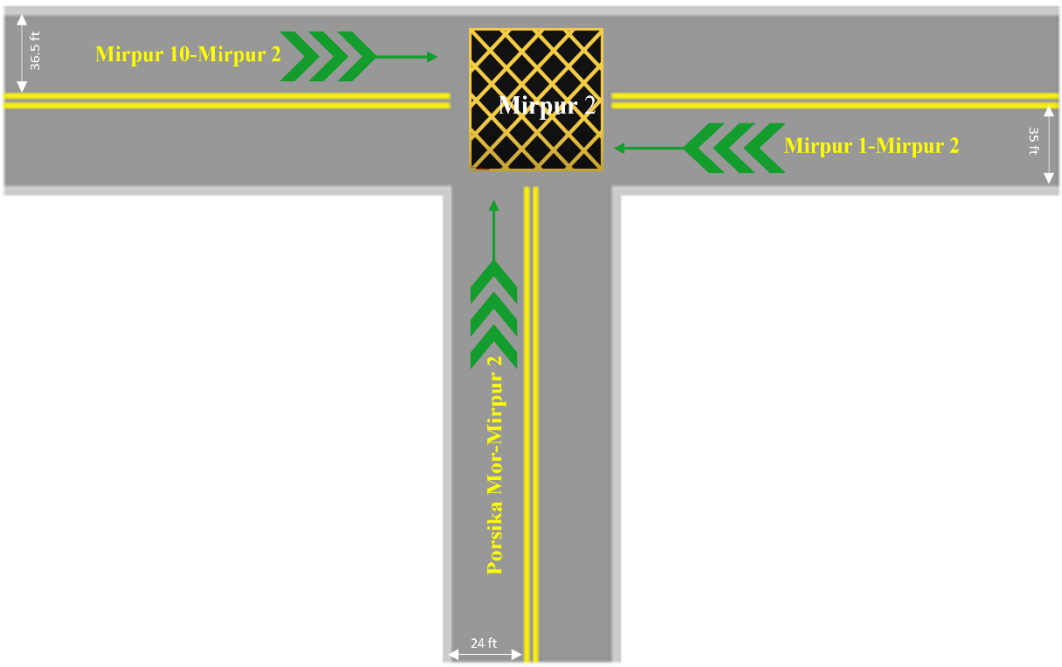


Figure 3.1: Location map of study area at Dhaka

Figure 3.2: Road connectivity of intersection



T - Intersection

Figure 3.3. Study area Intersection figure

Table 3.1: Road Geometry of Mirpur 2 intersection.

Intersection Name	Road Name	Lane Width (ft.)		Median (ft.)	Footpath width (ft.)	
		Right	Left		Right	Left
Mirpur 2	Mirpur 10 - Mirpur 2	36.5	36.5	4	18.5	18.5
	Porsika Mor - Mirpur 2	24	24	3.5	8	10
	Mirpur 1 - Mirpur 2	35	35	4	36.5	36.5

CHAPTER 4

Methodology

4.1 General

Identifying the level of service (LOS) is the main purpose of this research. LOS depends on various types of vehicles, road capacity, and road geometry. Level of service (LOS) is a term used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, delay, and safety. The level of service of a facility is designated with a letter, A to F, with A representing the best operating conditions and F the worst (Traffic Level of Service Calculation Methods Appendix B Traffic Level of Service Calculation Methods Level of Service Calculation Methods, n.d.). Calculating the passenger car unit, or PCU, is crucial for analyzing mixed or heterogeneous traffic since it simplifies the process of converting various vehicle types into an equal number of passenger cars (Mohan & Chandra, 2018). In Dhaka city by 2018, 10,974 CNG rickshaws and auto-tempos, 5,099 human haulers, 7,259 cargo vans, and 281,334 vehicles and microbuses, 65159 pickups, and 55,429 trucks were registered (*number of registered motor vehicles in dhaka (yearwise)*, 1809)

4.2 Date collection method

All traffic data was collected at three different stages on three different days. The 1st day was BPL final match day, the 2nd day was a holiday (Friday), and the 3rd day was a normal day (Thursday). The 1st stage was the morning peak (8–10 a.m.), the 2nd stage was the afternoon off peak (12–2 p.m.), and the 3rd stage was the evening peak (4-6 p.m.), and each peak was continued for 2 hours. All the data was collected by the video camera for accurate results, and it was later extracted by watching the video to get the perfect results.

4.3 Traffic volume count and signal analysis

After taking all the video clips for three days, we have counted the number of vehicles manually. Firstly, we have counted the large vehicles like buses, trucks, and cars. Secondly, the smaller vehicles were counted, like rickshaws, vans, bicycles, and motorcycles. Lastly, tally counting was used for all the vehicle numbers to identify the

number of vehicles that passed through the intersection. To identify the road geometry and capacity condition of intersection road length for both sides of the road, middle carriage width, footpath, and median data were taken through a field survey.

4.4 Data analysis table and equation

Table 4.1: Traffic performance measurement by V/C ratio (Hamiel, 2010)

LOS	V/C Ration	Detailed Description
A	0.00-0.35	Represents the best operating conditions and is considered free flow. Individual users are virtually unaffected by the presence of others in the traffic stream.
B	0.35-0.58	Represents reasonably free-flowing conditions but with some influence by others.
C	0.58-0.75	Represents a constrained constant flow below speed limits, with additional attention required by the drivers to maintain safe operations. Comfort and convenience levels of the driver decline noticeably
D	0.75-0.90	Represents traffic operations approaching unstable flow with high passing demand and passing capacity near zero, characterized by drivers being severely restricted in maneuverability.
E	0.90-1.00	Represents unstable flow near capacity. LOS E often changes to LOS F very quickly because of disturbances (road conditions, accidents, etc.) In traffic flow.
F	>1.00	Represents the worst conditions with heavily congested flow and traffic demand exceeding capacity, characterized by stop-and-go waves, poor travel time, low comfort and convenience, and increased accident exposure.

Table 4.2: Traffic performance measurement by V/C ratio (Hamiel, 2010)

LOS	Peak Hour Factor Value
A	0.7 or less
B	0.8 or less
C	0.85 or less
D	0.90 or less
E	0.95 or less
F	>1 or less

To find out the LOS mainly two methods have been applied. Firstly V/C ratio where V is the vehicle passing a point in 1 hour and secondly C in the maximum number of vehicles that can pass a certain point at the reasonable traffic condition.

- Volume capacity ration = $\frac{\textbf{Total hourly PCU}}{\textbf{Capacity}}$
- Capacity = $\frac{\textbf{Highest design capacity} \times \textbf{effective width}}{\textbf{12}}$
- Capacity = $\frac{Nsg}{C}$

[Where N= number of lanes (ln);
s = saturation flow rate;
g = effective green time (s);
C = cycle time (s)]

- PHF = (hourly volume/4* volume count at highest 15-min
- Saturation Flow Rate, $s = s_o$ fw fHV fG fp fbb fa fLU fLT fRT fLpb fRpb

s = rate of adjusted saturation flow (vehicle/h/ln)

so = base saturation flow rate (pc/h/ln)

fw = adjustment factor for lane width

fHV = adjustment factor for heavy vehicles in traffic stream

fg = adjustment factor for approach grade

fp = adjustment factor for existence of a parking lane and parking activity adjacent to lane group

fbb = adjustment factor for blocking effect of local buses that stop within intersection area

fa = adjustment factor for area type

fLU = adjustment factor for lane utilization

fLT = adjustment factor for left-turn vehicle presence in a lane group

fRT = adjustment factor for right-turn vehicle presence in a lane group

fLpb = pedestrian adjustment factor for left-turn groups

fRpb = pedestrian-bicycle adjustment factor for right turn groups

CHAPTER 5

Traffic Volume Estimation Results

5.1 Overview of Data Collection

This section will explore the many methodologies used for gathering data on traffic volume at the Mirpur 2 Intersection. The objective is to provide transparency and precision in the process of collecting pertinent data. In order to precisely gauge the amount of traffic, a blend of human and computerized counting approaches was used. The following approaches were employed:

Manual traffic counting refers to the process of collecting data on the number of vehicles passing through a certain location by physically seeing and recording the information. During the busiest times, skilled observers were positioned at key locations surrounding the crossroads. Every observer documented the number of vehicles seen according to their specific category (such as cars, trucks, or motorcycles), and the directions are (Mirpur 10-Mirpur 2; Porsika mor-Mirpur 2; Mirpur 1-Mirpur 2). Briefly, the amount of traffic was measured by quantitative observations. Numerical data generated through experiments, surveys, video recording, etc. Ensures the completeness, consistency, and accuracy of the collected data.

5.2 Traffic Volume Parameter

In order to achieve the study's aims, data analysis has been conducted in two stages. A preliminary examination of the current state of intersections has been carried out. Furthermore, survey data has been collected to determine the current traffic performance conditions at these crossings. Modal share is a crucial aspect in evaluating junction performance under mixed traffic conditions.

5.2.1 BPL Final Match Day

Mirpur 10–Mirpur 2: The most common vehicle in the evening was a car, with around 1310 discovered.

The rest of the summits have the maximum number of cars, with 1206 and 1099 during midday and morning, respectively. During the afternoon peak, the number of paddle rickshaws and motorcycles is at its highest. The highest volume of motorcycles occurs

in the midday, whereas the highest number of private CNG occurs in the midday. A moderate number of vehicles include paddle rickshaws, auto rickshaws, and bicycles. This lane has no effect on the minibus. Trucks, vans, mini trucks, and mini buses are less prominent and have a lower impact during the three peaks (***Figure 5.1).***

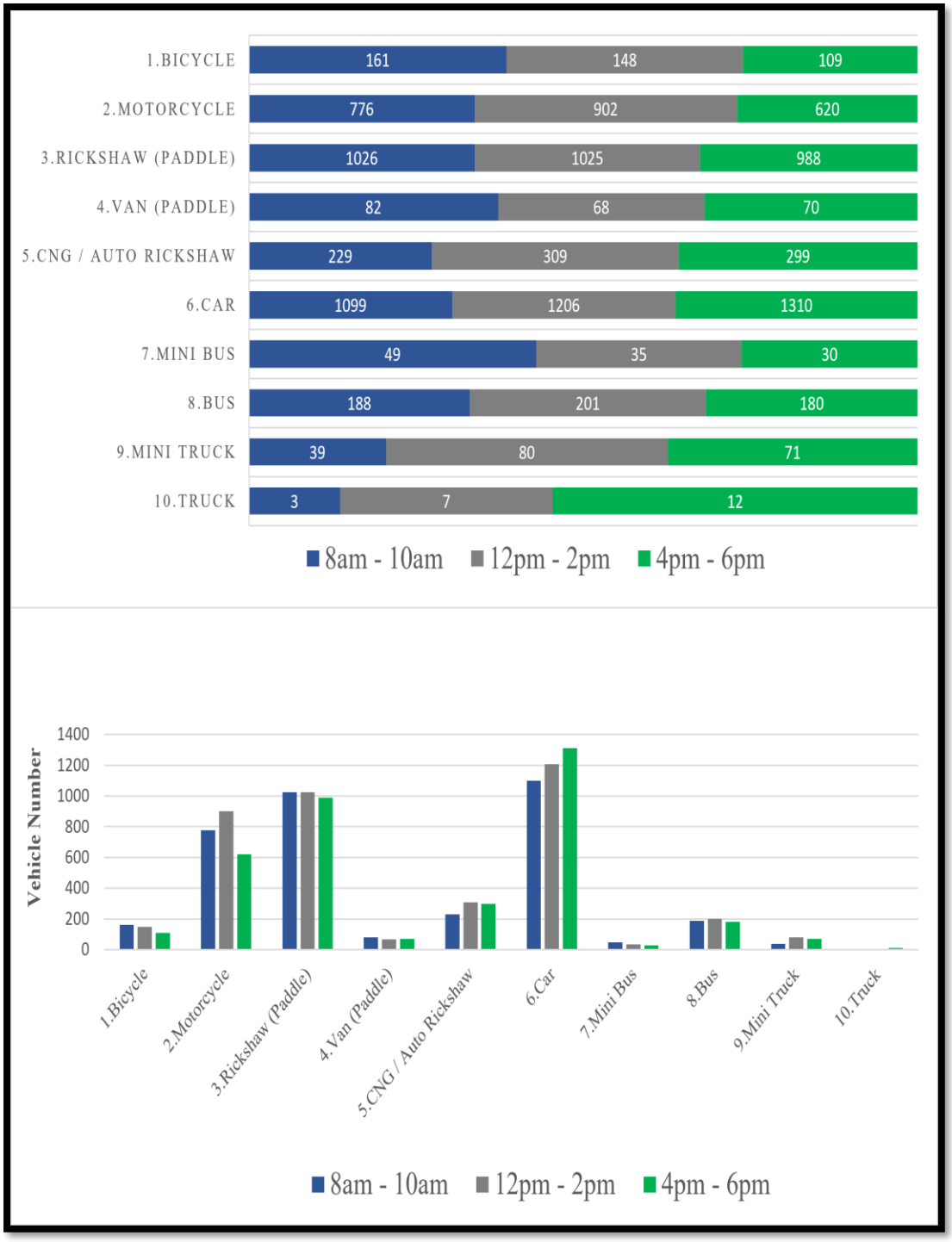


Figure 5.1: Mirpur 10 – Mirpur 2 (BPL Final Match Day)

Porsika Mor-Mirpur 2: There is a significant number of vehicles on the Porsika Mor-Mirpur 2 route, making it convenient for cars. A total of 726 vehicles of this sort were discovered throughout the evening. There are slow vehicle or human impacts in this lane. A single truck was discovered during the morning period. During the evening, morning, and afternoon, the concentration of paddle rickshaws and motorcycles reached its highest point. Buses, mini trucks, and vans are in convenient positions in this lane. Less umber of mini bus found in this lane. As always, trucks take the last position on the basis of number because only DNCC trucks are allowed in the day section for collecting waste (***Figure 5.2).***

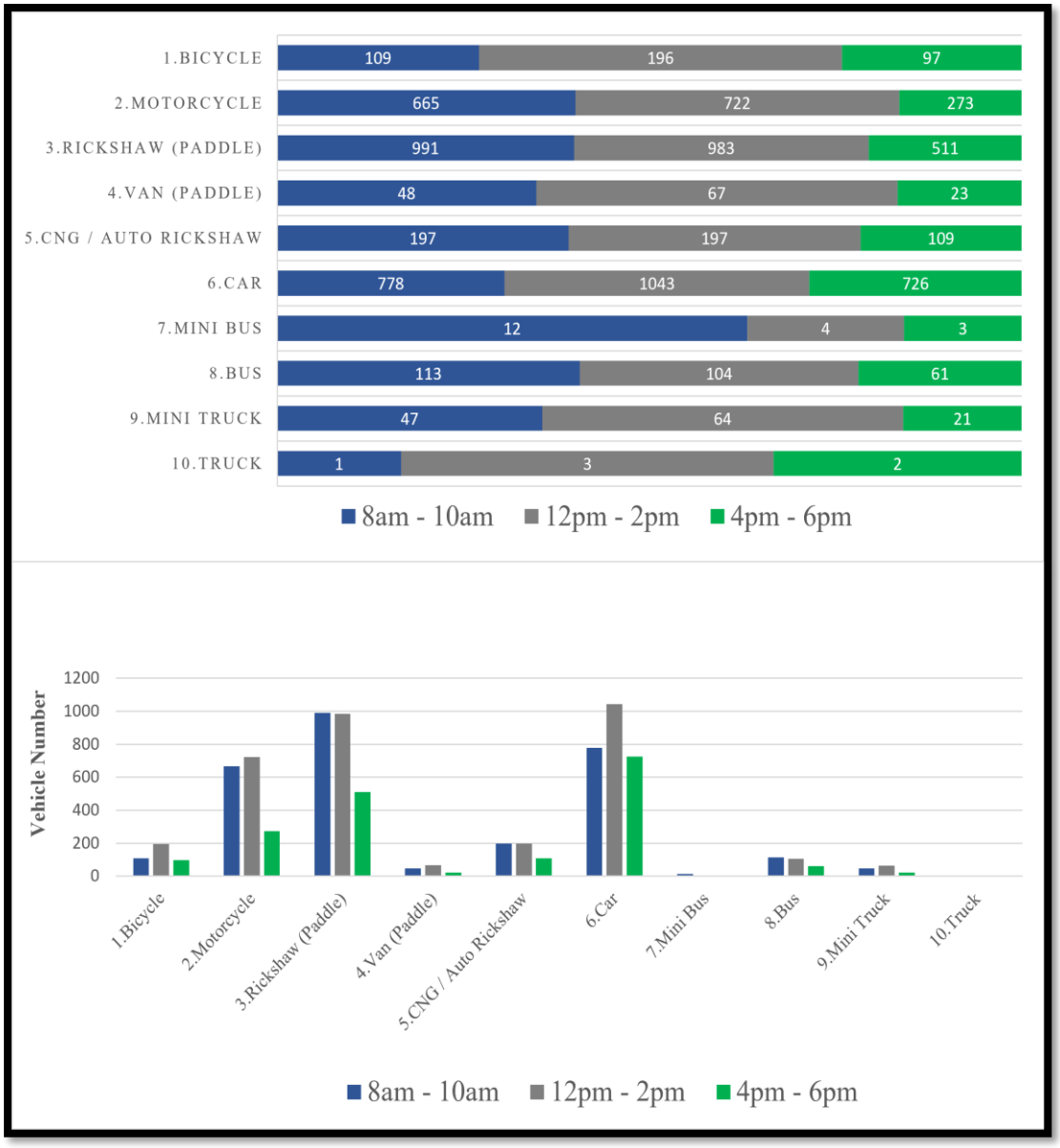


Figure 5.2: Porsika mor – Mirpur 2 (BPL Final Match Day)

Mirpur 1–Mirpur 2: Around 1655 cars were found throughout the evening, making them the most prevalent kind of vehicle. The remaining peaks have a vehicle count of 1300 and 1142 at noon and morning, respectively, which represents the highest number of cars. During the afternoon rush hour, the quantity of motorcycles reaches its maximum. The peak volume of paddle rickshaws is seen at noon, whereas the peak number of CNG vehicles is also observed during the evening. Several types of vehicles are present: vans, minibuses, and buses. The presence of a truck does not impact this lane. The van, mini truck, and mini bus have reduced prominence and a lesser influence at three peaks (Figure 5.3***).***

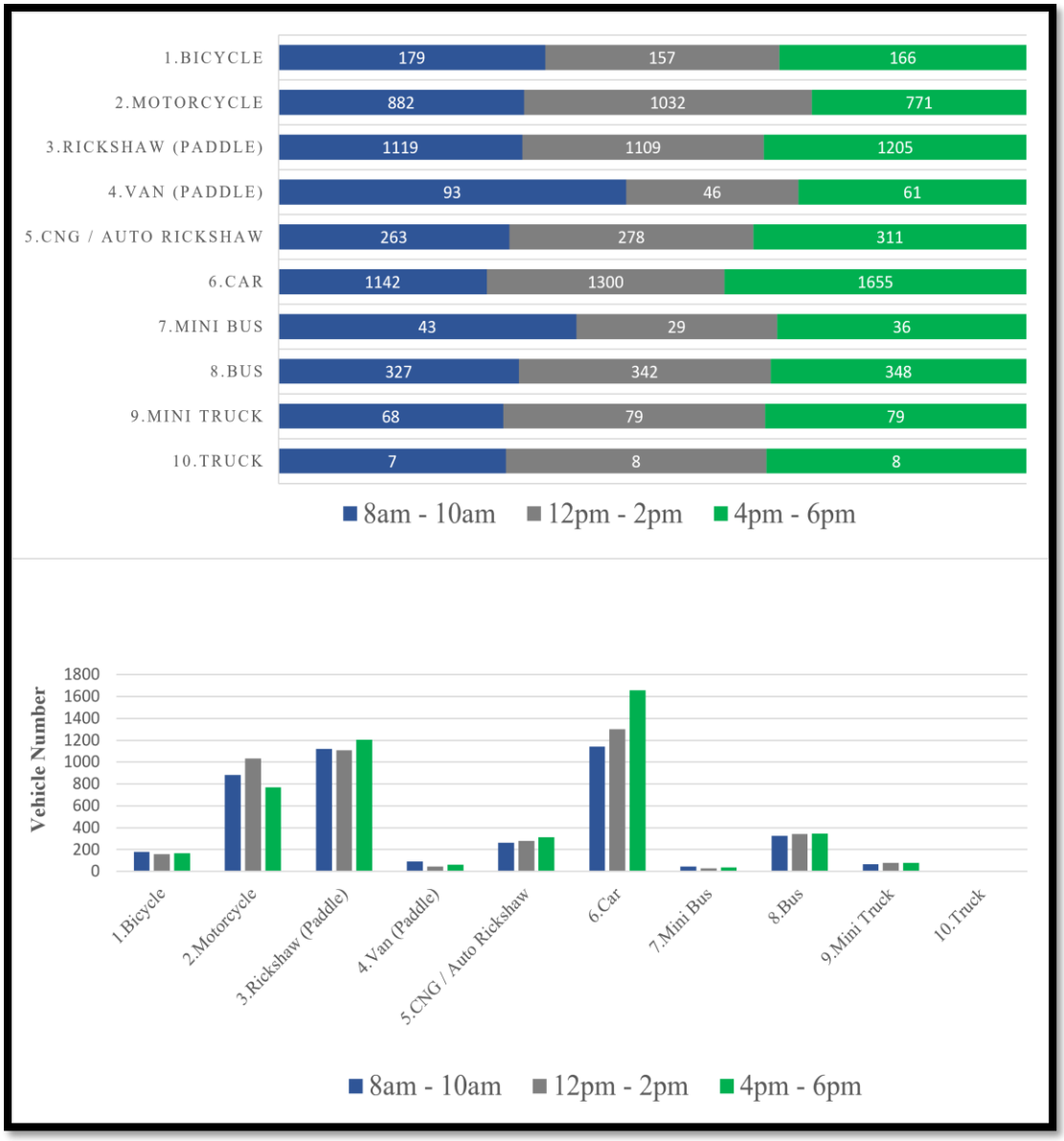


Figure 5.3: Mirpur 1 – Mirpur 2 (BPL Final Match Day)

In the below pie chart (***Figure 4.4***), it is seen that the maximum amount of vehicle contained in the BPL final day is a car with a total amount of 32%. It means the majority of people used cars that day to reach their own destination. So, it can be said that the maximum number of people went with their own vehicles to reach the stadium to watch the final match of the BPL.

The second type of DF vehicle, which contains a total amount of 27%, is the rickshaw. The majority of people in Dhaka city use rickshaws for their daily needs to go to their respective destinations. From school and college students to office workers, they use rickshaws daily for their own needs. The motorcycle seems to be the third most used vehicle, with a total amount of 20%. Lastly, the lowest number of vehicles that passed the intersection on the BPL day was a CNG, van, bus, bicycle, and mini truck. On the other hand, it is seen that trucks have the lowest number of vehicles, with a total of 0%.

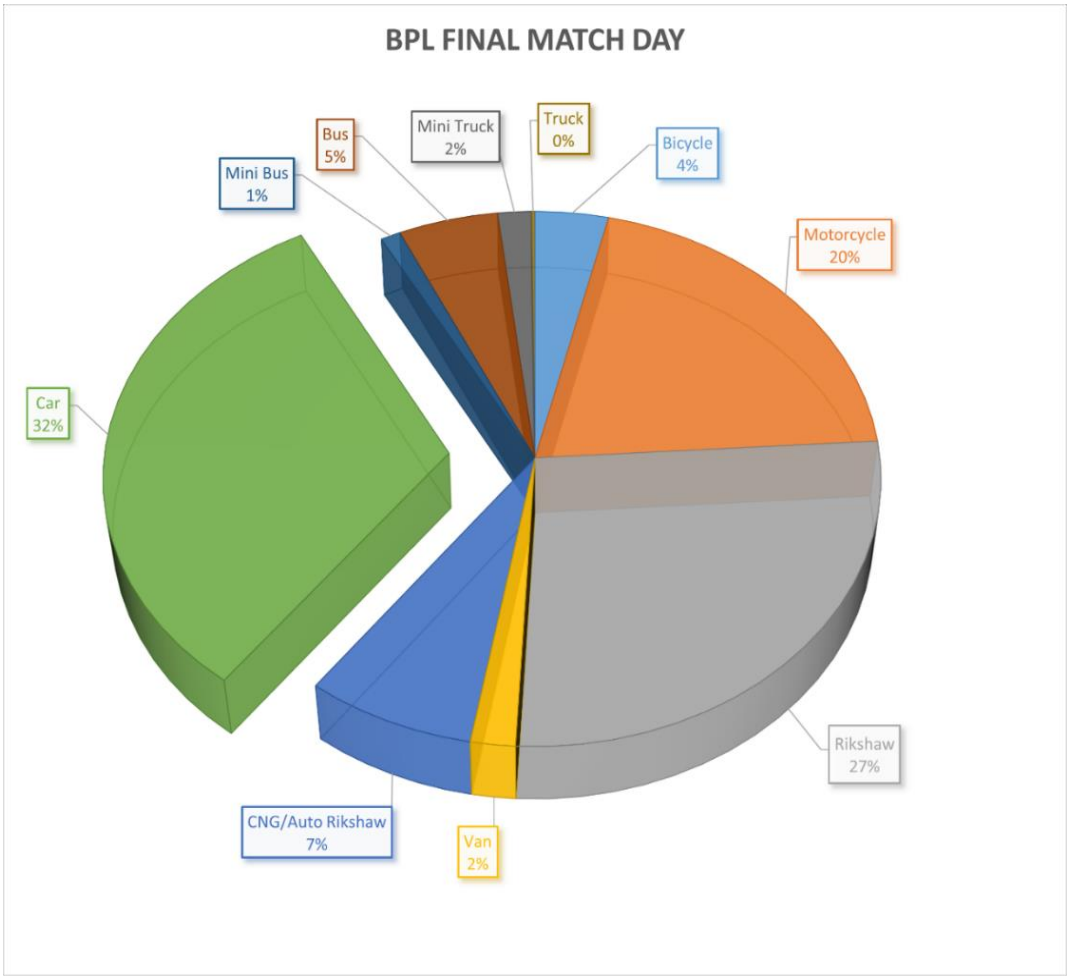


Figure 5.4: Percentage of vehicle at Mirpur 2 intersection

5.2.2 Regular Thursday

Mirpur 10–Mirpur 2: This lane is the widest lane between three lanes. Paddle Rickshaws have maximum flow in this lane. Which is the slowest and dominant vehicle in this lane for all the peak hours. It took first place for the morning, noon, and evening maximum lists. Car is the 2nd highest vehicle that passes Mirpur 2 intersection by using this lane. After that, the position was for a motorcycle. Less number of users are truckers due to restrictions on daytime. Van, minibus, and mini truck volumes were kind of similar for all peaks. Bicycle and bus passing volume was almost similar, and CNG was a bit higher than bus and bicycle (***Figure 5.5).***

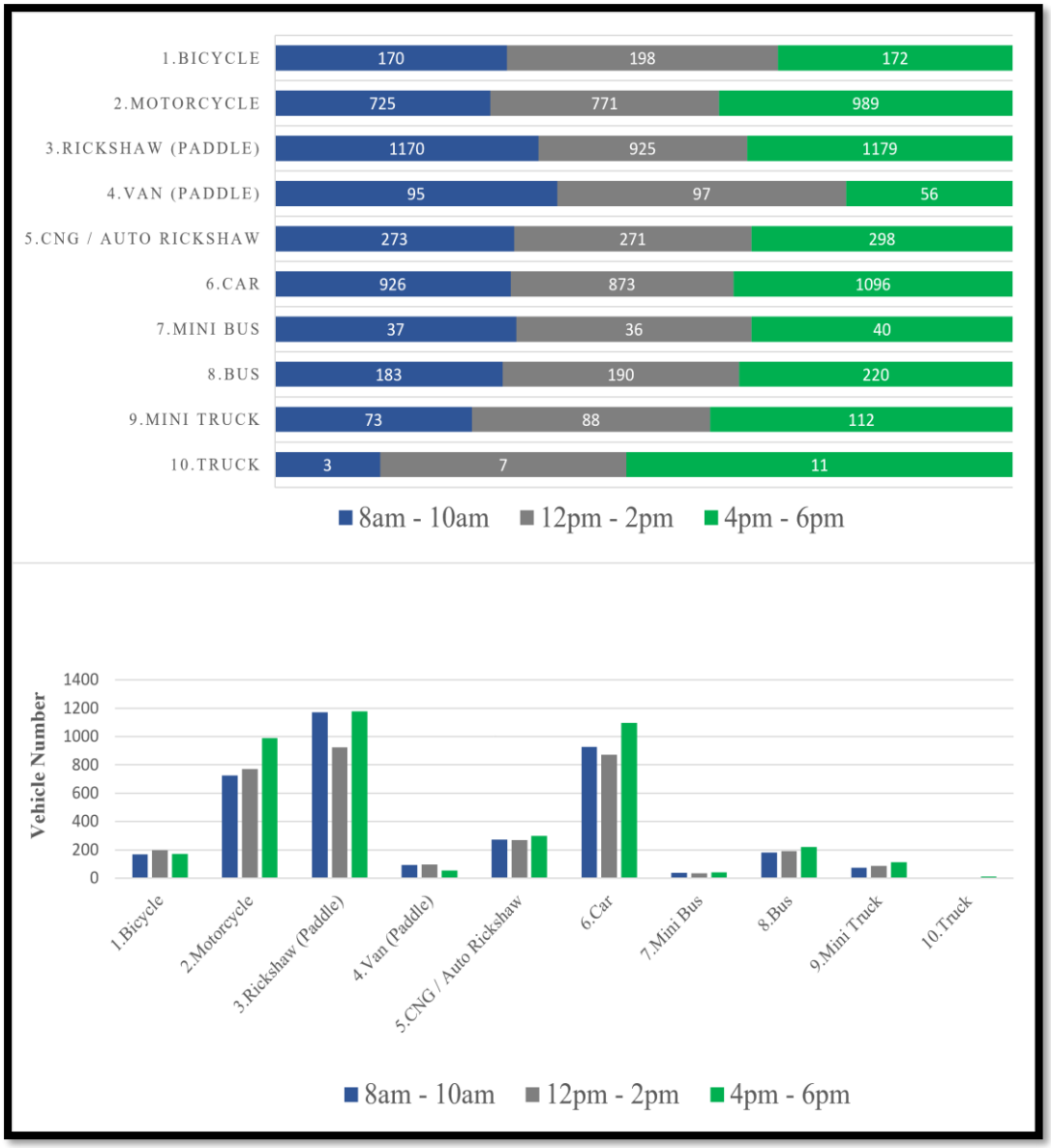


Figure 5.5: Mirpur 10 – Mirpur 2 (Thursday)

Porsika Mor-Mirpur 2: In the morning and evening peak hours, it is noticed that rickshaws take place at their highest. The total number of rickshaws in the morning is 1002, and in the evening, it is 1021. Other than rickshaws, motorcycles are also at their highest peak in the morning and evening hours. The lowest number of vehicles are trucks, mini trucks, and vans. Cars also follow, with a reasonable number in the morning, afternoon, and evening hours. CNG and Bus are similar numbers for all peak. It is noticeable that the maximum number of vehicles that pass through Porsika Mor-Mirpur 2 are motorcycles, CNG, cars, and rickshaws in all peak hours, with trucks being the lowest number of vehicles that pass through ***(Figure 5.6)***

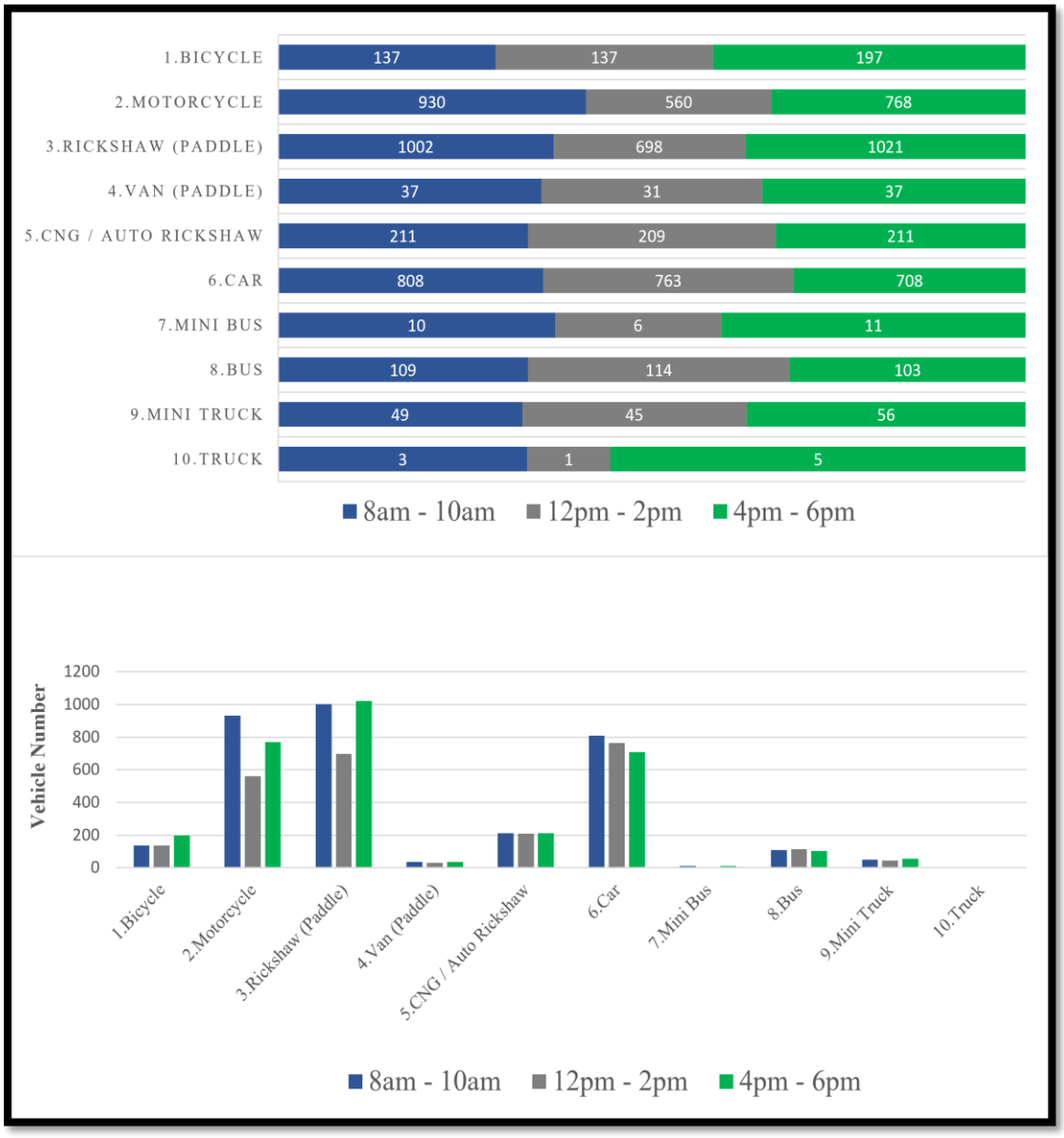


Figure 5.6: Porsika Mor – Mirpur 2 (Thursday)

Mirpur 1–Mirpur 2: On a regular day like Thursday, motorcycles are the most common vehicle that passes through Mirpur 1–Mirpur 2. Where rickshaw total numbers are 3206 in all peak hours and motorcycle total numbers are 2926. Then there are more cars, buses, CNG, and bicycles, with a total of 2046 vehicles. In this road section, we can see that all vehicles have the highest peak at the evening hour. Trucks are the lowest number of vehicles that pass through, with a total of 20. Normally, on a regular Thursday, it is noticed that most vehicles are at their highest peak in the evening hour due to the following day being a holiday ***(Figure 5.7).***

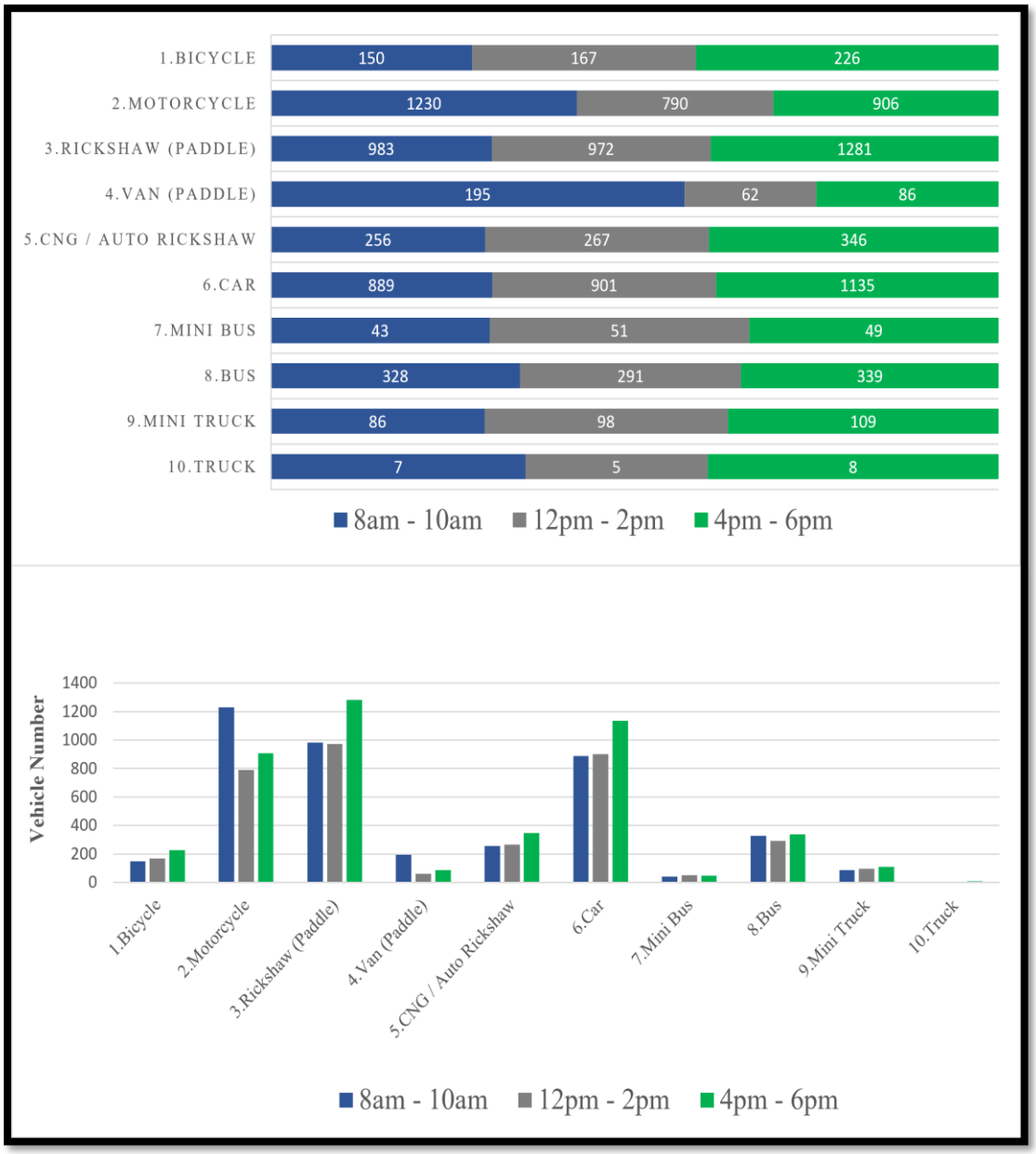


Figure 5.7: Mirpur 1 - Mirpur 2 (Thursday)

On a regular day like Thursday, it is seen that rickshaws are the most used vehicle, with a total amount of 29%. On a busy day, a rickshaw is most preferable because of its easy availability for all types of people to go to their own destination. Secondly, cars and motorcycles are the maximum number of vehicles that are used, with a total number of 26% and 22%, respectively. People find their own vehicles more comfortable than public transport on a regular basis. Besides buses, minibuses, bicycles, CNG, and vans had the lowest number of vehicles used on Thursday. Trucks are again the lowest number of vehicles used on a regular day. The intersection location of this study has a minor number of trucks passing in all three days when data have been taken (***Figure 5.8).***

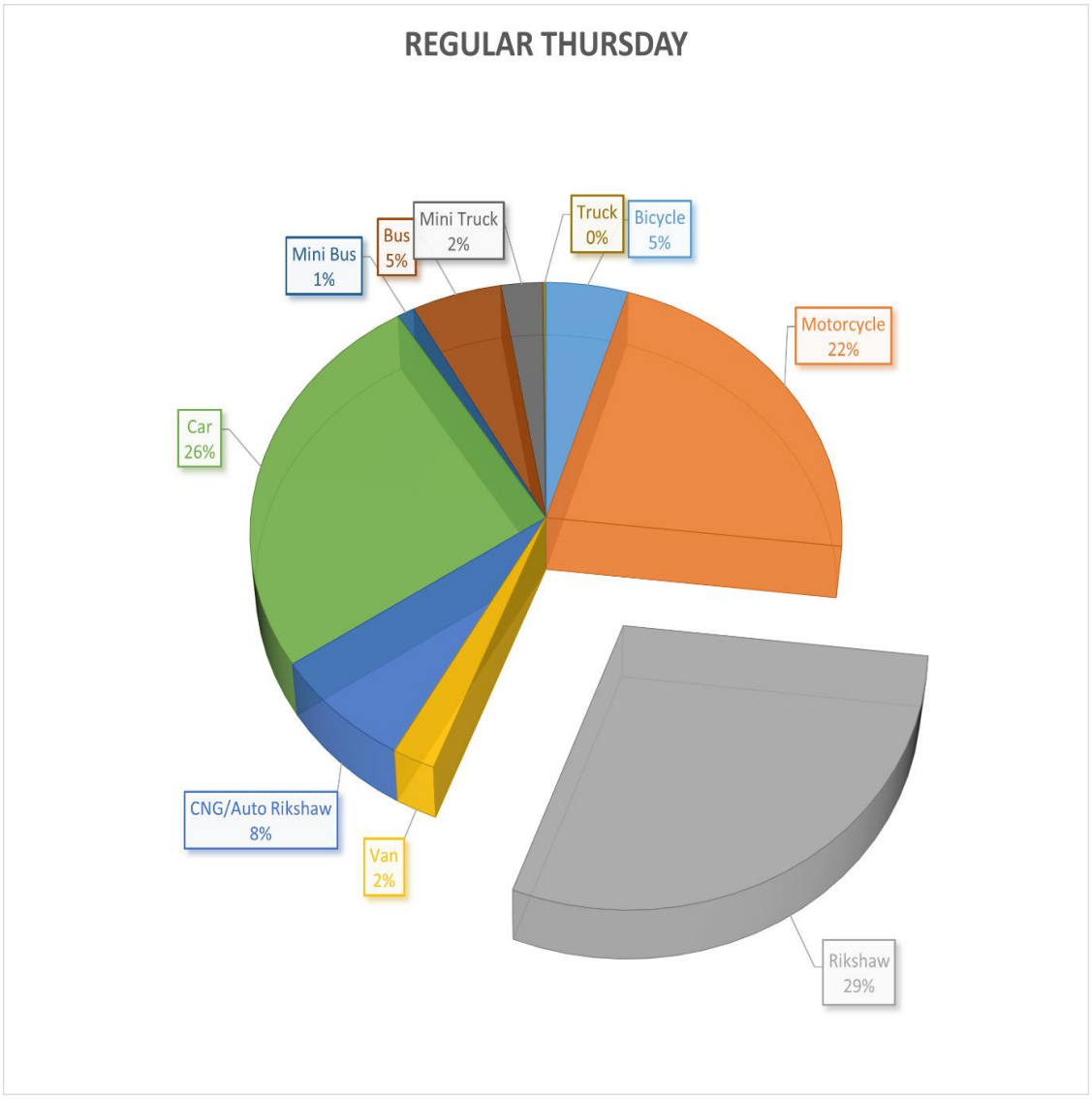


Figure 5.8: Percentage of vehicle at Mirpur 2 intersection

5.2.3 Friday (Holiday)

Mirpur 10–Mirpur 2: Friday being the weekly holiday, it is seen that the morning and evening hours are relatively high peak hours for all vehicles. Rickshaws account for the most vehicles, with 2519, followed by motorcycles with 1980. The second-highest number of vehicles is cars, with a total count of 1978. The evening peak hour is the busiest hour compared to the morning and afternoon peak hours. Following vans, minibuses, and mini trucks, the 2nd lowest number of vehicles in all peak hours. Trucks again had the lowest number of vehicles, with a total of 18 in the morning, afternoon, and evening. It is noticed that in the holiday season, motorcycles, rickshaws, CNG, and cars are the most used vehicles (***Figure 5.9).***

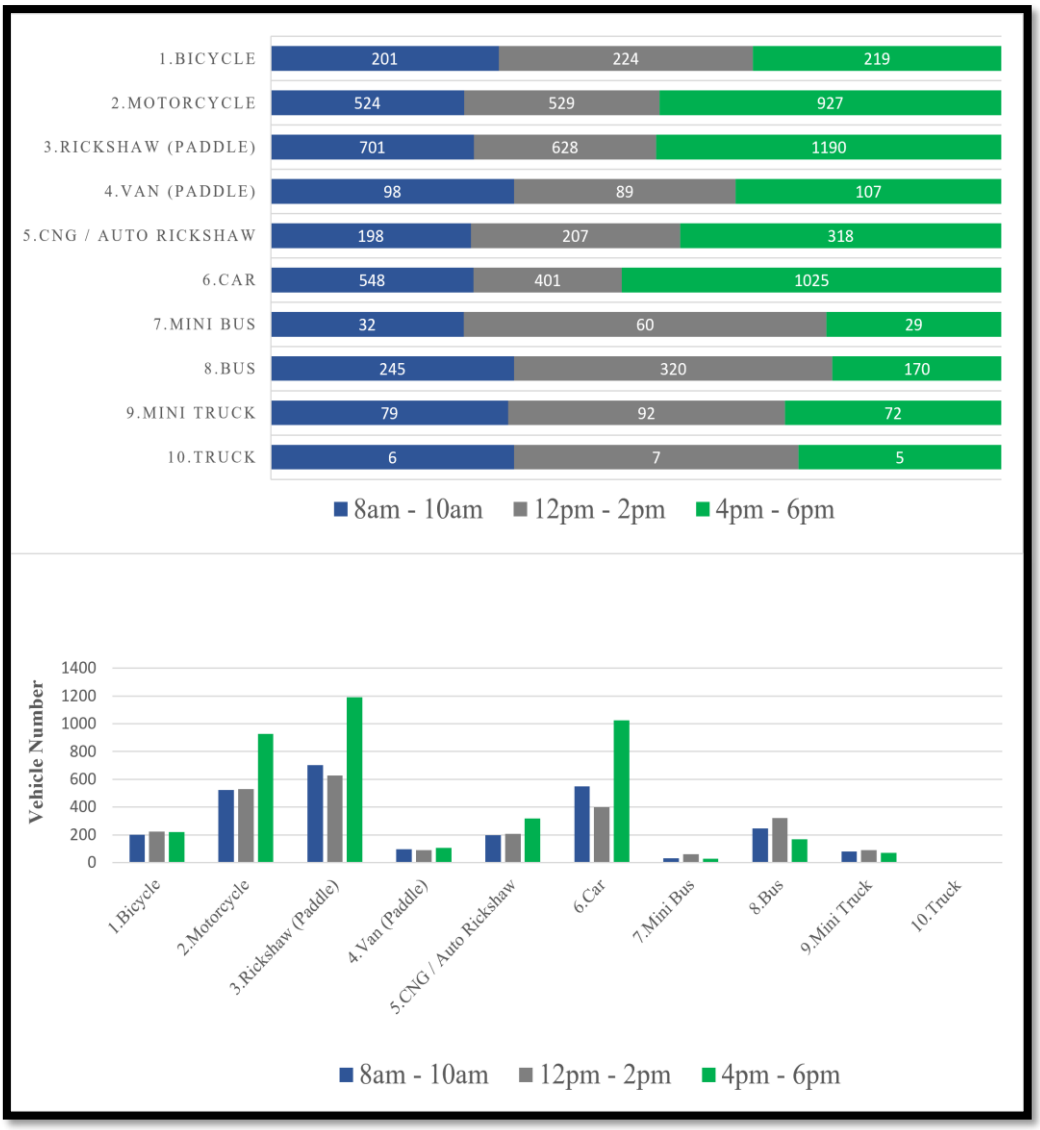


Figure 5.9: Mirpur 10 – Mirpur 2 (Friday)

Porsika Mor-Mirpur 2: This lane is the narrowest of the three lanes. The Paddle Rickshaw passes mostly in this lane. Which vehicle has the lowest speed and controls? It achieved first position in the morning, noon, and evening maximum rankings. The motorcycle is the second most common vehicle to pass through the Mirpur 2 intersection, utilizing this lane. Subsequently, the vacancy was for a motorbike. A smaller number of customers are using trucks owing to restrictions throughout the daytime. The number of vans and mini trucks was very equal at peak periods. The amount of bicycle and CNG traffic was about the same (***Figure 5.10).***

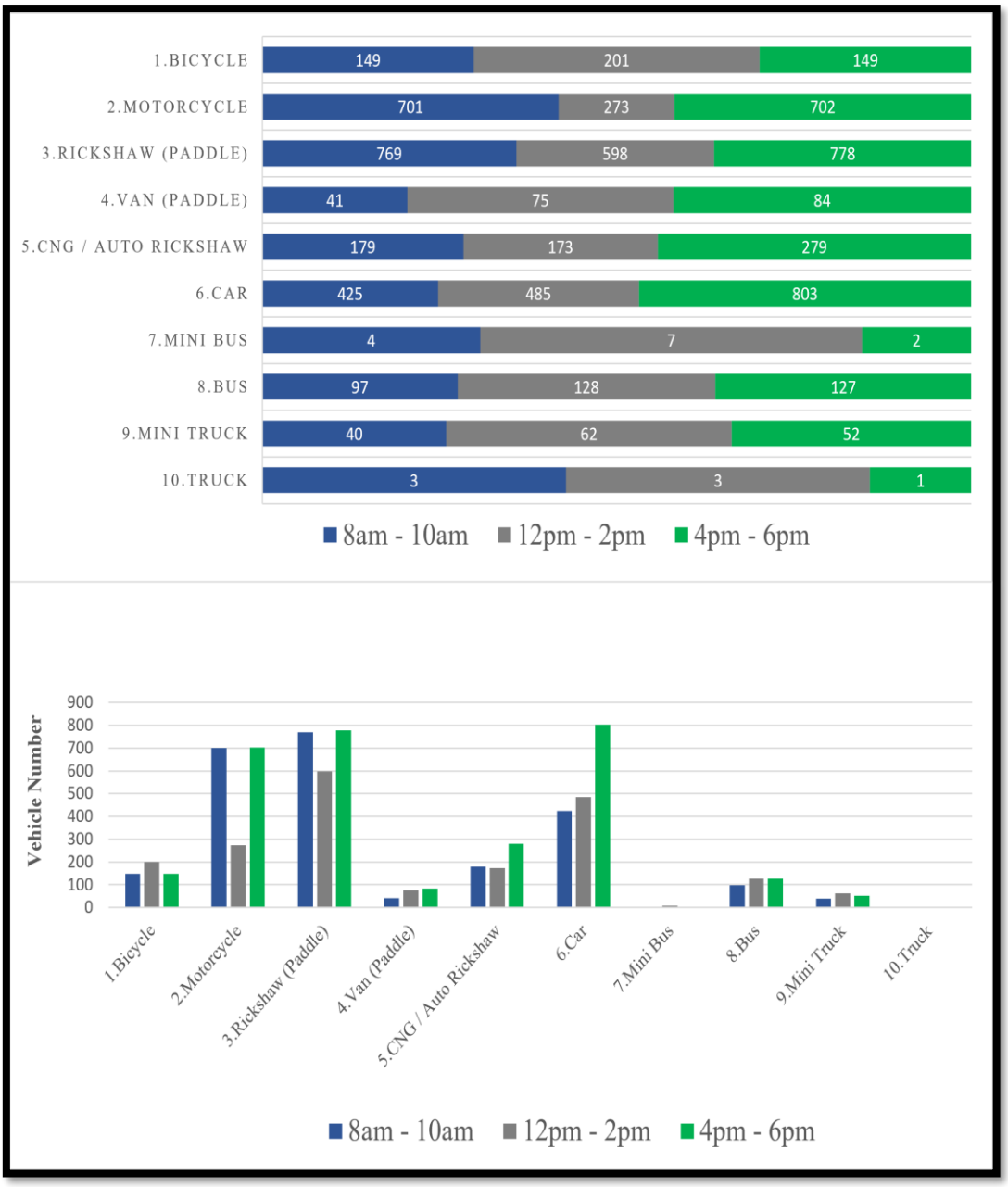


Figure 5.10: Porsika Mor – Mirpur 2 (Friday)

Mirpur 1–Mirpur 2: The most common vehicle in the evening was a car, with around 1310 discovered. The rest of the summits have the maximum number of cars, with 1206 and 1099 during midday and morning, respectively. During the afternoon peak, the number of paddle rickshaws and motorcycles is at its highest. The highest volume of motorcycles occurs in the midday, whereas the highest number of private CNG occurs in the midday. A moderate number of vehicles include paddle rickshaws, auto rickshaws, and bicycles. This lane has no effect on the minibus. Trucks, vans, mini

trucks, and mini buses are less prominent and have a lower impact during the three peaks (***Figure 5.11).***

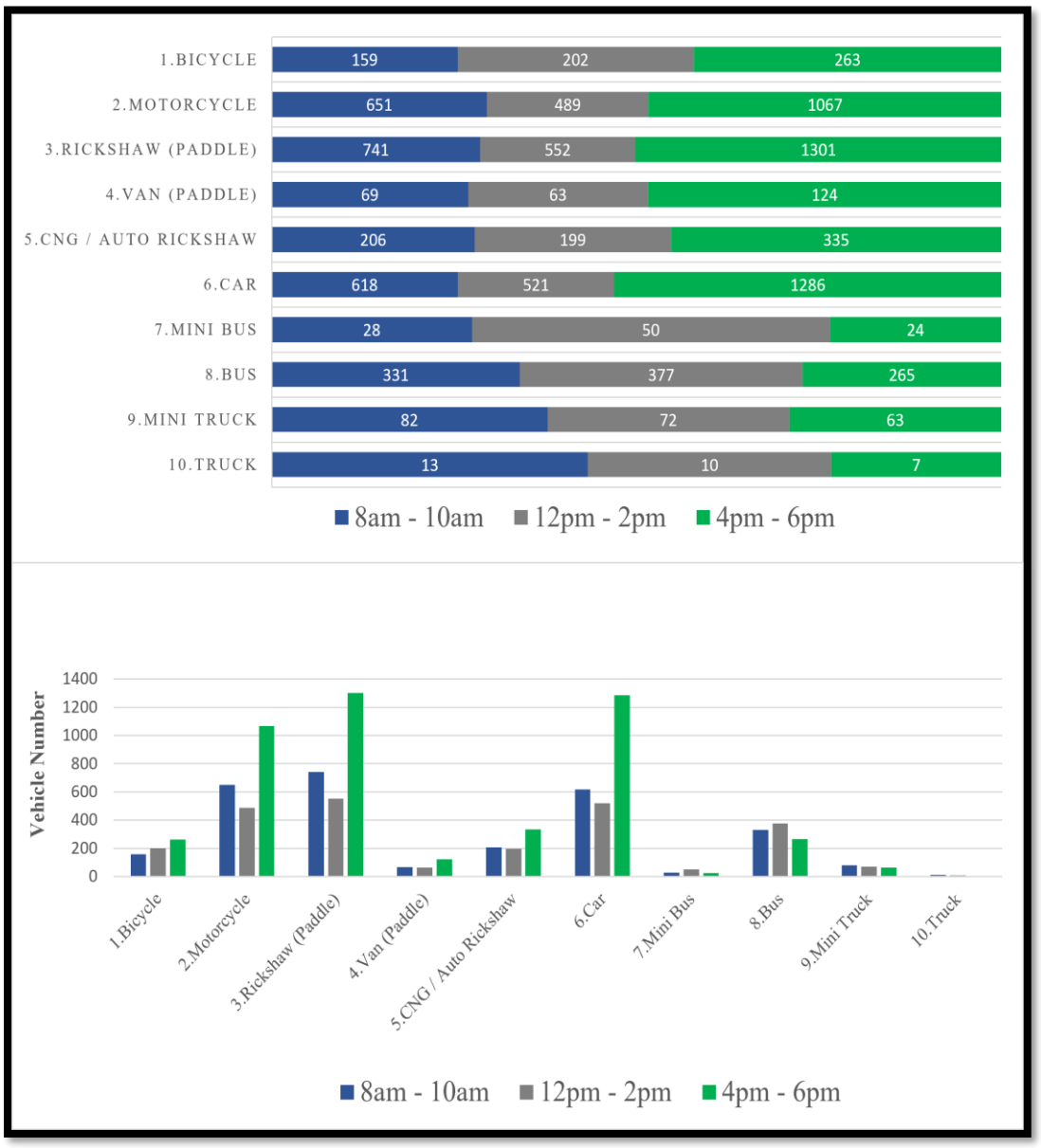


Figure 5.11: Mirpur 1 – Mirpur 2 (Friday)

Friday being the holiday, it is noticed that the rickshaw is the most used vehicle in the day, with a total amount of 27%. The majority of people use rickshaws during the holiday for outings and roaming. Motorcycles and cars are the second most commonly used vehicles, accounting for 22% and 21%, respectively. On holidays, generally, people use their own vehicles because private vehicles allow them to travel according to their own timing and schedule. Bus, CNG, and bicycle are being used in small amounts, with a total percentage of 8%, 8%, and 7%. Public transport lacks comfort,

time management, and is costly, so people do not feel comfortable enough to use public transport on a holiday. Trucks are also the lowest amount of vehicle used on that day.

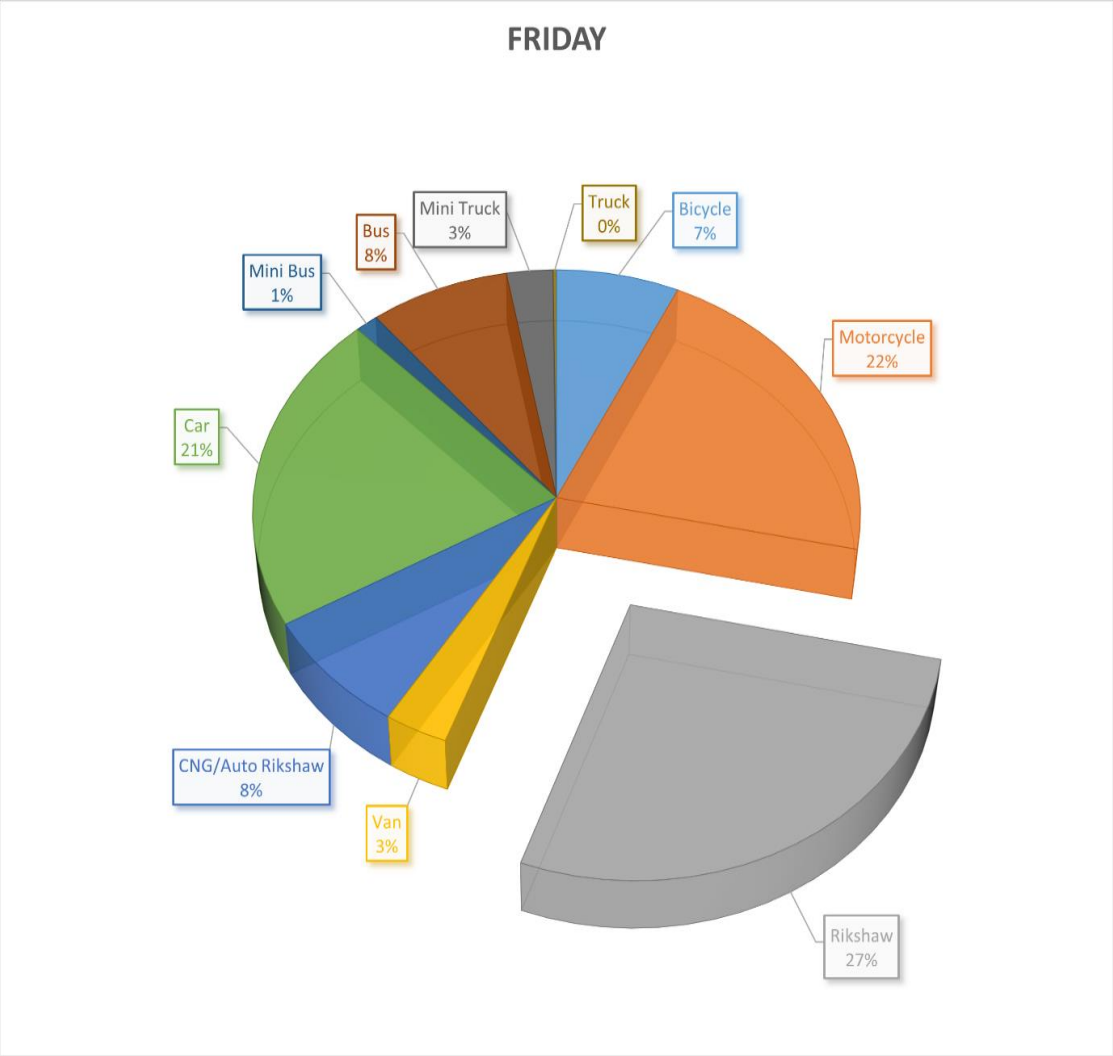


Figure 5.12: Percentage of vehicle at Mirpur 2

5.2.4 BAR CHART

The above bar chat illustrates information about the comparison in the amount of traffic on three different days. Three roadways are shown in the above chart. According to the chart on BPL final match day, it is seen that the highest number of vehicles passing through the direction of Mirpur 1-Mirpur 2 route with a total number of vehicles is 13143. A second large number of vehicles pass through on the route Mirpur 10-Mirpur 2, with total number of vehicles of 11322. Porsika Mor-Mirpur 2 route carries the

smallest number of vehicles that pass through on that route, with a total number of vehicles of 8179.

On a regular Thursday, it is seen that the Mirpur 1–Mirpur 2 route holds the highest number of vehicles passing through that direction, with a total of 12,256 vehicles. 11284 total vehicles pass through the Mirpur 10–Mirpur 2 route. As usual, the lowest number of vehicles passes through Porsika Mor-Mirpur 2, with total of 8977 vehicles.

Lastly, it is seen that on Friday, a total of 10168 vehicles passed through the Mirpur 1–Mirpur 2 route. In the route of Mirpur 10–Mirpur 2, the total number of vehicle passes is 9251. Porsika Mor-Mirpur 2 route holds the lowest number of vehicles, with a total of 7390 vehicles.

Analyzing the above details, it is noticed that in three different days, the number of vehicles passing through three different routes is almost the same. On three days, it is seen that Porsika Mor-Mirpur 2 holds the lowest number of vehicles that pass through on that route. And the highest number of vehicles passing on the same route in three different days is Mirpur 1–Mirpur 2.***(Figure 5.14)***

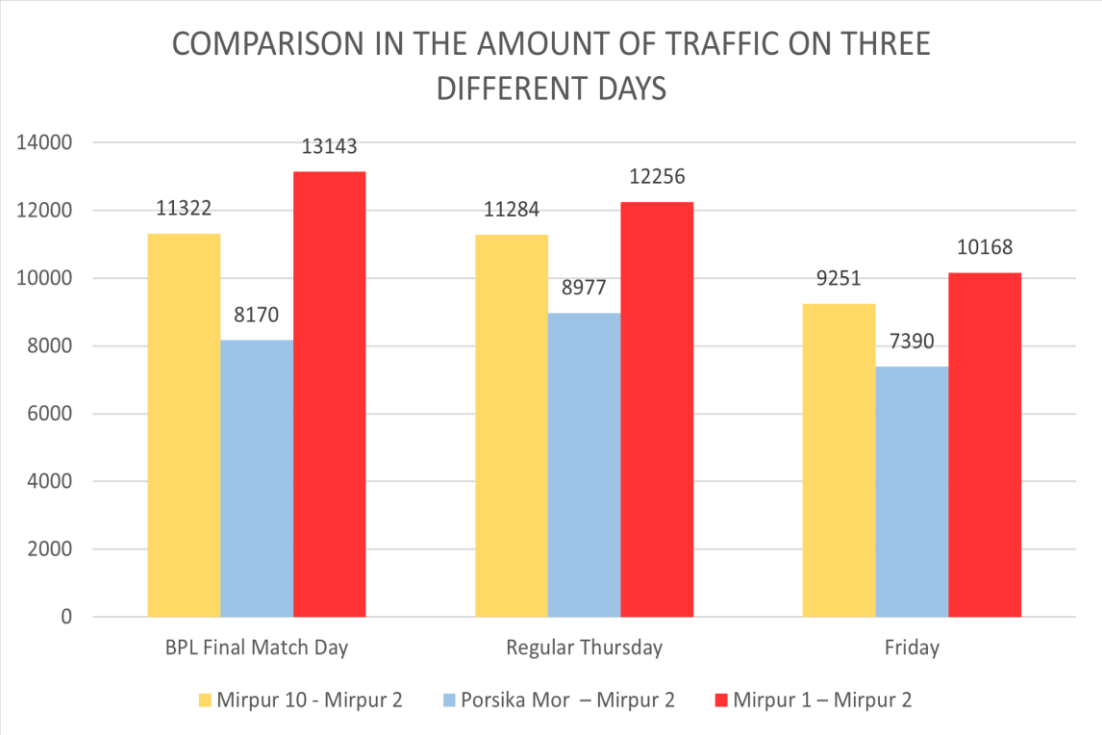


Figure 5.14: Comparison in the amount of traffic on three different days

5.3 Vehicle Types and Distribution

Ten types of vehicles were involved in our study. Some of motorized and some of are non-motorized vehicle. Such as:

1. Bi-cycle
2. Motorcycle
3. Rickshaw (Paddle)
4. Van (Paddle)
5. CNG/ Auto Rickshaw
6. Car
7. Mini Bus
8. Bus
9. Mini truck
10. Truck

5.3.1 Day wise Distribution

Rush Day (BPL Final Match Day)**:** During rush day, there is often an increase in the number of cars on the road, while in the evening, there tends to be a higher presence of delivery cars. The percentage was 32%.

Regular Day (Thursday)**:** Throughout the day, there is often a rise in the quantity of rickshaws on the road; however, in the evening, there is a greater prevalence of delivery rickshaws.

Holiday (Friday): The Rickshaw was the dominant vehicle on this day, with the highest percentage over other vehicles. The percentage of rickshaws was 27%. The car was the second-dominating vehicle, and its percentage was 21%.

5.4 Data Analysis (Approach Lane analysis)

5.4.1 Level of Service

The capacity was determined using a mathematical calculation. Flow-capacity ratios were used to determine the level of service (LOS) at various approaches to the intersection being investigated at different times of the day.

Tables 2, 3, and 4 represent the morning, afternoon, and evening peak periods, respectively. Here is the level of service with respect to the v/c ratio and PHF.

Table 5.1: Level of Service with respect to V/C Ratio at Mirpur 2 intersection

BPL FINAL MATCH DAY					
Morning Peak (8am - 10am)					
Lane Name	**Volume (PCU/h)**	**Capacity**	**V/C Ratio**	**LOS**	
Mirpur 10 - Mirpur 2	2565.38	3391.96	0.76	**D**	
Porsika Mor - Mirpur 2	2074.25	2785.71	0.74	**C**	
Mirpur 1 - Mirpur 2	3000.63	3528.54	0.85	**D**	
Afternoon Peak (12pm - 2pm)					
Mirpur 10 - Mirpur 2	2719.63	3444.73	0.79	**D**	
Porsika Mor - Mirpur 2	2278.63	2896.66	0.79	**D**	
Mirpur 1 - Mirpur 2	3048.75	3560.98	0.86	**D**	
Evening Peak (4pm - 6pm)					
Mirpur 10 - Mirpur 2	2576.63	3090.87	0.83	**D**	
Porsika Mor - Mirpur 2	1212.75	2724.14	0.45	**B**	
Mirpur 1 - Mirpur 2	3288.50	3087.52	1.07	**F**	
THURSDAY					
Morning Peak (8am - 10am)					
Mirpur 10 - Mirpur 2	2665.50	3513.31	0.76	**D**	
Porsika Mor - Mirpur 2	2186.38	2880.08	0.76	**D**	
Mirpur 1 - Mirpur 2	3086.75	3631.98	0.85	**D**	
Afternoon Peak (12pm - 2pm)					
Mirpur 10 - Mirpur 2	2455.25	3444.42	0.71	**C**	
Porsika Mor - Mirpur 2	1701.88	2835.15	0.60	**C**	**F**
Mirpur 1 - Mirpur 2	2627.63	3753.45	0.70	**C**	
Evening Peak (4pm - 6pm)					
Mirpur 10 - Mirpur 2	2911.13	3379.45	0.86	**D**	
Porsika Mor - Mirpur 2	2113.88	2910.36	0.73	**C**	
Mirpur 1 - Mirpur 2	3276.75	3570.31	0.92	**E**	
FRYDAY					
Morning Peak (8am - 10am)					
Mirpur 10 - Mirpur 2	2015.25	3164.98	0.64	**C**	
Porsika Mor - Mirpur 2	1636.75	2769.00	0.59	**C**	
Mirpur 1 - Mirpur 2	2209.63	3473.50	0.64	**C**	
Afternoon Peak (12pm - 2pm)					
Mirpur 10 - Mirpur 2	2034.00	3009.57	0.68	**C**	
Porsika Mor - Mirpur 2	1492.50	2750.28	0.54	**B**	
Mirpur 1 - Mirpur 2	1992.50	3398.51	0.59	**C**	
Evening Peak (4pm - 6pm)					
Mirpur 10 - Mirpur 2	2834.13	3432.58	0.83	**D**	
Porsika Mor - Mirpur 2	2012.63	2730.22	0.74	**C**	
Mirpur 1 - Mirpur 2	3306.25	3752.03	0.88	**D**	

Table 5.2: Level of Service with respect to PHF at Mirpur 2 intersection

BPL FINAL MATCH DAY					
Morning Peak (8am - 10am)					
Lane Name	**Volume (PCU/h)**	**Capacity**	**PHF**	**LOS**	
Mirpur 10 - Mirpur 2	2565.38	3391.96	0.85	**C**	
Porsika Mor - Mirpur 2	2074.25	2785.71	0.78	**B**	
Mirpur 1 - Mirpur 2	3000.63	3528.54	0.82	**C**	
Afternoon Peak (12pm - 2pm)					
Mirpur 10 - Mirpur 2	2719.63	3444.73	0.82	**C**	
Porsika Mor - Mirpur 2	2278.63	2896.66	0.79	**B**	
Mirpur 1 - Mirpur 2	3048.75	3560.98	0.86	**D**	
Evening Peak (4pm - 6pm)					
Mirpur 10 - Mirpur 2	2576.63	3090.87	0.82	**C**	
Porsika Mor - Mirpur 2	1212.75	2724.14	0.81	**C**	
Mirpur 1 - Mirpur 2	3288.50	3087.52	0.85	**C**	
THURSDAY					
Morning Peak (8am - 10am)					
Mirpur 10 - Mirpur 2	2665.50	3513.31	0.82	**C**	
Porsika Mor - Mirpur 2	2186.38	2880.08	0.81	**C**	
Mirpur 1 - Mirpur 2	3086.75	3631.98	0.86	**D**	
Afternoon Peak (12pm - 2pm)					
Mirpur 10 - Mirpur 2	2455.25	3444.42	0.79	**B**	**E**
Porsika Mor - Mirpur 2	1701.88	2835.15	0.95	**E**	
Mirpur 1 - Mirpur 2	2627.63	3753.45	0.83	**C**	
Evening Peak (4pm - 6pm)					
Mirpur 10 - Mirpur 2	2911.13	3379.45	0.85	**C**	
Porsika Mor - Mirpur 2	2113.88	2910.36	0.86	**D**	
Mirpur 1 - Mirpur 2	3276.75	3570.31	0.87	**D**	
FRYDAY					
Morning Peak (8am - 10am)					
Mirpur 10 - Mirpur 2	2015.25	3164.98	0.79	**B**	
Porsika Mor - Mirpur 2	1636.75	2769.00	0.79	**B**	
Mirpur 1 - Mirpur 2	2209.63	3473.50	0.88	**D**	
Afternoon Peak (12pm - 2pm)					
Mirpur 10 - Mirpur 2	2034.00	3009.57	0.82	**B**	
Porsika Mor - Mirpur 2	1492.50	2750.28	0.83	**C**	
Mirpur 1 - Mirpur 2	1992.50	3398.51	0.92	**E**	
Evening Peak (4pm - 6pm)					
Mirpur 10 - Mirpur 2	2834.13	3432.58	0.89	**D**	
Porsika Mor - Mirpur 2	2012.63	2730.22	0.86	**D**	
Mirpur 1 - Mirpur 2	3306.25	3752.03	0.88	**D**	

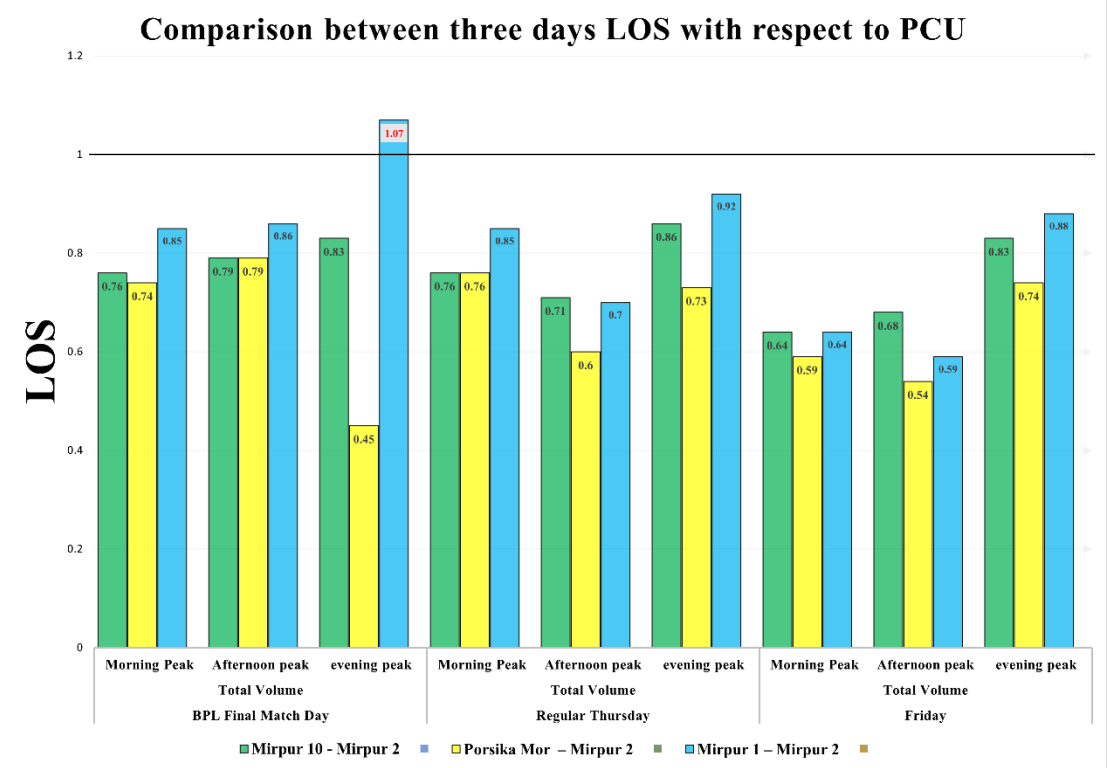


Figure 5.15: Comparison between three days LOS with respect to PHF

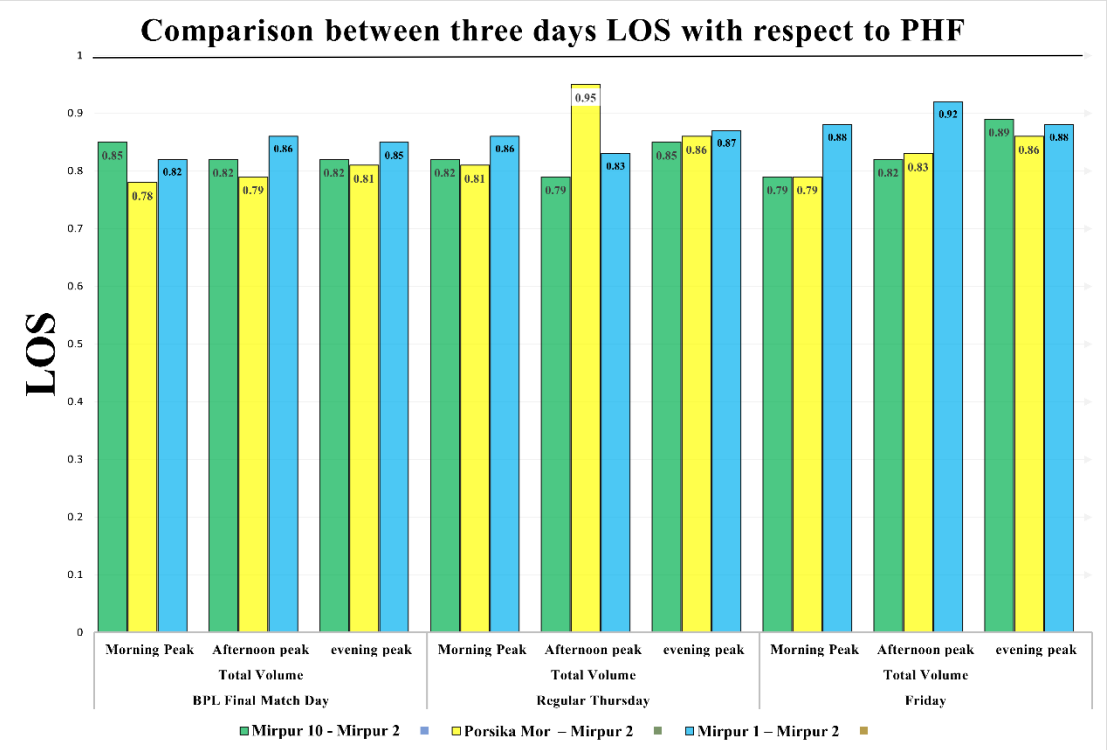


Figure 5.16: Comparison between three days LOS with respect to PHF

5.5 Analysis of Traffic Pattern

Capacity at three periods of high demand. The maximum level of service (LOS) on the Mirpur 1-Mirpur 2 lane during the evening peak on the BPL final match day is determined by the V/C ratio, as specified in ***Table 5.1***. Capacity was F, which represents the worst conditions with heavily congested flow and traffic demand exceeding capacity, characterized by stop-and-go waves, poor travel time, low comfort and convenience, and increased accident exposure.

The LOS detected by the PHF was E ***Table 5.2*** Porsika Mor-Mirpur 2 lane on Thursday afternoon and Mirpur 1-Mirpur 2 lane on Friday afternoon have their highest level of service (LOS) with respect to PHF. In the morning and evening peak hours, the LOS is also high. LOS E represents unstable flow near capacity. LOS E often changes to LOS F very quickly because of disturbances (road conditions, accidents, etc.) In traffic flow.

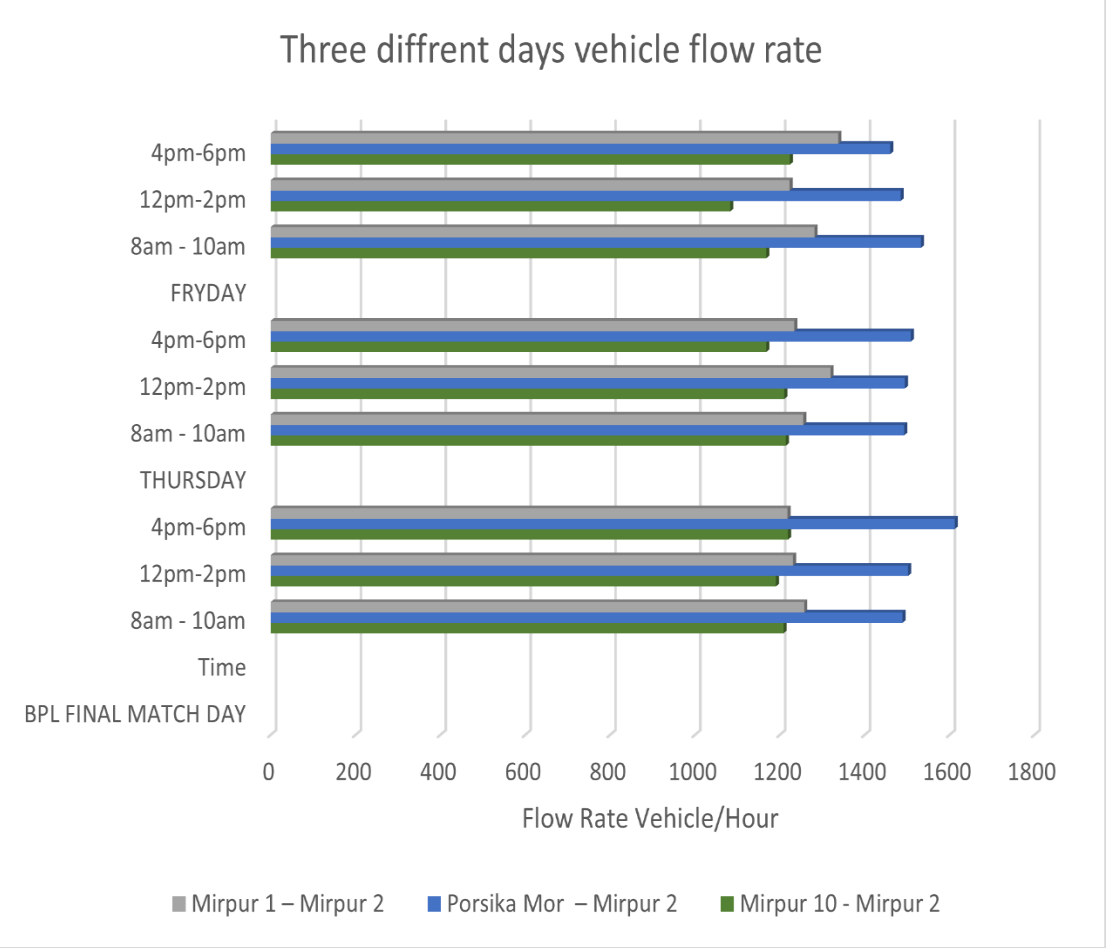


Figure 5.17 : Three Different Days Vehicle Flow rate

5.6 Suggestion

The time of traffic lights can be improved with the help of data-driven observations. Using real-time data, adaptive signal control systems can change signal cycles on the fly to meet changing traffic needs. Looking at past accident data at crossings lets you find areas with a lot of traffic. Projects try to teach both drivers and pedestrians how to behave safely, so everyone has a better idea of how to keep the roads safe. The goal of these programs is to teach both drivers and pedestrians how to behave responsibly so that the Mirpur 2 crossing can provide better service. As part of a complete urban transportation plan, it is important to set aside lines for slow-moving vehicle such as (paddle rickshaw and van) and place fixed bus stops in key places.

5.7 Challenges

Intersection congestion is a widespread problem in cities, which affects the effectiveness of transportation systems and the general well-being of citizens. This discourse examines the difficulties presented by the accumulation of traffic at intersections and proposes remedies to tackle this urgent issue. A lot of challenges are faced regularly at intersections. Here are the six most common challenges :

1. Delay travel time.
2. Safety Concern
3. Air quality and Environmental Impact
4. Economic Impacts
5. Urban Development Impact
6. Pedestrian and Cyclist Safety

5.8 Recommendations

Based on the study's results, the following suggestions can be made to make non signalized intersections and other roads in similar situations more accessible and help people get what they need.

1. A dedicated lane for every vehicle should be more effective to improve this non signalized intersection for suitable use.

2. Public awareness and programs to teach both drivers and walkers how to behave safely in the crossing.
3. Encourage the use of foot over bridge for pedestrian crossings.
4. Put up safety signs that are easy for drivers and walkers to see.
5. Mark the road with lines to show crosswalks, stop lines, and other important details.
6. Put up safety signs that are easy for drivers and walkers to see.
7. A large parking fine should be put in place.
8. It has been noticed that there is an illegal bus stop in the middle of this crossing, which causes severe problems including prolonged queue length, recurrent road accidents, and vendor related activities.
9. Local government should take those steps to better service in future for the road users.
10. Government should apply law to improve the level of service.
11. Low speed vehicle or non-motorized vehicle should remove from main road for smooth traffic service.

5.9 Limitations

An important and essential limitation of our investigation was the lack of signalized intersection. As a result, some statistics may show minor discrepancies from the actual data, which may be ignored.

The study was time-consuming and difficult to first collect video data and then manually count traffic volumes.

Innumerable pedestrians crossing unnecessarily in the middle of the road without crossing the foot over bridge was a sight to behold, which could have been a major cause of traffic congestion.

CHAPTER 6

Discussion and Conclusion

6.1 Discussion

6.1.1 Congestion Reason at Mirpur 2 Intersection

The fast process of urbanization and the expansion of the population in Mirpur have resulted in a rise in the number of vehicles owned and an increase in traffic volume. Congestion may occur when there is a significant demand for road space, particularly near intersections. Due to their slow speed, rickshaws could block the efficient movement of traffic. Frequently, they function at reduced velocities in contrast to motorized vehicles, resulting in congestion at intersections and on heavily trafficked highways. On BPL final match day, lots of car flow congestion was created at the Mirpur 2 intersection. Regular Thursday and Friday rickshaws are dominating vehicles because of congestion.

6.1.2 Effect of Congestion in Intersection

A fundamental disadvantage of uncontrolled or non-signalized intersections, also known as priority-controlled intersections, is their inability to provide explicit indicators to cars as they approach the intersection. The problem becomes more severe when less important movements on smaller roads result in substantial delays, impacting the overall efficiency of these crossings. The occurrence of this delay often leads to confrontations between vehicles, making it a significant factor in accidents and traffic congestion. When the Level of Service (LOS) is graded as F, it indicates a situation where cars are forced to go at very slow speeds inside the intersection. When considering the Mirpur 2 intersection, it is important to note that the nearby commercial and educational establishments generate a significant amount of traffic, which is a key factor in the consistently poor level of service (LOS). The recent occurrence of traffic congestion has exacerbated the sluggish movement of cars at this crossroads, particularly in specific lanes where the traffic volume exceeds their intended capacity. When the volume of traffic exceeds or drops below the maximum capacity of certain lanes, it results in vehicle crashes, reduced average speeds, and frequent unplanned

halts. As a consequence, congestion occurs as a result of both high traffic demand and ineffective road operations.

6.2 Conclusion

The objective of this study is to investigate the traffic characteristics at a major and non-signalized intersection and identify the LOS. The data analysis and findings indicate that the traffic at MIRPUR is characterized by a significant level of heterogeneity and a lack of lane discipline.

The highest number of dominant vehicles (cars) is found in the evening peak hour (4-6 p.m.) At MIRPUR 1-MIRPUR 2 on BPL final match day, with a total vehicle number of 1655. According to the V/C ratio (1.07) and PHF (0.85), the LOS are in the F and C categories, where LOS F means vehicles are being forced to move and speed of vehicles is low. On the other hand, in the morning and evening peak hours of the BPL final matchday V/C ratio and PHF, the LOS are A, B, C, and D, which are satisfactory compared to category F.

On the other hand, on a regular day like Thursday, in our study, we found the Rickshaw to be the most dominant vehicle, with a total number of 1281 in the route of Mirpur 1–Mirpur 2 in the evening peak (4-6 p.m.). Here, according to the V/C ratio (0.92) and PHF (0.87), the LOS are in the categories of E and D. E represents the unstable flow, and D represents high passing demand. All traffic from the other two approaches presents Level of Service categories A, B, and C. The categories represent the best category system for unstable flow with high passing demand.

Apparently, it is seen that the rickshaw is the most dominant vehicle on a weekday Friday, with a total number of vehicles consisting of 1301 in the route of Mirpur 1–Mirpur 2 in the evening hour peak. This study elicits that on a weekday, most people depend on public transport, which is available to all classes. Besides, a large number of people use this mode of transport to reach their destination. Here, according to the V/C ratio (0.88) and the PHF (0.88), the LOS is found to be both categories in D. On the other hand, the other route approaches the category from B, C, and D. Friday afternoon PHF shows high of that day Level of Service. Overall, this study finds that according to the peak hour factor method, the LOS of the Mirpur 1-Mirpur 2 intersection at the evening peak hour on Thursday is E at its highest peak (0.95). According to the V/C

ratio method, the LOS of the Mirpur 1-Mirpur 2 intersection at the evening peak hour on BPL day is in the F category. The final V/C ratio is F.

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APPENDIX

Table A. 1: Directional Traffic Volume Count and Find out PHF on BPL Final Match Day at Morning Peak

BPL Final (8 am to 10 am)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	161	109	179	0.5	40.25	27.25	44.75	0.0373	0.0286	0.0356
Motorcycle	776	665	882	0.75	291	249.375	330.75	0.1800	0.1746	0.1753
Rikshaw	1026	991	1119	2	1026	991	1119	0.2379	0.2602	0.2224
Van	82	48	93	4	164	96	186	0.0190	0.0126	0.0185
CNG/Auto Rikshaw	229	197	263	0.75	85.875	73.875	98.625	0.0531	0.0517	0.0523
Car	1099	778	1142	1	549.5	389	571	0.2549	0.2043	0.2269
Mini Bus	49	12	43	3	73.5	18	64.5	0.0114	0.0032	0.0085
Bus	188	113	327	3	282	169.5	490.5	0.0436	0.0297	0.0650
Mini Truck	39	47	68	2.5	48.75	58.75	85	0.0090	0.0123	0.0135
Truck	3	1	7	3	4.5	1.5	10.5	0.0007	0.0003	0.0014
Total	**3652**	**2961**	**4123**		**2565.375**	**2074.25**	**3000.625**	**0.85**	**0.78**	**0.82**
% of Bus	5.15	3.82	7.93	Levek of Service (LOS)				C	B	C
% of Truck	0.08	0.03	0.17							
Volume Count at highest 15 min	539	476	629							

Table A. 2: Directional Traffic Volume Count and Find out PHF on BPL Final Match Day at Afternoon Peak

BPL Final (12 pm to 2 pm)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	148	196	157	0.5	37	49	39.25	0.0305	0.0459	0.0309
Motorcycle	902	722	1032	0.75	338.25	270.75	387	0.1857	0.1690	0.2028
Rikshaw	1025	983	1109	2	1025	983	1109	0.2111	0.2301	0.2180
Van	68	67	46	4	136	134	92	0.0140	0.0157	0.0090
CNG/Auto Rikshaw	309	197	278	0.75	115.875	73.875	104.25	0.0636	0.0461	0.0546
Car	1206	1043	1300	1	603	521.5	650	0.2484	0.2441	0.2555
Mini Bus	35	4	29	3	52.5	6	43.5	0.0072	0.0009	0.0057
Bus	201	104	342	3	301.5	156	513	0.0414	0.0243	0.0672
Mini Truck	80	64	79	2.5	100	80	98.75	0.0165	0.0150	0.0155
Truck	7	3	8	3	10.5	4.5	12	0.0014	0.0007	0.0016
Total	**3981**	**3383**	**4380**		**2719.625**	**2278.625**	**3048.75**	**0.82**	**0.79**	**0.86**
% of Bus	5.05	3.07	7.81	Levek of Service (LOS)				C	B	D
% of Truck	0.18	0.09	0.18							
Volume Count at highest 15 min	607	534	636							

Table A. 3: Directional Traffic Volume Count and Find out PHF on BPL Final Match Day at Evening Peak

BPL Final (4 pm to 6 pm)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	109	97	166	0.5	27.25	24.25	41.5	0.0242	0.0428	0.0303
Motorcycle	620	273	771	0.75	232.5	102.375	289.125	0.1377	0.1206	0.1407
Rikshaw	988	511	1205	2	988	511	1205	0.2194	0.2257	0.2199
Van	70	23	61	4	140	46	122	0.0155	0.0102	0.0111
CNG/Auto Rikshaw	299	109	311	0.75	112.125	40.875	116.625	0.0664	0.0481	0.0568
Car	1310	726	1655	1	655	363	827.5	0.2909	0.3207	0.3020
Mini Bus	30	3	36	3	45	4.5	54	0.0067	0.0013	0.0066
Bus	180	61	348	3	270	91.5	522	0.0400	0.0269	0.0635
Mini Truck	71	21	79	2.5	88.75	26.25	98.75	0.0158	0.0093	0.0144
Truck	12	2	8	3	18	3	12	0.0027	0.0009	0.0015
Total	**3689**	**1826**	**4640**		**2576.625**	**1212.75**	**3288.5**	**0.82**	**0.81**	**0.85**
% of Bus	4.88	3.34	7.50	Levek of Service (LOS)				C	C	C
% of Truck	0.33	0.11	0.17							
Volume Count at highest 15 min	563	283	685							

Table A. 4: Directional Traffic Volume Count and Find out PHF on Regular Thursday at Morning Peak

Thursday (8 am to 10 am)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	170	137	150	0.5	42.5	34.25	37.5	0.0381	0.0335	0.0310
Motorcycle	725	930	1230	0.75	271.875	348.75	461.25	0.1624	0.2275	0.2541
Rikshaw	1170	1002	983	2	1170	1002	983	0.2621	0.2451	0.2031
Van	95	37	195	4	190	74	390	0.0213	0.0091	0.0403
CNG/Auto Rikshaw	273	211	256	0.75	102.375	79.125	96	0.0612	0.0516	0.0529
Car	926	808	889	1	463	404	444.5	0.2074	0.1977	0.1837
Mini Bus	37	10	43	3	55.5	15	64.5	0.0083	0.0024	0.0089
Bus	183	109	328	3	274.5	163.5	492	0.0410	0.0267	0.0678
Mini Truck	73	49	86	2.5	91.25	61.25	107.5	0.0164	0.0120	0.0178
Truck	3	3	7	3	4.5	4.5	10.5	0.0007	0.0007	0.0014
Total	**3655**	**3296**	**4167**		**2665.5**	**2186.375**	**3086.75**	**0.82**	**0.81**	**0.86**
% of Bus	5.01	3.31	7.87	Levek of Service (LOS)				C	C	D
% of Truck	0.08	0.09	0.17							
Volume Count at highest 15 min	558	511	605							

Table A. 5: Directional Traffic Volume Count and Find out PHF on Regular Thursday at Afternoon Peak

Thursday (12 pm to 2 pm)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	198	137	167	0.5	49.5	34.25	41.75	0.0453	0.0505	0.0386
Motorcycle	771	560	790	0.75	289.125	210	296.25	0.1765	0.2065	0.1825
Rikshaw	925	698	972	2	925	698	972	0.2118	0.2574	0.2246
Van	97	31	62	4	194	62	124	0.0222	0.0114	0.0143
CNG/Auto Rikshaw	271	209	267	0.75	101.625	78.375	100.125	0.0620	0.0771	0.0617
Car	873	763	901	1	436.5	381.5	450.5	0.1999	0.2813	0.2082
Mini Bus	36	6	51	3	54	9	76.5	0.0082	0.0022	0.0118
Bus	190	114	291	3	285	171	436.5	0.0435	0.0420	0.0672
Mini Truck	88	45	98	2.5	110	56.25	122.5	0.0201	0.0166	0.0226
Truck	7	1	5	3	10.5	1.5	7.5	0.0016	0.0004	0.0012
Total	**3456**	**2564**	**3604**		**2455.25**	**1701.875**	**2627.625**	**0.79**	**0.95**	**0.83**
% of Bus	5.50	4.45	8.07	Levek of Service (LOS)				B	E	C
% of Truck	0.20	0.04	0.14							
Volume Count at highest 15 min	546	339	541							

Table A. 6: Directional Traffic Volume Count and Find out PHF on Regular Thursday at Evening Peak

Thursday (4 pm to 6 pm)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	172	197	226	0.5	43	49.25	56.5	0.0349	0.0545	0.0441
Motorcycle	989	768	906	0.75	370.875	288	339.75	0.2007	0.2124	0.1767
Rikshaw	1179	1021	1281	2	1179	1021	1281	0.2392	0.2824	0.2498
Van	56	37	86	4	112	74	172	0.0114	0.0102	0.0168
CNG/Auto Rikshaw	298	211	346	0.75	111.75	79.125	129.75	0.0605	0.0584	0.0675
Car	1096	708	1135	1	548	354	567.5	0.2224	0.1958	0.2213
Mini Bus	40	11	49	3	60	16.5	73.5	0.0081	0.0030	0.0096
Bus	220	103	339	3	330	154.5	508.5	0.0446	0.0285	0.0661
Mini Truck	112	56	109	2.5	140	70	136.25	0.0227	0.0155	0.0213
Truck	11	5	8	3	16.5	7.5	12	0.0022	0.0014	0.0016
Total	**4173**	**3117**	**4485**		**2911.125**	**2113.875**	**3276.75**	**0.85**	**0.86**	**0.87**
% of Bus	5.27	3.30	7.56	Levek of Service (LOS)				C	D	D
% of Truck	0.26	0.16	0.18							
Volume Count at highest 15 min	616	452	641							

Table A. 7: Directional Traffic Volume Count and Find out PHF on Friday at Morning Peak

Friday (8 am to 10 am)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	201	149	159	0.5	50.25	37.25	39.75	0.0604	0.0490	0.0480
Motorcycle	524	701	651	0.75	196.5	262.875	244.125	0.1575	0.2306	0.1966
Rikshaw	701	769	741	2	701	769	741	0.2106	0.2530	0.2237
Van	98	41	69	4	196	82	138	0.0294	0.0135	0.0208
CNG/Auto Rikshaw	198	179	206	0.75	74.25	67.125	77.25	0.0595	0.0589	0.0622
Car	548	425	618	1	274	212.5	309	0.1647	0.1398	0.1866
Mini Bus	32	4	28	3	48	6	42	0.0096	0.0013	0.0085
Bus	245	97	331	3	367.5	145.5	496.5	0.0736	0.0319	0.0999
Mini Truck	79	40	82	2.5	98.75	50	102.5	0.0237	0.0132	0.0248
Truck	6	3	13	3	9	4.5	19.5	0.0018	0.0010	0.0039
Total	**2632**	**2408**	**2898**		**2015.25**	**1636.75**	**2209.625**	**0.79**	**0.79**	**0.88**
% of Bus	9.31	4.03	11.42	Levek of Service (LOS)				B	B	D
% of Truck	0.23	0.12	0.45							
Volume Count at highest 15 min	416	380	414							

Table A. 8: Directional Traffic Volume Count and Find out PHF on Friday at Afternoon Peak

Friday (12 pm to 2 pm)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	224	201	202	0.5	56	50.25	50.5	0.0718	0.0835	0.0730
Motorcycle	529	273	489	0.75	198.375	102.375	183.375	0.1696	0.1134	0.1767
Rikshaw	628	598	552	2	628	598	552	0.2013	0.2483	0.1994
Van	89	75	63	4	178	150	126	0.0285	0.0311	0.0228
CNG/Auto Rikshaw	207	173	199	0.75	77.625	64.875	74.625	0.0663	0.0718	0.0719
Car	401	485	521	1	200.5	242.5	260.5	0.1285	0.2014	0.1882
Mini Bus	60	7	50	3	90	10.5	75	0.0192	0.0029	0.0181
Bus	320	128	377	3	480	192	565.5	0.1026	0.0532	0.1362
Mini Truck	92	62	72	2.5	115	77.5	90	0.0295	0.0257	0.0260
Truck	7	3	10	3	10.5	4.5	15	0.0022	0.0012	0.0036
Total	**2557**	**2005**	**2535**		**2034**	**1492.5**	**1992.5**	**0.82**	**0.83**	**0.92**
% of Bus	12.51	6.38	14.87	Levek of Service (LOS)				B	C	E
% of Truck	0.27	0.15	0.39							
Volume Count at highest 15 min	390	301	346							

Table A. 9: Directional Traffic Volume Count and Find out PHF on Friday at Evening Peak

Friday (4 pm to 6 pm)					PCU/hr			PHF		
Vehicle type	Mirpur 10 - Mirpur 12	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	PCE	Mirpur 10 - Mirpur 12	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2	Mirpur 10 - Mirpur 12	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
Bicycle	219	149	263	0.5	54.75	37.25	65.75	0.0479	0.0431	0.0486
Motorcycle	927	702	1067	0.75	347.625	263.25	400.125	0.2029	0.2031	0.1973
Rikshaw	1190	778	1301	2	1190	778	1301	0.2605	0.2251	0.2406
Van	107	84	124	4	214	168	248	0.0234	0.0243	0.0229
CNG/Auto Rikshaw	318	279	335	0.75	119.25	104.625	125.625	0.0696	0.0807	0.0619
Car	1025	803	1286	1	512.5	401.5	643	0.2244	0.2323	0.2378
Mini Bus	29	2	24	3	43.5	3	36	0.0063	0.0006	0.0044
Bus	170	127	265	3	255	190.5	397.5	0.0372	0.0367	0.0490
Mini Truck	72	52	63	2.5	90	65	78.75	0.0158	0.0150	0.0116
Truck	5	1	7	3	7.5	1.5	10.5	0.0011	0.0003	0.0013
Total	**4062**	**2977**	**4735**		**2834.125**	**2012.625**	**3306.25**	**0.89**	**0.86**	**0.88**
% of Bus	4.19	4.27	5.60	Levek of Service (LOS)				D	D	D
% of Truck	0.12	0.03	0.15							
Volume Count at highest 15 min	571	432	676							

Table A. 10: Find out Saturation flow and v/c ratio on BPL Final Match Day at Morning Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.05	1.04	1.07
fg	1	1	1
fp	1	1	1
fbb	0.82	0.84	0.69
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1208.84	1489.17	1257.51
C (s)	201		
g (s)	188		
N (ln)	3	2	3
c (pcu/hr)	3391.96	2785.71	3528.54
v (pcu/hr)	2565.375	2074.25	3000.625
v/c	0.76	0.74	0.85
LOS	D	C	D

Table A. 11: Find out Saturation flow and v/c ratio on BPL Final Match Day at Afternoon Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.05	1.03	1.07
fg	1	1	1
fp	1	1	1
fbb	0.81	0.85	0.68
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1191.00	1502.26	1231.19
C (s)	195		
g (s)	188		
N (ln)	3	2	3
c (pcu/hr)	3444.73	2896.66	3560.98
v (pcu/hr)	2719.625	2278.625	3048.75
v/c	0.79	0.79	0.86
LOS	D	D	D

Table A. 12: Find out Saturation flow and v/c ratio on BPL Final Match Day at Evening Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.05	1.03	1.07
fg	1	1	1
fp	1	1	1
fbb	0.83	0.91	0.68
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1219.53	1612.25	1218.21
C (s)	232		
g (s)	196		
N (ln)	3	2	3
c (pcu/hr)	3090.87	2724.14	3087.52
v (pcu/hr)	2576.625	1212.75	3288.5
v/c	0.83	0.45	1.07
LOS	D	B	F

Table A. 13: Find out Saturation flow and v/c ratio on Regular Thursday at Morning Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.05	1.03	1.07
fg	1	1	1
fp	1	1	1
fbb	0.83	0.85	0.69
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1214.25	1493.09	1255.26
C (s)	197		
g (s)	190		
N (ln)	3	2	3
c (pcu/hr)	3513.31	2880.08	3631.98
v (pcu/hr)	2665.5	2186.375	3086.75
v/c	0.76	0.76	0.85
LOS	D	D	D

Table A. 14: Find out Saturation flow and v/c ratio on Regular Thursday at Afternoon Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.05	1.04	1.07
fg	1	1	1
fp	1	1	1
fbb	0.82	0.84	0.73
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1210.77	1494.90	1319.39
C (s)	174		
g (s)	165		
N (ln)	3	2	3
c (pcu/hr)	3444.42	2835.15	3753.45
v (pcu/hr)	2455.25	1701.875	2627.625
v/c	0.71	0.60	0.70
LOS	C	C	C

Table A. 15: Find out Saturation flow and v/c ratio on Regular Thursday at Evening Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.05	1.03	1.07
fg	1	1	1
fp	1	1	1
fbb	0.79	0.86	0.68
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1167.99	1508.79	1233.95
C (s)	197		
g (s)	190		
N (ln)	3	2	3
c (pcu/hr)	3379.45	2910.36	3570.31
v (pcu/hr)	2911.125	2113.875	3276.75
v/c	0.86	0.73	0.92
LOS	D	C	E

Table A. 16: Find out Saturation flow and v/c ratio on Friday at Morning Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.08	1.04	1.10
fg	1	1	1
fp	1	1	1
fbb	0.77	0.86	0.69
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1168.03	1532.84	1281.89
C (s)	155		
g (s)	140		
N (ln)	3	2	3
c (pcu/hr)	3164.98	2769.00	3473.50
v (pcu/hr)	2015.25	1636.75	2209.625
v/c	0.64	0.59	0.64
LOS	C	C	C

Table A. 17: Find out Saturation flow and v/c ratio on Friday at Afternoon Peak

Time	Mirpur 10 - Mirpur 2	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.11	1.06	1.12
fg	1	1	1
fp	1	1	1
fbb	0.70	0.82	0.65
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1083.15	1484.75	1223.13
C (s)	149		
g (s)	138		
N (ln)	3	2	3
c (pcu/hr)	3009.57	2750.28	3398.51
v (pcu/hr)	2034	1492.5	1992.5
v/c	0.68	0.54	0.59
LOS	C	B	C

Table A. 18: Find out Saturation flow and v/c ratio on Friday at Evening Peak

Time	Mirpur 10 - Mirpur 12	Porsika Mor – Mirpur 2	Mirpur 1 – Mirpur 2
SO	1800	1800	1800
fw	1	1	1
fHV	1.04	1.04	1.05
fg	1	1	1
fp	1	1	1
fbb	0.84	0.82	0.75
fa	0.95	0.95	0.95
fLU	1	1	1
fLT	0.95	1.0	1.0
fRT	0.85	0.99	0.99
fLpb	1	1	1
fRpb	1	1	1
s (veh/h/ln)	1223.89	1460.19	1337.79
C (s)	215		
g (s)	201		
N (ln)	3	2	3
c (pcu/hr)	3432.58	2730.22	3752.03
v (pcu/hr)	2834.125	2012.625	3306.25
v/c	0.83	0.74	0.88
LOS	D	C	D