A STUDY ON INTEGRATION OF PROPOSED PUBLIC BUS ROUTE NETWORK WITH BRT AND MRT SYSTEM IN DHAKA CITY

Master of Urban and Regional Planning

Submitted By

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Session: October 2018

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Dhaka, Bangladesh

November, 2022

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ACKNOWLEDGEMENT

At first, all praise belongs to Almighty Allah, the most merciful, the most beneficent for giving me the ability to complete the study.

It is my greatest pleasure to acknowledge my heartiest gratitude and indebtedness to my supervisor, Dr. Mohammad Shakil Akther, Professor, Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology for his constant supervision, continuous guidance, invaluable suggestions, and strong support at all stages of this research work. To be true, it was really a tough task to complete the study. It has happened only because I was fortunate to work under his supervision.

I express my gratitude to the honorable defense committee members and external for their valuable comments and suggestions which directed me the right way in successful completion of the study.

Along with this, I would express my heartiest thanks to the officials of Dhaka Transport Coordination Authority (DTCA), Rajdhani Unnayan Kartipakkha (RAJUK), Dhaka Mass Transit Company Limited (DMTCL), Dhaka Bus Rapid Transit Company Ltd. (Dhaka BRT), and Bangladesh Road Transport Authority (BRTA) for helping me by providing necessary data, documents and supporting materials in completion of the thesis.

Last but not the least; I express my limitless gratefulness and indebtedness to my parents, my husband Yejaj, my brother, sister-in-law, my niece Raha and my in-laws for their continuous support and encouragement and cooperation to complete this research. Without their continuous support, successful completion of this study could not be thought of.

Further I would like to express my thanks to my colleagues and friends who cheered me and supported me during the whole journey.

ABSTRACT

The public transportation system greatly influences the total effectiveness of any city's transportation system. A well-developed public transportation infrastructure can aid the economic growth of a city. Public buses offer a flexible mode of public transportation that can accommodate a range of needy individuals across the metropolis. Congestion, poor traffic management, high accident rates, and a growing pollution issue, however, are depicted public bus service scenario in Dhaka's. Earlier in Dhaka public buses are Dhaka's only means of mass transportation, many people rely on them every day, but in recent days MRT is also included.

The study focuses on the integration of various public transit network in Dhaka city. In Dhaka along with existing bus route network, several transit projects are taken such as MRT 1, 6, 5 and BRT 3. These transit projects have their own operation plans. However, none of them mentioned about integration with other transit services. Following this, this study attempted to work on the integration aspect of transit services considering their designed operational characteristics.

Based on this, the study has three major objectives. In the first objective the study tried to review the ongoing and proposed transit projects following their operational and network characteristics, after that, in the second objective the traffic impact of rationalized bus route network on BRT and MRT corridor has been studied. Following these, on the third objective an integrated transit network system has been developed considering their operational aspects.

To pursue the activities for achieving first objective, the operation plans of different services have been reviewed and discussed along with this, the network overlapping ratio following intra and inter network are studied. Apart from this, using the network analyst tool of ArcGIS, service areas around transit stops are developed and the access road density and structure density are studied. However, in case of second objective, following the overlapping ratio of rationalized bus routes along with BRT and MRT services, the bus routes were grouped into different categories. After that, based on their fleet distribution the transit traffic impacts of BRT, MRT corridors was analyzed. Following this, buffer areas around transit corridors were developed and the distribution of different land use categories within these areas were studied. Lastly, on the third objective, a macro simulation model using future (year 2035) peak hour transit travel demand matrix has been developed, on which different transit network combinations have been studied and the traffic impact of integration on networks are studied.

As a part of the study, it has been found out, that, the accessibility rationalized network is better than the existing one. Along with this, the existing network has higher overlapping ratio (both intra and inter) than rationalized one. Apart from this, following the coverage issue, rationalized network has better spatial coverage than existing one. Moreover, around the BRT and MRT lines, there is a greater concentration of mixed-use, residential, and industrial land use than there is of other land uses. However, owing to their alignment, MRT 6 and MRT 1 also have high percentages of vacant lands.

In case of macro-simulation model, first scenario developed considering only existing bus routes (base scenario), and on this scenario the number of transit trips is the highest among all scenarios. The trip number stays nearly the same as the basic one when considering current bus routes that connect to MRT lines 1, 5, and 6. Although there are significant operational speed, transfer fee, and per-kilometer fare differences between the MRT system and bus, transit users still favor both in a comparable way, and the load factor value of 2.12 makes this the best fit scenario. However, the alignment plan of the rationalized routes caused the network of bus routes to receive 93% fewer trips than the current bus route network. Along with this, while considering BRT network with rationalized bus routes, it seems that, the transit trip number from rationalized base scenario increased by 43%, and with MRT it increased by 81%, and with both MRT and BRT, the value increased by 93%. To conclude, it can be said that, although the current network has operational and functional limitations, it still serves the purpose better when considering fleet alignments and distribution.

ABBREVIATIONS

BRT	Bus Rapid Transit
MRT	Mass Rapid Transit
PHPDT	Peak Hour Peak Direction Traffic
Pax.Km	Passenger Kilometer
Kmph	Kilometers per Hour
Km	Kilometer
DMTCL	Dhaka Mass Rapid Transit Company Limited
DBRT	Dhaka Bus Rapid Transit Company Limited
BRTA	Bangladesh Road Transport Authority
BRTC	Bureau of Research, Testing and Consultation
TTC	Travel Time Cost
DTCA	Dhaka Transport Coordination Authority

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Chapter 1: Introduction

1.1. Background of the Study

The efficient operation of a city is significantly influenced by the transportation sector. It is an essential element of city life. With a population of over 14.4 million, Dhaka is one of the world's most populated cities. Both motorized and non- motorized modes of transportation operate in Dhaka. However public buses are the only form of mass transit in Dhaka, and it accounts for 30% of the total number of trips (RAJUK, 2015).

The need for public transportation is growing in this metropolis along with the population. In response to this problem, the government has undertaken many urban transport projects. The latest of these plans calls for development of two BRT and five MRT systems in Dhaka.

Due to limitations in infrastructure and operational strategy, Dhaka's current public bus service is regarded as an inefficient service (Infrastructure Investment Facilitation Company (IIFC), 2020). The government has started a project to rearrange the current bus routes to make it more effective and to assure maximum accessibility, geographic coverage, and operational efficiency. The public bus service would be affected by the introduction of the BRT and MRT networks.

Due to proximity and route overlap, these buses may complement and supplement the BRT and MRT systems, but they also frequently would compete with them. In this case, creating an integrated system that considers all three transit options is important. The integration of a network of several transit providers is a widespread practice worldwide. It's typical to combine feeder routes with trunk lines and to integrate the tariff system.

1.2. Rationale of the Study

In emerging cities, where people's need for mobility is growing due to rapid urbanization, public bus service plays a key role in carrying a sizable number of people. To meet the needs of the expanding population and to improve the quality of life for the citizens of a city like Dhaka, the public bus system must run smoothly and effectively.

Studies that have already been done on the Dhaka public transportation system’s focusing on issues such as service facilities and demand-supply management (Ahsan, 2013; Jahan, Bushra,

& Sayeed, 2011). However, none of them concentrate on how the bus network's operating features might alter if BRT and MRT systems are implemented and put into use.

This study seeks to evaluate the impact of MRT, and BRT systems on public transport network considering bus routes. Since Dhaka's public bus system is the only form of public transportation, it should function in a way that will allow it to adapt to new transit facilities when they are introduced. To build strategies for operating public buses in a new environment, this study might be beneficial.

1.3. Objectives of the Study

The aim of this research is to develop an integrated public transport network for Dhaka by comparing and evaluating the different integration options of proposed public transportation system of Dhaka. Considering that the following objectives are set for the study.

i. To review the proposed and on-going transit projects and programs in Dhaka city.

ii. To predict and assess the impacts of BRT and MRT network on proposed bus route network in terms of traffic volume.

iii. To develop an integrated operational network considering all three transit services where minimum travel cost and transfers would be prioritized.

1.4. Scope of the Study

In this study, the operational and network characteristics of ongoing and proposed transit systems, including the proposed BRT Line 3, MRT Lines 1, 5, and 6, and existing and proposed rationalized bus routes, were examined. The traffic impact on various transport corridors were examined also, allowing for the creation of a comparative scenario.

After that, as part of the study, a macro transit demand model with eight scenarios was created, from which it was deduced that the distribution of transit traffic varies with the addition of each transit service.

It was expected that this study will aid in understanding the relationships between the proposed bus route network and the BRT and MRT routes as well as how the bus route network will change after the BRT and MRT services begin to run. To make decisions on integrating transit services in the future, policy makers and authorities of various government agencies would benefit from the study.

1.5. Limitation of the Study

In this study, secondary data were used. The on-going and proposed transit projects are reviewed following the available reports and GIS database. Following this, the travel-demand macro simulation model is formulated, and traffic impact analysis is done. In the simulation the model the traditional BPR function has been used for congestion analysis and it could not get customed following indigenous characteristics, as this was not within the scope of the study.

Apart from that, the study focuses on the projected data following the RSTP 2016-2035 database, as the projection values can be changed with the progression of time, this was addressed in this study by incorporating the traffic growth factor values within the projected matrices. Due to time constraints and shortage of manpower, primary surveys could not be conducted to collect updated data. Along with this, as the operational and construction activities of MRT Line 2,4 and BRT Line 7 has not been started yet that is why, this study does not include any of this in its scope.

Chapter 2: Literature Review and Theoretical Framework

Any transportation system would not be complete without transit services. Any city's transportation system plays some role in determining its economic growth. Therefore, it is crucial to have a functioning transit system to guarantee the efficient flow of heavy traffic. In this study, the current transit initiatives are examined, and an attempt has been made to create an integrated transit network. A variety of journals, books, published and unpublished papers, regulations, and earlier research have been examined for this purpose to gain a better understanding of the concepts relating to the applications of network integration and impact assessment in transportation planning. The theoretical underpinnings of this study and understanding of network integration measures were shaped by these literature evaluations.

2.1. Review of Transit Projects

Impact of transit projects can be evaluated in two ways, which are operational effects and indirect strategic effects. In case of operational effects travel time, modal shifts and ridership are meant. Whereas on indirect strategic effect, price of surrounding land uses, and urban development was meant.

In comparison with other transit projects BRT can be a better option as higher ridership and property values can be achieved at a low cost (Ingvardson & Nielsen, 2017). However, in many studies it was seen that the price of lands surrounding the transit stations had little impact as the transit projects were announced for commencement (Stokenberga, 2014; Lee, 2022; Gatzlaff & Smith, 1993).

Stutsman in 2002 found that to compare the LRT and BRT on the same corridor major impact study (MIS), environmental impact study (EIS) along with operational characteristics of transits such as ridership, community-political response, cost effectiveness required to be known for all the modes. Apart from this,the study also indicated that, LRT is better than BRT in terms of noise and traffic and it has new riders whereas, BRT is somewhat cost-effective. Zhang in 2009 studied that, whether to develop bus or rail system in the same corridor is a matter of meta-analysis. The transit operation has impact on land use prices and ridership which eventually influences the revenue earning and investments.

However, prioritization among transit projects is quite common, while doing this, practitioners all over the world follow certain criteria which are integration with other mode of transport,

congestion, network effect, project interdependencies and so on (Nagorsky, Sabag, Emerson, & Hewitt, 2016).

Wirasinghe, et al. in 2013 studied that, while reviewing any BRT system some operational characteristics such as running ways, vehicles, operation control, stations, fare collection system, passenger information system require to be reviewed. Moreover, safety, capacity, accessibility, reliability ensures whether a bus service should be termed as express or regular service.

Currie and Delbosc in 2013 mentioned that, the ridership of LRT, BRT and street car gets influenced by several factors such as influence of transit mode, vehicle capacity, service level, employment and residential density,car ownership, speed, stop spacing, accessibility, right of way, integration of fare system and so on. However, service of each transit system also influences their ridership as well. Transit facility with lower service level gets low ridership than others.

Another aspect of studying the impact of transit is to understand the change in land prices along the transit stations. The area surrounding the station on which the impact of transit falls is known as transit influence zone and the area of that zone is delineated till which the change has occurred after the innauguration of the transit service. The technology used in transit service also influence in this process (Zhang, Meng, Wang, & Xu, 2014). However, in many literature it is seen that, ITS technology used in transit also influences its' operational efficiency, technical performance and costs (Babar & Burtch, 2020; Deng & Nelson, 2013; Abdelghany, Mahmassani, & Abdelghany, 2006).

According to Deng & Nelson in 2010 if BRT systems are developed in an efficient way then it can provide better service compared to other transit systems in low cost and short implementation time. For this, modern vehicles, dedicated bus ways and application of intelligent transport systems are required.

Vessali in 1996 found that, the accessibility of transit services changes the price of lands by six to seven percents. Along with this, several other factors such as vacancy rate, population and employment growth, changes in land uses all are influnced by transit development. However, throughout the nineteenth century, transit was crucial to urban growth. In more recent times, rail transit has frequently influenced urban development as well, but in conjunction with good zoning, appealing sites, and a robust market for development. In San Francisco, Toronto, and Washington, D.C., there are numerous illustrations of station-area improvements. Land close

to transit hubs has seen higher rental yields in various cities. If rail transit is constructed, station-area development should be promoted to increase the investment's returns (Huang, 2016).

Deng and Nelson in 2011 studied that, if BRT systems are developed appropriately and operated in an innovative manner then it can offer significant impact on land use developments at a low cost compared to MRT systems.

Levinson et al., in 2002 explained that, BRT entails an integrated system of buildings, services, amenities, operations, and ITS enhancements that are intended to enhance performance, passenger appeal, image, and identity. Due to its steering and guiding capabilities, BRT vehicles may operate in a variety of settings without requiring transfers or expensive running way construction for the duration of their operation. BRT can offer one-seat, high-quality transit performance over a wider geographic range than dedicated guideways thanks to its flexibility.

Apart from these, the project reports of different transit projects in Dhaka were reviewed. The importance of mass transit development was first addressed in Strategic Transport Plan for Dhaka in 2005. Following this, the Dhaka Urban Transport Network Development Study , 2010 mentioned the feasibility and different operational aspects of BRT Line 3 and MRT Line 6. After that, Strategic Transport Plan (Revised) 2016 discussed about all the proposed mass transit lines (BRT 3, 7 and MRT 1, 2, 4, 5, 6). However, in all these plans and studies only the operational aspects and feasibilities of station development were discussed. However, the network impact such as overlapping with other transit services, land use impacts were not discussed. Considering the facts, this study would also focus onto analyzing the network impacts of the transit services as a part of the scope of the study.

2.2. Impact of Transit Projects

The transportation system of any area has an impact on its land use characteristics. To develop a richer understanding on transportation-land use relationship, the transportation and land use professionals must solve many critical issues.

Polzin, 1999 have studied the direct and indirect impacts of public transit on land use. As part of direct impacts compelling market for additional investments on land use development for real time accessibility improvements can be considered. Along with this, the transit induced indirect impacts on land use are reduced impact fees such as parking fees due to transit betterment.

Again, Litman, 2022 in his study showed that, short travel distances increases walking and cycling mode shares; along with this, improved public transit accessibility ensures higher modal share of public transit, together these factors influence the car ownership rate in any particular area.

Brown in 2008 found that, development of highways has direct impact on land use which can be shown as impact for development of right of way, and development activities followed by new investments. However, in the case of transit, direct impact can be found on land use when lands are acquired for right of way and station development. Apart from this, the indirect impact could be addressed followed by investments which got attracted following the investments attracted towards transit line.

Apart from this Badoe & Miller in 2000 found that, urban densities, traditional neighborhood design schemes, land use mix have an impact on vehicle ownership and their use. Zhang et al., in 2017 found that, high density of commercial land use has a great impact on traffic scenario. High ratio of commercial land use creates congestion.

In urban areas like Portland, Oregon, and Washington, D.C., both of which are noted for having good TOD planning at the regional and corridor levels, vehicle trip rates of transit-oriented housing projects were especially low. Additionally, trip rates often decreased as neighborhood concentrations increased (Robert Cervero & Arrington, 2008).

Apart from this, estimating transit project budgets mostly depends on accuracy of estimating traffic on transit corridors. However, if the cost is overestimated then the budget allocation would go in the wrong direction. In these circumstances, it is necessary to estimate the transit budgets properly to ensure sustainable management (Skamris & Flyvbjerg, 2019).

In case of installing new transit facilities in any urban area, there would be both environmental and traffic impacts. The noise level within the transit vicinity area gets higher than usual level when MRT or BRT system gets installed. In Delhi Metro such impact could be found (Garg, Sharma & Maji, 2011).

Figliozzi & Glick in 2017 in their study described the methodology of understanding the impact of any transportation project into any roadway. While doing research on such projects traffic volumes and level of service changes in before-and-after service development needs to be studied. Field measurements and traditional level of service studies cannot easily be used to

carry out the full evaluation of bus operations because they lack necessary precise information and specialized equipment.

For light rail systems to rank in the top 25% of rail transit investments in terms of cost efficiency, an analysis reveals that a residential density of roughly 30 people per gross acre is required near stations; for heavy rail systems, the density is 45 people per gross acre. Ridership would grow significantly if there were more people living close to stations, especially if there were jobs and housing within a half-mile of the stations. Stakeholders deemed large densities to be intolerable and only backed bus rapid transit when there would be no impact on private automobile traffic (Robert; Cervero & Guerra, 2011).

A GIS-based tool developed by Hamed & Effat in 2007 is used for measuring the noise and vibration that public transportation systems produce in the air was used and it is based on US Federal Transit Administration's (FTA) approach, and incorporates spatial information, satellite imaging, geostatistical modeling, and software programming. This tool is used to assess different layouts on a case study of the initial environmental assessment of a light rail transportation project in a metropolitan metropolis in the Middle East.

2.3. Integration among Different Transit Services

Planned and run as a streamlined, integrated public transportation system, has the highest level of user appeal and is the most effective. Urban areas with rapidly expanding economies are especially crucial for this where private automobile must increasingly compete with public transportation. Integration among public transport services follows two dimensions, which are: i) inclusion of all routes and modes that make up the multi-modal public transportation network, ii) combining the operational and physical components of each modes and services (Fang & Zimmerman, 2015).

However, integration among transport services is not a new concept, it has been practiced for several years. In Singapore, while integrating transit services it was kept in mind that, improving transit modes only would not be sufficient enough, rather improvement of all facilities at intermediate and final locations, including links, customer support, and service data are required for ensuring smooth function of the network (Ibrahim, 2003).

In several countries there are specific policies which are used for integrating transit services and these policies have direct and indirect impacts on the demand. The direct impacts can be

found on these components: Infrastructure (routes, transfer points), fare payment (universal transit fare cards or passes), schedule (coordination and synchronization of arrival and departure times), information (single one-stop delivery of information to transit customers, such as trip itinerary planning and real-time information about transit delays and incidents), and integration of special events and emergency situations (coordinated multi-organizational policies for implementation) are all included in the passengers category (Mark A., 2004).

Integration of transit can be done considering only fare. In the city of Haifa, Israel, transit ridership increased as the policy makers shifted from per km fare policy to zonal fare policy with no transfer penalty. Eventually, the fare of the transit system decreased for many users and people found it more affordable to use transit services than private vehicles (Sharabi & Shiftan, 2012). In another study by Jose, Swamy, & Sinha, in 2018 tried to develop a scenario following the fare integration of bus, BRT and ferry service in Kochi, and found that, it had a direct impact on ridership increment.

In Sau Paulo between the year 2002 to 2006 the boarding of transit system increased by 49% and the ridership increased by 15%. To gain this much increment the systems were integrated using modern technologies. As the transit fleets were renovated, simultaneously, many supporting facilities such as information sharing system, priority lanes and transfer station developments were done which eventually resulted into increased transit ridership (Hidalgo, 2009).

In comparison to metropolitan regions with other network architectures or modal combinations, those that have integrated their rail transportation into a decentralized network structure are reported to have higher riding habits, higher service productivity, and superior cost-effectiveness (J. R. Brown & Thompson, 2008).

Jin et al., in 2014 found that, to increase the acceptance of metro service among operators and users it is necessary to introduce new bus service to complement the metro which is followed in Singapore.

However, integration and optimization of transit network considering parameters such as travel time, transfers, fare penalties are quite common. Several studies are done following these issues.

Yao et al., in 2014, developed an optimization model to meet passenger demand and deliver dependable transit service, that takes into consideration the stochastic trip time. In the

optimized transit network, the optimization model seeks to maximize the efficiency of passenger trips. To address the issue, the tabu search algorithm is used.

In case of large-scale transit networks, while optimizing or integrating, minimal transfers and minimum user costs can be considered. Zhao in 2006 found that, maximizing service coverage, given information on transit demand, transit fleet size, and the street network of the transit service area provide valuable input in optimization.

2.4. Past Studies on Dhaka Public Transport Network

Since public bus is the only existing mass transit system in Dhaka, several research and studies have been performed till present. In this part of the study, a review of some studies regarding the public bus service in Dhaka has been provided.

Ahsan (2013) studied the accessibility issue of bus stops of Dhaka city. In that study, the existing accessibility status of bus stops was measured, and optimum location of bus stops was also determined considering some issues like road density, served population, trip generation etc. Considering these factors, accessibility indices were generated for each bus stop and the bus stops were classified based on their accessibility indices. Then, optimum locations were proposed following proper criteria for better accessibility of bus stops (Ahsan, 2013).

Jahan et al in 2011 which focused on the measurement of the demand and supply of existing public bus service for a specific route in Dhaka. On this study, the researchers attempted to measure the demand and supply of Motijheel-Mirpur route, for which surveys were conducted on four different bus stops on this route. Frequency of service, fleet size, number of passengers aboard in bus, number of people waiting for bus in bus stop etc. were considered (Jahan, Bushra, & Sayeed, 2011).

Along with this, a study conducted by Rouf, Hossain, & Hossain in 2019 showed that, the perception of female passengers influenced by factors such as reliability, comfort, service, responsiveness and empathy, safety and security, affordability and vehicle access. Apart from this, the study also found that, the situation is hostile for female passenegers than male ones.

M S U Rahman in 2011 found that, while being delighted with the cost of the bus ride, passengers are very dissatisfied with the lengthy wait times, which can occasionally last over an hour.

Apart from this, in case of every transit project such as MRT 6, MRT1, BRT 3 etc. have their own operation and service plans, where the fleet size, headways, speed, capacity for each transit service are discussed. But there is no mention of integration among services. How the existing and proposed bus routes can complement the higher speed transit services has never been any matter of concern. Thus, there is a prominent knowledge gap in the case of assessing the impact of MRT and BRT system on the proposed new bus route network and integrating it with BRT, MRT system.

2.5. Definitions Used for the Study

Passenger Load Factor

It is the ratio of the total number of on-board passengers and total capacity of the transit service. If the value of load factor remains below 1 than it is considered to be a good transit service (Norhisham et al., 2020).

Auxiliary Volume of Traffic

In this study, the passenger traffic using modes such car, walking, and non-motorized vehicles are called the auxiliary volume of traffic. Within the bus route network these modes of traffic are allowed for movement in this study as the BRT and MRT networks are dedicated for BRT and MRT only.

Headway

The headway between vehicles in a transit system is the separation quantified in both space and time (Berrebi et al., 2021). The shortest distance or time that a system can achieve without reducing speed is known as the minimum headway. In this study, time headway has been used for further calculation.

Speed

Speed is the amount of distance a vehicle travels in one measure of time. Miles/hour or kilometers/hour are the units used to describe it.

Peak Hour Traffic

Peak hour traffic refers to the volume of traffic during the hour when the most traffic utilizes the road system, as determined individually for each segment of a transportation facility. On this study the peak hour travel demand matrix has been used for further analysis and here the peak factor (ratio of peak hour traffic volume to whole day traffic volume) is 0.8.

Origin-Destination Matrix

A description of movement in a specific region is called an OD or Origin Destination Matrix, which is used to gauge the demand for transportation. Each cell in an OD matrix represents the intersection of a journey from an origin to a destination, and the more trips there are along a given route, the more popular that route is. On this study a matrix of 141 TAZs has been used.

Service Area

A network service area is a territory that includes all streets that are reachable from one or more facilities within a specific travel distance or time. For instance, the streets that can be accessed within 10 minutes of a facility are all included in the 10-minute service area for that facility.

Chapter 3 Methodology

A detailed research methodology is established to achieve the research's goal. The approach is broken down into several stages, each of which must be completed before the study can be considered complete and the objectives attained. The methodological steps are addressed in this chapter, and a flow chart is created to depict the full framework.

3.1 Selection of the Study

At the very first stage, the study topic has been selected concerning the existing transit service along with on-going and proposed transit projects of Dhaka. Public bus service is the only available public transit system in Dhaka. As the world's population grows, so does the demand for public transportation. However, Dhaka's current transportation system is unable to meet this demand. Considering this, the government has chosen to introduce two Bus Rapid Transit (BRT) and five Mass Rapid Transit (MRT) systems in Dhaka. Along with these transit options, public buses in Dhaka are intended to meet the mobility needs of the city's large population.

The existing public bus service in Dhaka city cannot provide an efficient service due to infrastructure limitations and operational strategies. As a result, the Dhaka Transport Coordination Authority (DTCA), in collaboration with the Dhaka North City Corporation (DNCC) and the Dhaka South City Corporation (DSCC), has embarked on a project to restructure the existing bus route network to improve efficiency and meet bus users' travel demands. The goal of the project was to reorganize current bus routes to maximize accessibility, geographic coverage, and reduce overlapping and operational inefficiencies.

However, this idea does not address the issue of linking the bus network with the projected BRT and MRT systems. The introduction of BRT and MRT lines, however, will have an impact on public bus service. As a result, there are chances of route overlapping with the BRT and MRT corridor in the new proposed public bus network. Once the BRT and MRT systems go live, these bus routes may need to adjust their operational features. These buses could both complement and compete with BRT and MRT systems. In this scenario, an integrated system that includes all three transit services must be developed so that they may support one another and provide their users with an uninterrupted and efficient travel experience. So far, plans and projects created in Bangladesh have examined operational characteristics, business models, fare structures, and implementation plans for certain transit services, but none of them have

considered the integration of all proposed transit services. By avoiding overlaps, lowering travel costs, and increasing accessibility, the network and services can be integrated to create a specified scenario in which a user can plan their entire trip utilizing transportation (BRT, MRT, public bus). As a result, an attempt will be made in this study to examine the impact of MRT and BRT systems on the proposed new bus route network and their integration with BRT and MRT systems. This research will aid in the development of strategic policies for the integration of all three transit services.

3.2 Selection of the Study Area

In the proposed bus route rationalization project, there are 42 bus routes under nine clusters and 501 bus stops. These along with Bus Rapid Transit (BRT) and Mass Rapid Transit (MRT) network would be considered in this study. Apart from this, the 141 Traffic Analysis Zones (TAZs) would be considered for demand estimations of public transit.

3.3 Data Collection of the Study

For this study GIS shapefiles of proposed bus route network, BRT and MRT network as well as shapefiles of bus stops, BRT and MRT stops are collected from Dhaka Mass Transit Company Limited (DMTCL), Dhaka Bus Rapid Transit Company Limited (DBRT) and Dhaka Transport Coordination Authority (DTCA). The frequency, headway, operational hours of transit services, number of passengers in different routes, all are collected from different documents published by DTCA, DBRT and DMTCL.

Along with these, the fare structures of bus routes, BRT/MRT are collected from Bangladesh Road Transport Authority (BRTA) and DTCA. Apart from this, the available reports (operational plans, service plans, feasibility) of ongoing transit projects such as MRT6, MRT1, MRT5, BRT3, Bus Route Rationalization and so on, are collected from respective authorities and reviewed.

TAZ wise public transit demand matrix is prepared following the database of “Strategic Transport Plan for Dhaka 2015-35 (Revised and Updated 2015)” which was collected from DTCA. Along with this, the vehicular traffic trend analysis has been done and it was incorporated in this study to have a better estimation of demand. On this purpose, the vehicle registration data has been collected from BRTA. A complete table following the data and their sources is provided below.

Table 1: List of collected data and their sources.

Data	Source Document/Personnel	Agency
Rationalized bus routes and stops shapefiles	Revision and Updating of Previous Study Report on Bus Route Rationalization and Company Based Operation of Bus Service in Dhaka	DTCA
Operational characteristics of rationalized bus routes (headway, fleet number, fare)	Revision and Updating of Previous Study Report on Bus Route Rationalization and Company Based Operation of Bus Service in Dhaka. And discussion with project manager officials.	DTCA, BRTA
Existing bus routes and stops shapefiles along with Operational characteristics (headway, fleet number, fare)	Dhaka Bus Network and Regulatory Reform Implementation: Final Report	DTCA, BRTA
MRT Line 6 route and stops along with Operational characteristics (headway, fleet number, fare)	Preparatory Survey on Dhaka Urban Transport Network Development Project Phase 2	DMTCL
MRT Line 5 route and stops along with Operational characteristics (headway, fleet number, fare)	The Preparatory Study on The Dhaka Mass Rapid Transit Development Project (Line 5) In Bangladesh	DMTCL
MRT Line 1 route and stops along with Operational characteristics (headway, fleet number, fare)	The Preparatory Study on The Dhaka Mass Rapid Transit Development Project (Line 1) In Bangladesh	DMTCL
BRT Line 3 route and stops along with Operational characteristics (headway, fleet number, fare)	Greater Dhaka Sustainable Urban Transport Project (GDSUTP). Package 3: Operational Design and Business Model (ODBM): Task 3- Operating Plan for BRT and Other Services. Public Transport Demand Assessment and Service & Operations Plan (Final Report: Volume-1)	DBRT, BRTC, BUET
TAZ shape files and TAZ wise demand matrix (public bus only) of 2035	Household Interview Survey 2014	DTCA
Number of registered motor vehicles in Dhaka 2018		BRTA

3.4 Data Analysis

On this section the approaches which are followed to analyze the data for achieving the three objectives of the study are described.

3.4.1 Reviewing Transit Projects

To achieve this objective the transit projects both on-going and proposed all are analyzed following certain criteria which are network characteristics and operational characteristics.

While studying the network characteristics of the transit projects, the overlapping ratio among transit lines, their stop coverages following both road density and structure density are studied.

In terms of network characteristics, network length, average stop spacing, overlapping and connections with other transit projects have been studied. While analyzing the overlapping and connection issues, the clip tool from ArcGIS 10.7 has been used, and once the clip is done the overlapped network length is measured. Following the ratio of the actual length and the overlapped network length, transit routes were classified into certain groups.

Along with this, the distribution of transit stops on the transit corridor is analyzed. The network coverage area of the transit stops is studied, for this service area around each bus/BRT/MRT stops are generated, for this the network analysis tool of the ArcGIS 10.7 has been used. A 400-meter service area around each Bus and BRT stop and 800-meter for MRT stop, as suggested in the Dhaka Structure Plan, 2016-2035 and Delbosc and Currie, 2011 are considered for accessible distance, has been generated.

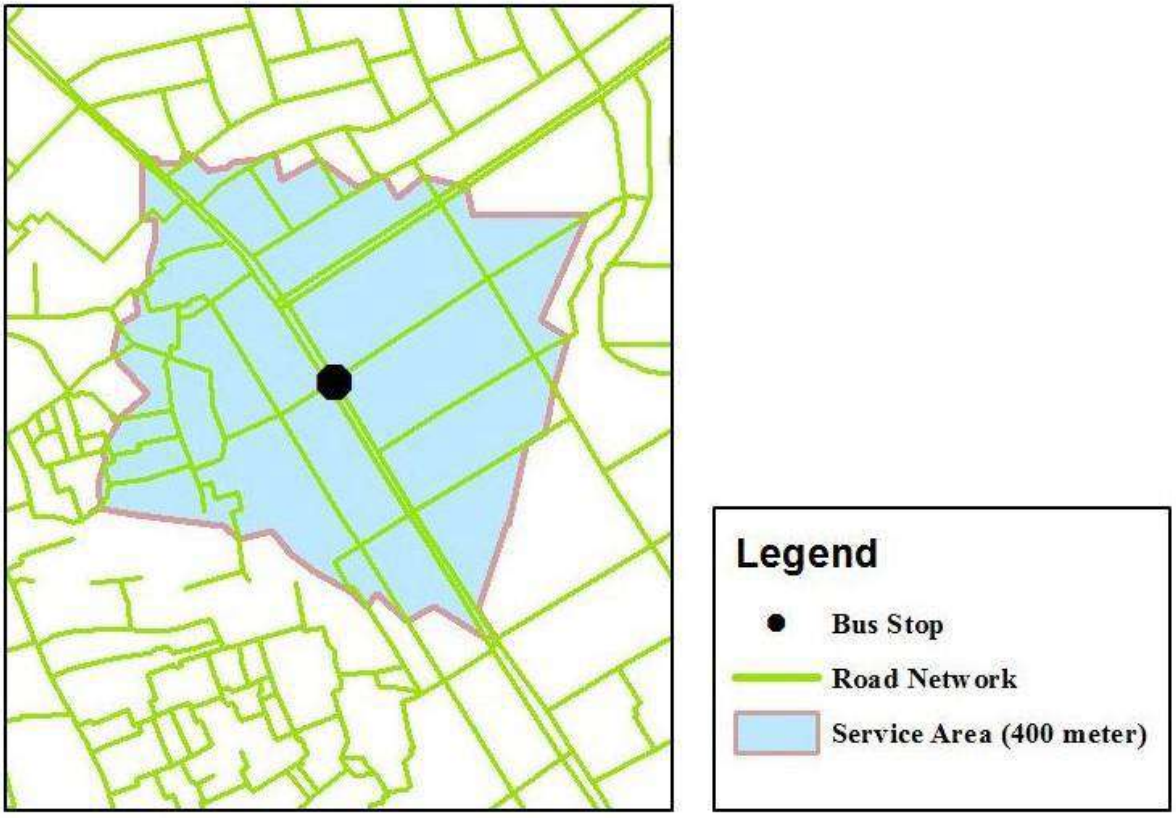


Figure 1:400-meter Service Area Generated around Each Bus Stop

Following this, the local road density (km/sq. km) and structure density (number/sq. km) within these service areas were studied and listed following the alignment of the transit corridor.

After this, the operational characteristics of these transit lines such as their operational hour, ridership (estimation), speed, headway, access fare and per km fare all are listed.

These listings done under objective one is used for further analysis in objective two and three.

3.4.2 Assessing the Vehicular and Passenger Impact of BRT/MRT Lines on Proposed New Bus Routes

On this part, the overlapping routes following different transit lines were identified and planned number of vehicles for movement were also incorporated in this. Along with this, following the operation plan of the transit lines, the number of vehicles operating in these lines were predicted. In this way, the total vehicular load on the transit line was estimated. Apart from this, following the overlapping length, bus routes which were crossing through and bus routes which were passing through were identified and grouped. However, to study the distribution of land use along the transit corridor buffer of 400 meter for BRT lines and 800 meters for

MRT lines were formed. The land use within these buffers were clipped and analyzed to understand their contribution in traffic generation.

For instance, in case of BRT Line 3, at first the shapefiles of newly proposed bus routes and BRT line were placed on each other. After this, the clip tool of ArcGIS 10.7 was used to clip the bus routes which were aligned on this, and along with it their overlapping length were also calculated. Followed by this, the distribution of different bus fleets on these routes were checked from the "Bus Services, Routes Restructuring and Clustering Report" of Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka project. On these bus routes standard buses of 50 seats, 26-40 seats, articulated buses and AC standard buses could be found. Following their capacity standards from "Transit Capacity and Quality Service Manual, Third Edition 2017" the passenger traffic on the corridor was estimated. Following their overlapping lengths and overlapping pattern, among the 40 stops of BRT Line3, crossings could be found on six stops and the overlapping bus routes were then grouped into two categories which are "Crossing Bus Routes" and "Passing Through Bus Routes". Along with this, a 400-meter buffer around the corridor was formed and the landuse within this corridor was clipped and analyzed. According to this, the biggest percentage of land use is for residential purposes, followed by mixed use for the second highest percentage.

Table 2:Characteristics of Bus Transit Vehicles—United States and Canada

Bus Type	**Length (m)**	**Width (m)**	**Typical Capacity**		
			Seats	**Standees**	**Total**
Small Bus/Minibus	5.6-9.1	2.0-2.4	8-30	0-10	8-40
Transit Bus	10.7	2.4-2.6	30-35	20-30	50-60
Transit Bus (Low Floor)	12.2	2.4	30-40	25-40	55-70
Transit Bus (Articulated)	18.3	2.4-2.6	65	55	120

(Source: TRB, 2017)

3.4.3 Integration among Transit Services

To accomplish the third objective, a macro simulation model has been developed considering both existing and rationalized network, and a comparative analysis has been done. On this part, with the bus route network (existing or rationalized) BRT and MRT services are added,

and the network performance has been checked following the load factor and auxiliary traffic volume values.

Three transit systems and their possible integration following network and operational characteristics were done in this study. In case of system integration, the real transit scenario was replicated and following their operational characteristics and demand which were studied in previous two objectives. However, following the data availability the study confines itself within bus routes (both existing and rationalized), BRT Line 3 and MRT Line 6,1 and 5. The activities under this objective are described below:

Network Development

The network is developed using EMME software. The shapefiles of existing bus route network and bus stops collected from "Dhaka Bus Network and Regulatory Reform Implementation: Final Report (2016)" along with shape files of MRT6, MRT1, MRT5 (North and South), BRT3 were used to develop the network. At first the GIS shapefiles of bus route network was added in the EMME network editor as background image and the projection was set to WGS 1984: UTM zone 46_N.

Following the steps of network development, the bus stops were added as nodes using the "Network Editor" tool of EMME 4.5.1. and each node was assigned with a unique ID.

After this, two-way links were developed connecting each node with one another, and on this step each link had defined X and Y value. Along with this, the allowed modes for movement on links were mentioned.

As the links and nodes were developed, the transit lines were added. Each transit line had two directions: one is Northbound and another one is Southbound. In this phase the transit mode, its speed and corresponding passenger car unit (PCU), vehicle capacity in total along with standing and sitting passengers were defined. Figure 2 and Figure 3 shows the prepared network considering two bus network projects.

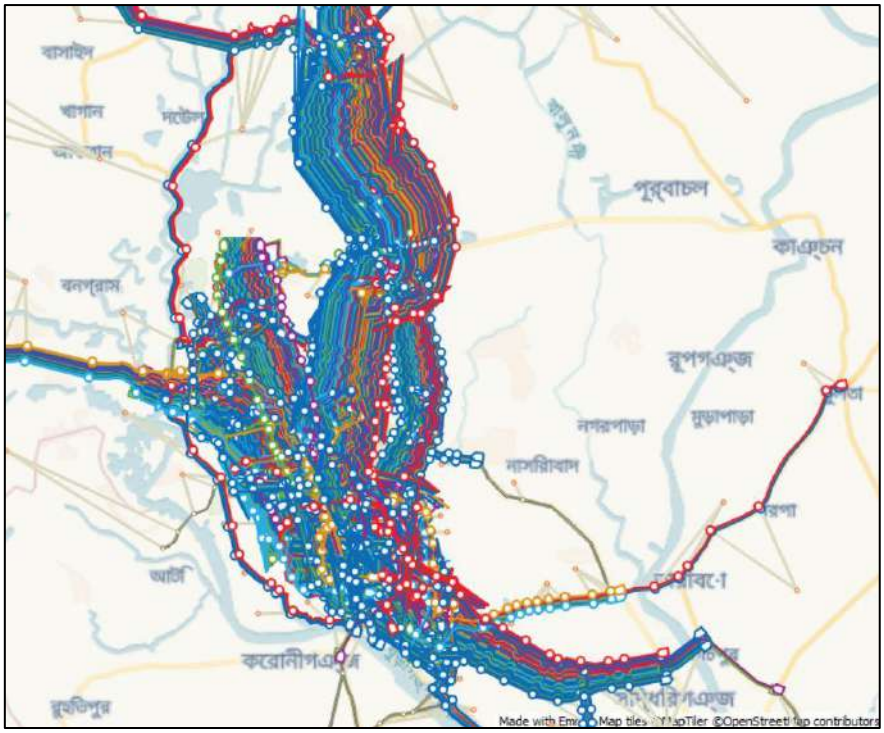


Figure 2: Existing Bus Route Network in EMME 4.5.1

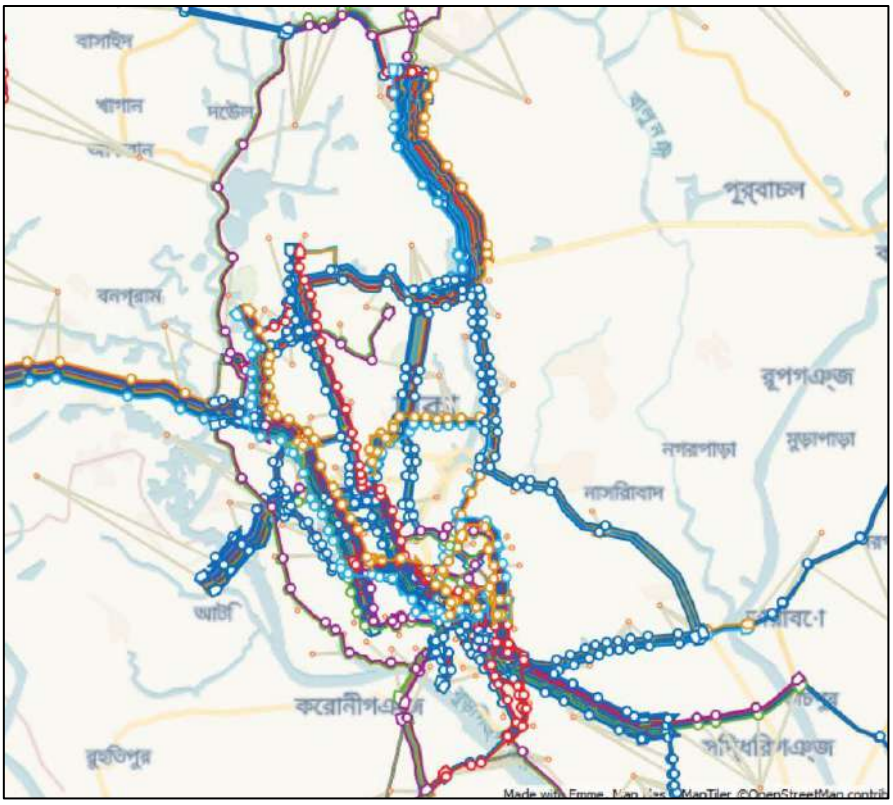


Figure 3:Rationalized Bus Route Network in EMME 4.5.1

Defining Modes and Scenarios

On this phase, modes defined for movement within the network are added in the network and a unique short form against each transit mode is assigned. Table 3 shows the list of defined modes, their types, and short forms.

Table 3: Modes and types

Modes	**Type**	**Short forms**
Car	Auto	C
Bus	Transit	B
BRT	Transit	B
MRT	Transit	M
Pedestrian	Auxiliary transit	P
Nonmotorized vehicle	Auxiliary transit	N

Following the focus of the study in total eight scenarios have been developed considering that, what is existing picture and how it evolves when interventions like rationalization of bus routes, BRT and MRT are introduced.

The list of scenarios and their IDs following the model development is provided in Table 4

Table 4: List of transit scenarios

Scenario ID	**Name of the scenario**	**Transit components**
3001	Existing Bus Routes	160 active bus routes from Dhaka Bus Network and Regulatory Reform Implementation: Final Report (2016).
3002	Existing Bus Routes with BRT	160 active bus routes from Dhaka Bus Network and Regulatory Reform Implementation: Final Report (2016) along with BRT Line 3.
3003	Existing Bus Routes with MRT	160 active bus routes from Dhaka Bus Network and Regulatory Reform Implementation: Final Report (2016) along with MRT Line 6, 1 and 5.
3004	Existing Bus Routes with BRT and MRT	160 active bus routes from Dhaka Bus Network and Regulatory Reform Implementation: Final Report (2016) along with MRT Line 6, 1 and 5 and BRT Line 3.
4001	Rationalized Bus Routes	42 rationalized bus routes from Revision and Updating of Previous Study Report on Bus

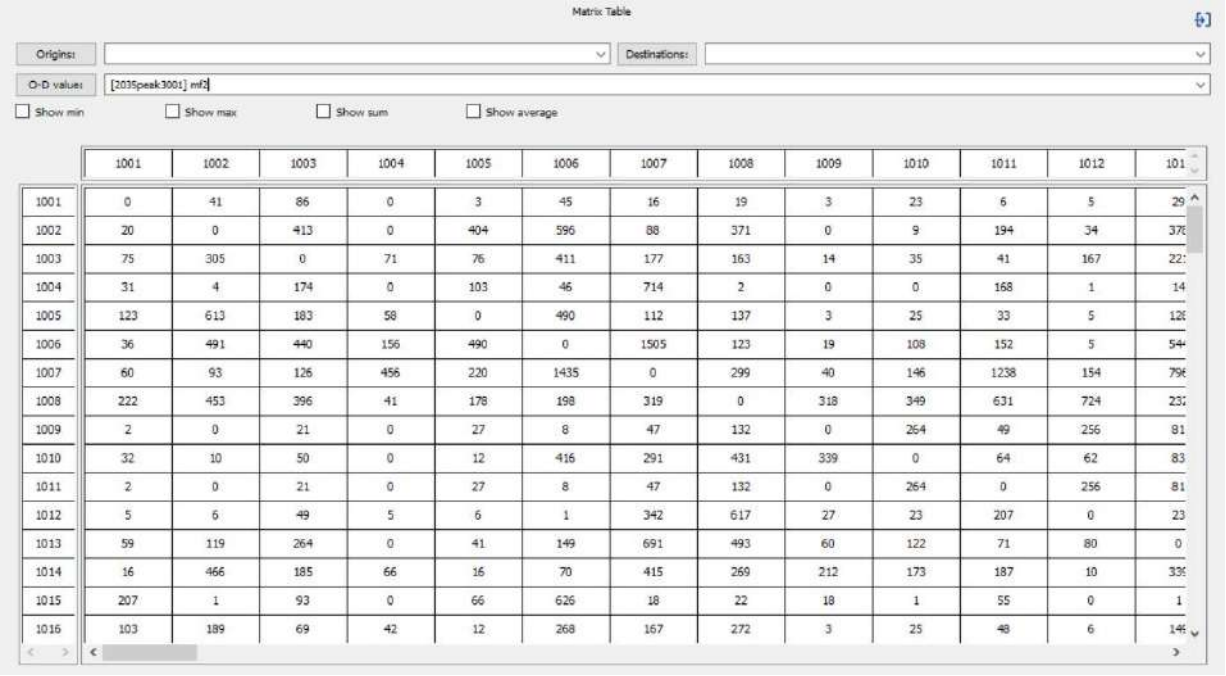
		Route Rationalization and Company based Operation of Bus Service in Dhaka (2020).
4002	Rationalized Bus Routes with BRT line 3	42 rationalized bus routes from Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka (2020) and BRT Line 3.
4003	Rationalized Bus Routes with MRT line	42 rationalized bus routes from Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka (2020) and MRT Line 6,1 and 5.
4004	Rationalized Bus Routes with BRT and MRT	42 rationalized bus routes from Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka (2020) and MRT Line 6,1 and 5 and BRT Line 3.

Following this, at first the base network of links and nodes were developed and on each scenario the transit lines were changed based on requirement.

Demand Matrix

On this study the demand for public bus is only used for transit assignment. The Household Interview Survey 2014 database prepared under "Strategic Transport Plan for Dhaka 2015-35 (Revised and Updated 2015)" was used. On this database travel demand OD matrices for public bus following 141 TAZs of RSTP is done for the year 2014 and it is projected for 2025 and 2035. This study uses the demand matrix of 2035 for analysis, as the chronological timeline of opening of all phases of transit projects ends up in 2035. A glimpse of the total demand matrix into EMME 4.5.1 is provided into Figure 4 and the entire OD matrix is provided in the

Annexure C.



	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	101
1001	0	41	86	0	3	45	16	19	3	23	6	5	29
1002	20	0	413	0	404	596	88	371	0	9	194	34	37
1003	75	305	0	71	76	411	177	163	14	35	41	167	22
1004	31	4	174	0	103	46	714	2	0	0	168	1	14
1005	123	613	183	58	0	490	112	137	3	25	33	5	12
1006	36	491	440	156	490	0	1505	123	19	108	152	5	54
1007	60	93	126	456	220	1435	0	299	40	146	1238	154	79
1008	222	453	396	41	178	198	319	0	318	349	631	724	23
1009	2	0	21	0	27	8	47	132	0	264	49	256	81
1010	32	10	50	0	12	416	291	431	339	0	64	62	83
1011	2	0	21	0	27	8	47	132	0	264	0	256	81
1012	5	6	49	5	6	1	342	617	27	23	207	0	23
1013	59	119	264	0	41	149	691	493	60	122	71	80	0
1014	16	466	185	66	16	70	415	269	212	173	187	10	33
1015	207	1	93	0	66	626	18	22	18	1	55	0	1
1016	103	189	69	42	12	268	167	272	3	25	48	6	14

Figure 4: OD matrix into EMME 4.5.1

The OD matrix is prepared considering trips by public bus from one TAZ to another for one day. Since EMME 4.5.1 simulates the traffic scenario for 1 hour only considering this the peak-one hour demand of public bus is used for transit assignment. For this the public bus travel demand matrix of 2035 is factorized into 8% as in Highway Design Manual of Road and Highways Department of Bangladesh it is mentioned that the peak AADT is about 8% of total AADT. Along with this, the study also includes the vehicle growth rate trend analysis and following the growth rate over last 10 years the peak demand matrix has been multiplied with the growth rate which is about 0.08.

Apart from this, to deploy the demand matrix 141 TAZ shapefiles were added in the background and their centroids were generated using ArcGIS 10.7. Once the centroids were developed, these centroids were reciprocated in EMME 4.5.1. Using the two-way connector development tool in EMME 4.5.1, the nodes within each TAZ were connected to the centroid, and on this connector movement of auxiliary transit modes such as pedestrian (P), and Non-motorized vehicles (NMV) were allowed.

Figure 5:141 TAZs from RSTP 2015-2035

Fare Input

On this part the fares of different transit modes were taken into input and set as penalty. In case of setting the penalty value both access fare and per km fare for each transit mode were considered.

Table 5: Input fare values for different transit modes

Mode	Access Fare (BDT)	Per Km Fare (BDT)
Existing Bus	10	2.15
Rationalized Bus	10	2.15
BRT	10	2.5
MRT	20	4.5

Along with the access fare and per km fare it is required to input the perception factor or value of time for bus users in this process. In case of Dhaka, the value of time (VoT) for bus users could not be found for recent times, that is why the study relies on the travel time cost value found from the "Road User Cost Study (Phase 1 and 2)-June 2018" of LGED.

According to the report the TTC value for Bus is 20.40 BDT/Passenger hour and it was taken as the perception factor and converted into minutes for macro simulation, the value is about 0.34.

Transit Assignment

As a part of the study, a transit assignment has been done. In case of typical four step model, it is accounted to be the fourth or last step of model, and in this study the public transit demand found from "Household Interview Survey 2014" is incorporated and the last step of traditional four step modelling has been followed.

In case of transit assignment there are several options. In developed world transportation network with less traffic congestion the "Extended Transit Assignment" is the most preferred tool to be used. But in case of Dhaka, the transportation network has higher traffic congestion than usual limit and, in this case, it is preferred to use "Congested Transit Assignment".

While having transit assignments it is necessary to develop "Impedance Matrix" for each scenario and have "Transit Time Function (TTF)" value 1 for each transit line.

The specifications of "Congested Transit Assignment" are provided below:

Apart from this congestion function and stopping criteria were required to be fixed as well.

Table 6: Congestion function and stopping criteria for transit assignment

Congestion Function Type	**Congestion Term Weight**	**Congestion Term Exponent**	**Assignment Period**	**Number of Iterations**	**Relative Gap**
BPR	0.15	4	1	10	0.001

However, in case of congestion function the traditional BPR function has been used. It is,

$T_a = T_o\ (1+\alpha(V/C)^{\beta})$

T_a= Congested travel time, T_o = Free-flow travel time, α = Scale parameter, V= Link traffic volume, C= Link capacity, β = Shape parameter

α = 0.15, β = 4

Values are taken following the Highway Capacity Manual, 2000 by Transportation Research Board (TRB)

Transit Travel Time Function

On this study the focus is to understand the change in transit network as different transit projects get introduced over time. For this, parameters such as speed, headway were incorporated but fare is not considered in this study.

While having transit assignments it is necessary to have defined transit utility function, and on this study the utility function ft1 is

ft1= length*60/speed

Here the length changes with each transit line and speed changes with each transit mode.

The considered speed and headway for each transit line are mentioned while discussing each transit assignment scenario in result analysis section.

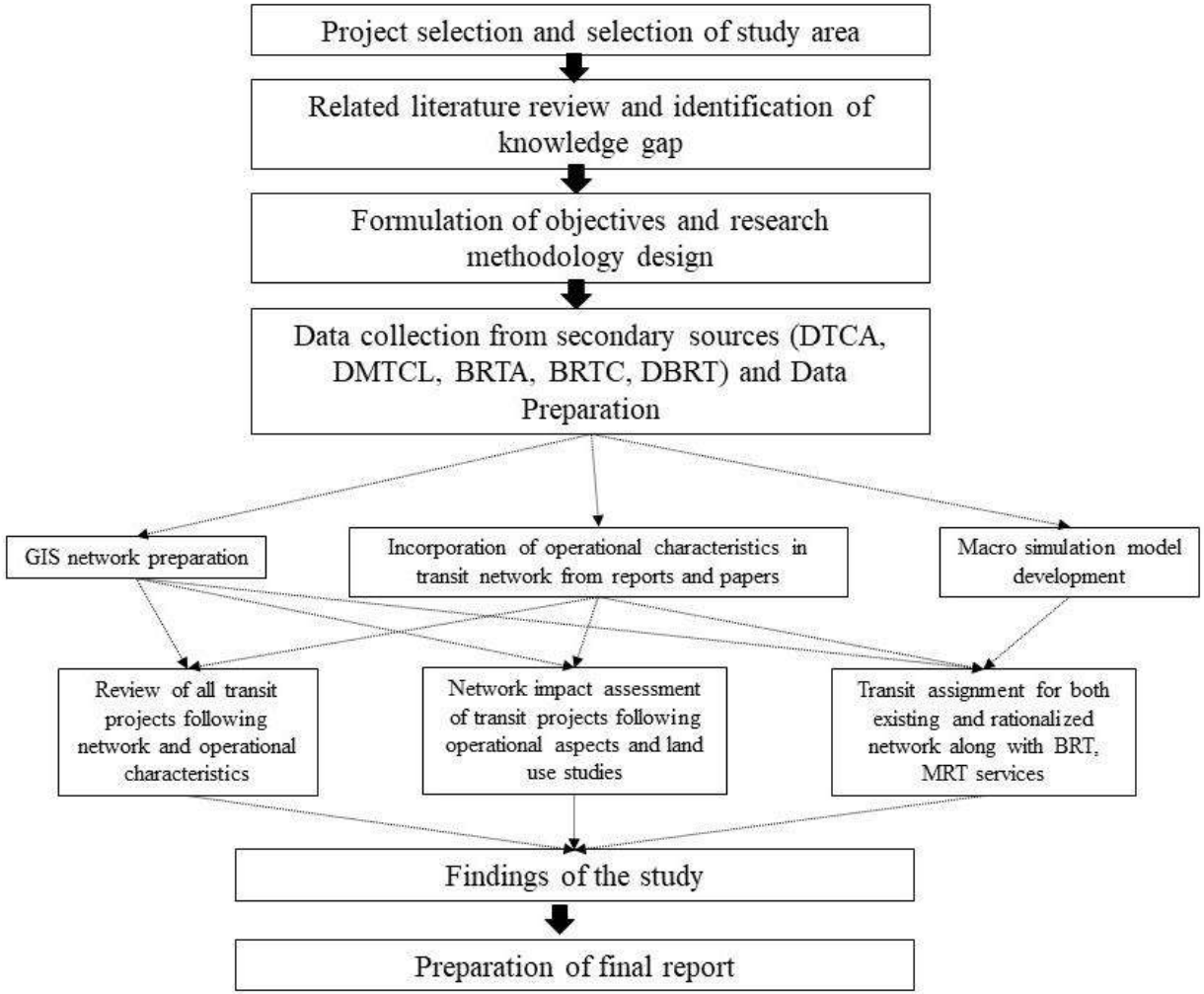
3.5. Findings of the study

The study would have three major findings, and these are:

Proposed and on-going transit projects (planning and infrastructure development) would be reviewed following both their operational and network characteristics. The new bus routes which overlapped with BRT and MRT lines would be identified and based on their characteristics and trips these routes would be classified into different groups to identify the effect of BRT/MRT lines. Lastly, a macro simulation model would be developed following a defined list of scenarios and these scenarios would help to understand the network impact of different transit interventions.

3.6. Methodological Framework

The entire methodology is shown shortly in a flow chart provided below:



Chapter 4 Study Area Profile

The study focused on the upcoming BRT and MRT systems of Dhaka along with the newly proposed public bus route network. On this study the Traffic Analysis Zones (TAZs) considered under "Strategic Transport Plan for Dhaka 2015-35 (Revised and Updated 2015)" are accounted to understand the transit trip demand and their distribution. Apart from these, the transit lines and their corresponding stops all are considered.

4.1. Selection of Study Area

On this study the 141 TAZs which were considered in the "Household Income Survey 2014" under RSTP 2015-35, were considered. These 141 TAZs cover wards under Dhaka North City Corporation (DNCC), Dhaka South City Corporation (DSCC), RAJUK DMDP area along with surrounding Savar Paurashava, Gazipur City Corporation and Narayanganj City Corporation. They are entirely covered by the recently approved Detailed Area Plan 2016-35 area. Along with these 141 TAZs, newly proposed 44 bus routes, 400 bus stops and five MRT lines, two BRT lines and their corresponding stops all are included in this study (Figure *6*).

At present, the only available public transit in Dhaka is the bus, which generates 30% of the total number of trips (RAJUK, 2015). But with the increasing number of populations the demand for public buses is also increasing (DTCA, 2016). The existing transportation system of Dhaka cannot cope with this demand. In this situation, the government of Bangladesh has taken initiatives to introduce five Mass Rapid Transit (MRT) and two Bus Rapid Transit (BRT) systems in Dhaka (DTCA, 2015). Along with these newly introduced transit facilities the existing public bus system would serve the needs of the people. But due to operational deficiency and lack of proper infrastructure management, the existing bus service of Dhaka cannot provide an efficient service (Infrastructure Investment Facilitation Company (IIFC), 2020). In these circumstances, Dhaka Transport Coordination Authority (DTCA) along with Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC) have initiated a project to restructure the existing bus route network of Dhaka city. The project aimed to reorganize the existing bus routes to ensure maximum accessibility, geographical coverage and minimize the overlapping along with operational inefficiencies (Infrastructure Investment Facilitation Company (IIFC), 2020).

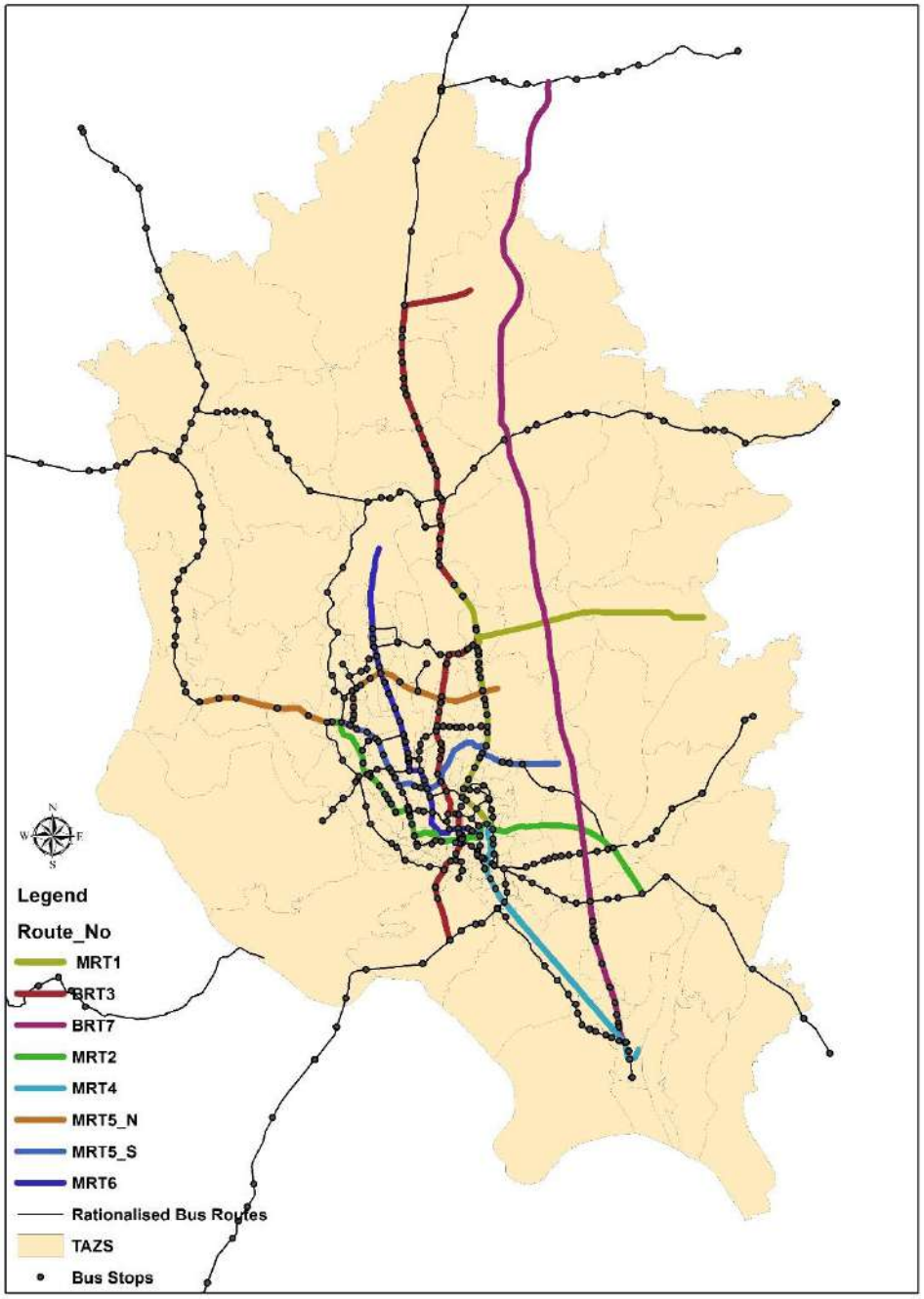


Figure 6: Study Area Map

4.2. Transit Lines and Their Aspects

4.2.1. Mass Rapid Transit (MRT) Projects

MRT1

The MRT1 has two sections, one is underground and another one is elevated. The underground section would start from Airport and would end up at Kamalapur, whereas the elevated section

would start from Joar Shahara and would end up at purbachal. The entire length of the corridor (consisting of both underground and elevated) is 29 km. The underground section would have 12 stations and the elevated part would have seven stations (Almec Corporation., Oriental Consultants Global Co., Ltd., Nippon Koei Co., Ltd., Katahira and Engineers International, 2018).

MRT2

MRT2 would start from Gabtoli and would end up at Chittagong Road. It would have 21 km length and there would be 24 stations within this length (DTCA, 2015).

MRT4

MRT4 would start from Kamalapur and would end up at Narayanganj. It would have a length of 12 km and on this the stations are yet to be fixed (DTCA, 2015).

MRT5

It has two sections, the north section, and the south section. The north section would start from Hemayetpur and it would end up at Vatara. This section would have 13 stations, and it would cross MRT6 at Mirpur 10 and MRT1 at Notun Bazar. This section is a mixed version of both elevated and underground structures, of the entire corridor 6.5 km is elevated and rest of the part is underground.

The south section would start from Gabtoli and would end at Bhulta. It would have a length of 26.2 km. On the entire corridor there will be 15 stations. On the corridor it would cross MRT 6 and BRT3 lines (Almec Corporation., Oriental Consultants Global Co., Ltd., Nippon Koei Co., Ltd., Katahira and Engineers International, 2018).

MRT6

It has 20 km long corridor starting from Uttara North and ends at Motijheel which is one of the major central business districts (CBDs) of Dhaka. At this 20 km there are 16 stations and the average distance from one station to another is about 1.2km (DTCA, 2015).

4.2.2. Bus Rapid Transit (BRT) Projects

BRT3

It has 42 km corridor starting from Shib bari chourasta at Gazipur and ends up at Keraniganj. On the entire corridor it has 40 stations. On its' right of way, it crosses MRT 5 (both north and south), MRT6 and MRT 2 (ALG; DevCon, 2017).

BRT7

It is a 32 km long route which would start from Mirerbazar and would end up at Narayanganj. It would have 16 stations in its entire corridor (DTCA, 2015).

4.2.3. Bus Route Network

Bus Route Rationalization Project

The Bus Route Rationalization Project was initiated by DSCC, DNCC and DTCA. On this project 44 new bus routes are proposed under nine major clusters. These clusters are defined following the origin-destination of bus routes. The entire network has a length of 516 km with 500 bus stops. The average distance between two bus stops is almost 1.032 km which is less than existing one (Infrastructure Investment Facilitation Company (IIFC), 2020).

Existing Bus Route Network

In the existing bus route network, almost 9,311 buses and 8,639 minibuses operate in the roads of Dhaka city, which represents almost 3% of total motorized traffic (DTCA, 2015). The entire network is controlled by almost 103 large companies which are registered in BRTA (DTCA, 2016). But except these companies, a large portion of fleets are owned and operated by almost 1,539 operators who are not registered as the companies rather operate as the individual operators (DTCA, 2016). The average daily trip length of public bus is almost 5.8 km (DTCA, 2016), which is quite higher than other available modes of travel. The existing public bus network of Dhaka is currently regulated by Bangladesh Road Transport Authority (BRTA) and Bangladesh Road Transport Corporation (BRTC). BRTA grants the fare structure, route permission, driver registration and vehicle registration issues, whereas BRTC is responsible for the provision of bus service on different routes.

4.3. General Information regarding Study Area

4.3.1. Land Use Profile

The 141 TAZs considered for preparation of "Strategic Transport Plan for Dhaka 2015-35 (Revised and Updated 2015)" follow almost similar area of Detail Area Plan (DAP) 2016-2035. Considering this, the landuse within this area has been studied.

Table 7: Distribution of land use within 141 TAZs

Land use category	Area in sq. km	Percentage
Administrative	2.44	0.16
Agriculture	484.63	31.48
Commercial	21.99	1.43
Community Facilities	5.6	0.36
Education and Research	17.25	1.12
Forest Land	22.8	1.48

Health Facilities	1.13	0.07
Industrial	43.88	2.85
Institutional	9.92	0.64
Mixed Use	38.87	2.52
Open Space	5.62	0.37
Residential	440.35	28.6
Restricted	28.32	1.84
Transport and Communication	61.18	3.97
Vacant Land	130.07	8.45
Water body	225.54	14.65
Grand Total	1539.59	100

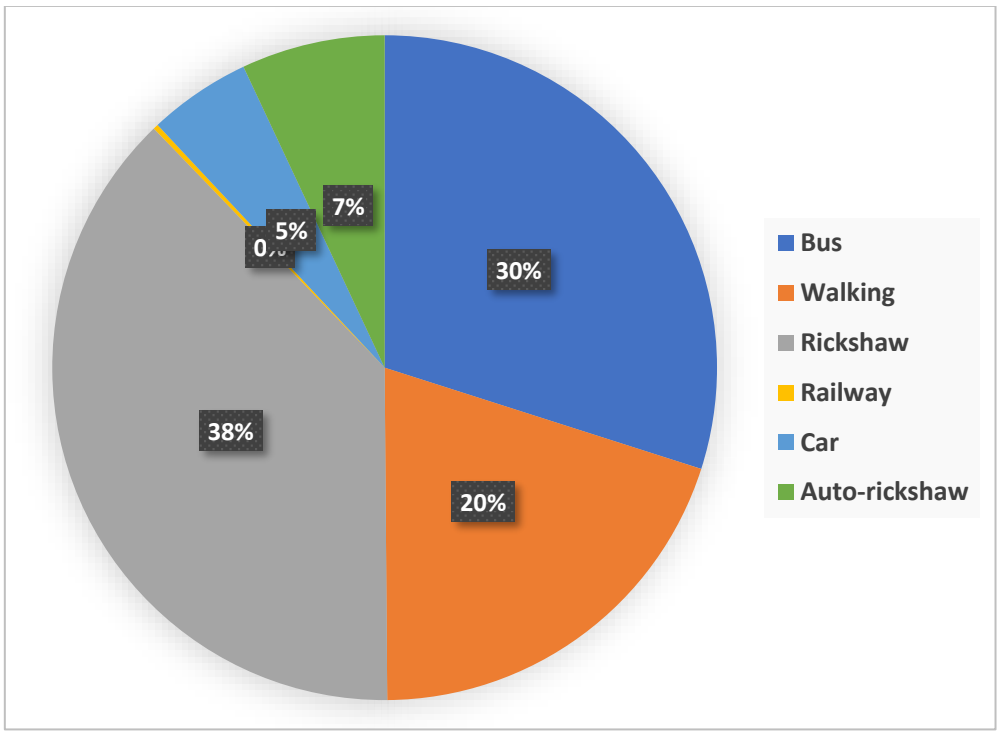
(Source: RAJUK 2021)

According to Table 7, the highest percentage belongs to agriculture, and after this the second highest share goes to residential land use. As most of the suburban areas of Dhaka metropolitan city are still vacant and their primary use is to grow foods, and most of which are supplied in Dhaka, to fulfill the demand of food intake. After this, the second highest goes to residential land use. High, middle and low-income housing all are found in this category. Following this, along with agriculture, waterbodies also share almost 15% land use.

Apart from these, industrial, commercial, mixed land use are also prevalent here, but the share of these land use categories is so high as other ones.

However, excessive share of residential, commercial, mixed, industrial, administrative land uses plays vital role in generating traffic. Following the prevalent land use categories on different areas the distribution of traffic also changes following the peak and off-peak hours. In Dhaka CBDs such as Motijheel, Uttara, Banani, Mirpur 10 etc. have high flow of traffic during peak hours. Along with this, many areas where known schools and colleges are established, such as Baily Road, Firmgate etc., also have high traffic flow during starting and ending hours of schools and colleges.

4.3.2. Modal Share



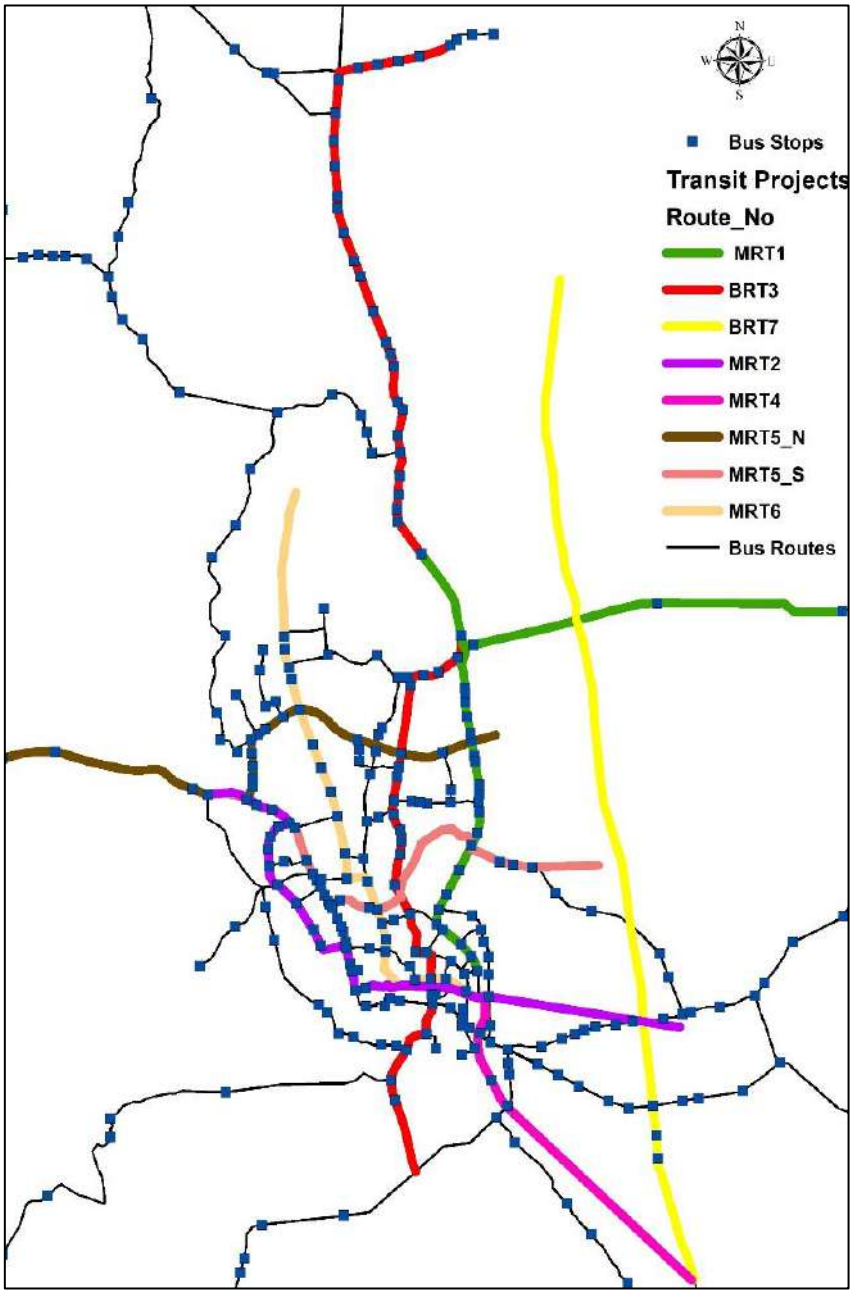
(Source: RAJUK, 2015)

Figure 7: Modal Share of Available Transport Modes in Dhaka

In Dhaka, the transportation sector is dominated by several types of transport modes. Both motorized and non-motorized vehicles ply on roads. The modal choice behavior of the people is mostly dominated by their household income. Both lower and middle-income group of people are mostly dependent on public bus service for their daily movement (DTCA, 2016). The major user of public bus service is the lower income working section and the school going children (RAJUK, 2015). Almost 44% of the total trips are made for working purpose and almost two-third of the trips are made by public bus (RAJUK, 2015). The modal share of different transport modes is provided in Figure *7*.

Figure 7 shows that the highest number of trips are made by rickshaw, as the residents of Dhaka city mostly rely on rickshaw for making short trips. Then almost 30% of trips are made by public bus among which most of them are made by working section people and school going children. Apart from that, nearly 20% of trips are made by walking. People prefer walking in case of any short-distance travel.

4.4. Existing Public Transit Network in Dhaka



(Source: DTCA, 2016)

Figure 8: Existing public bus route network in Dhaka City

Public bus is the only available public transit system in Dhaka. In a working day, almost 21 million trips are made in Dhaka city in average, which carry about 1.9 million passengers (Mustaqeem, Jalaluddin, & Hassan, 2016). But the current structure of bus route network has never been developed considering any plans or future demand issues. In case of bus route network, some factors like the overlapping of bus routes, undesirable route length and ill

practice of competition among bus operators influence the service provision. The current bus route network is comprised of 160 bus routes and 238 bus stops among which almost all the routes are delineated in north-south direction except five bus routes. These routes are east-west oriented. The current network is restricted to about 200 kilometers only (Mustaqeem, Jalaluddin, & Hassan, 2016; DTCA, 2016). In existing bus route network only 5 routes are provided which cannot ensure the proper connectivity in eastern and western part of Dhaka city. In Figure 8, the distribution of bus routes and bus stops in Dhaka City area is shown.

At Kazi Nazrul Islam Avenue, DIT Avenue, Begum Rokeya Avenue and Mirpur Road most demands are generated. Highest number of trips are made by public bus in these four points on each working day (DTCA, 2016).

Problems of Present System

Though public bus is the only available mass transit system of Dhaka, still the service provided by it is not satisfactory due to many problems, such as long waiting time for buses, unexpected delays, lack of comfort and long walking distance from the origin and destination to the bus stops, etc. (Ahsan, 2013). Apart from this, the transportation sector of Dhaka city is characterized by many problems such as congestion, inadequate traffic management, high accident rates, increasing air pollution problems, public transport crisis, unaffordable and inaccessible public transport (Ahsan, 2013). According to Ahsan, 2013, some of the major problems of public bus service are:

- Overcrowded bus
- Lack of adequate facilities at bus stops
- Irregularity at service provision
- Poor co-ordination with supporting modes
- Unorganized ticket collection system
- Lack of safety and comfort
- Problematic boarding and alighting facilities
- Poor physical condition of buses
- Inaccessibility of women
- Lack of facilities for disabled people
- Ill practice of competition and overtaking

The major complaint of the users of public bus service is that the buses are mostly overcrowded by passengers. There is a bad practice of bus drivers and conductors to board and alight passengers from the middle of the roads. In most of the cases, the comfort and safety issues of the passengers are not taken care of. The women passengers face the problem of sexual harassment and ill behavior by bus staffs. Pick pocketing in public bus is also a common scenario. Moreover, the physical condition of the buses is not good at all. The bus owners do not abide by the laws and regulations. Most of the buses that move on the roads are old, having faulty engines and fueling system, which cause severe air pollution (DTCA, 2016). These buses often face the problem of sudden breakdown on roads. Another major problem of public bus service is the unorganized ticket collection system. The existing bus operators do not follow the ticketing structure created by the BRTA. There is a tendency of taking extra fare from the passengers than the fixed rate. Besides, the buses do not follow rules and regulations while stopping at intersections. The bus drivers and conductors stop buses at each possible point where they can get any passenger. That's why the provided bus bays and bus stops are failed to perform their purpose.

The operational characteristics and structure of public buses of Dhaka city are not user friendly. Because of these existing problems, the public bus service cannot be comfortably used by disabled people (Ahsan, 2013). The distribution of service facilities (bus stops, bus routes etc.) across the wards along with the operational characteristics are unsatisfactory because the optimization in distribution of service facilities has never been the concerned issue in case of development of existing bus network system.

Chapter 5: Review of Transit Projects

While reviewing the transit projects it is very necessary to evaluate the projects from several aspects such as operational characteristics, network impacts, land use impacts and so on. In case of Dhaka, five MRT, two BRT and two bus rationalization projects were initiated. But no comparative analysis considering their network and operational characteristics, land use impacts are done. Following this, the study concentrates on understanding the transit projects from various perspectives such as network impacts and their operational aspects.

5.1. Mass Rapid Transit (MRT) Line 6

The MRT Line 6 is the first Mass Rapid Transit system under implementation in Bangladesh. It was mentioned as a top priority project in DHUTS and in 2013 DMTCL (Dhaka Mass Transit Company Limited) was formed to built it. The construction works started at 2015 (DTCA, 2015) and expected to be completed by the end of 2022 . It is expected that by Decembor 2022, the Uttara – Agargaon section would be open for service. The entire network has a length of 20.1 km.

Figure 9: Alignment of MRT6

5.1.1. Network Characteristics and Operational Issues of MRT Line 6

Table 8: Network and operational aspects of MRT Line 6

Network Length (Km)	Stop Spacing (Km)	Operational Hour	Speed (Kmph)	Ridership	Headway	Access fare	Per Km Fare (BDT)
20.1	1.21	18	32	48,82,000 pax.km/day (2030)	3 min	20	4.5

(Source: Katahira & Engineers International; Oriental Consultants Co., Ltd; METRO Development Co., Ltd., 2011)

The MRT Line 6 has a length of 20.1 km. It starts from Uttara Phase 3 and ends up at Shapla Chattar, Motijheel. It is mentioned that it might be extended till Kamalapur Railway Station in future.

There are 16 stations in this corridor having an average spacing of 1.21 km though ideally the the accessible distance for any MRT station is about 800 meters (Delbosc & Currie, 2011).

According to "Transit Capacity and Quality of Service Manual, Third Edition" the transit system providing services more than or equal to 20 hours in a day has level A graded service quality (Brinckerhoff, 2013). In case of MRT 6, the service is provided for 18 Hours so it provides level B graded service (Katahira & Engineers International; Oriental Consultants Co., Ltd; METRO Development Co., Ltd., 2011).

From the initial year till the monitoring period the speed of the transit service would be 32 kmph. The estimated ridership of MRT6 in 2030 would be 48,82,000 pax.km/day. On the starting of operation, the ridership is estimated to be 15,47,000 pax.km/day and on 2030 it would increase more than 3 times. The headway of operation is 3 mins. So the frequency would be 0.006 sec^{-1}. The fare of the entire corridor would be BDT 40.25 (Mamun, 2021).

5.1.2. Overlapping and Connections with Other Transit Projects for MRT Line 6

The MRT 6 line has overlapped with other transit projects. Table 9 provides the details of overalpping with bus route rationalization projects.

Table 9:Distribution of frequency of overlapping bus routes following two projects in MRT6 corridor

Transit Project	**Overlapping Percentage (%)**				
	0-20	**21-40**	**41-60**	**61-80**	**81-100**
Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work	81	27	8	8	2
Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka	17	4	2	1	0

According to the first bus route rationalization project the active bus routes in Dhaka were 160 and there was high percetage of overlapping within these bus routes. But in the new project the number of active bus routes would be 42.On MRT6 alignment only one bus route is found which has overlapping percentage more than 60%. But in case of previous project two bus routes were found having overlapping percentage more than 80%.

Along with this, MRT 6 has overlapping and connections with other BRT and MRT lines. MRT 5 North line crosses it at Mirpur-10 station. Whereas MRT 5 South crosses the corridor at Kawran Bazar station. BRT Line 3 will be crossing it at Paltan intersection.

5.1.3. Road Density and Structure Density within 800 meters of MRT 6 Stops

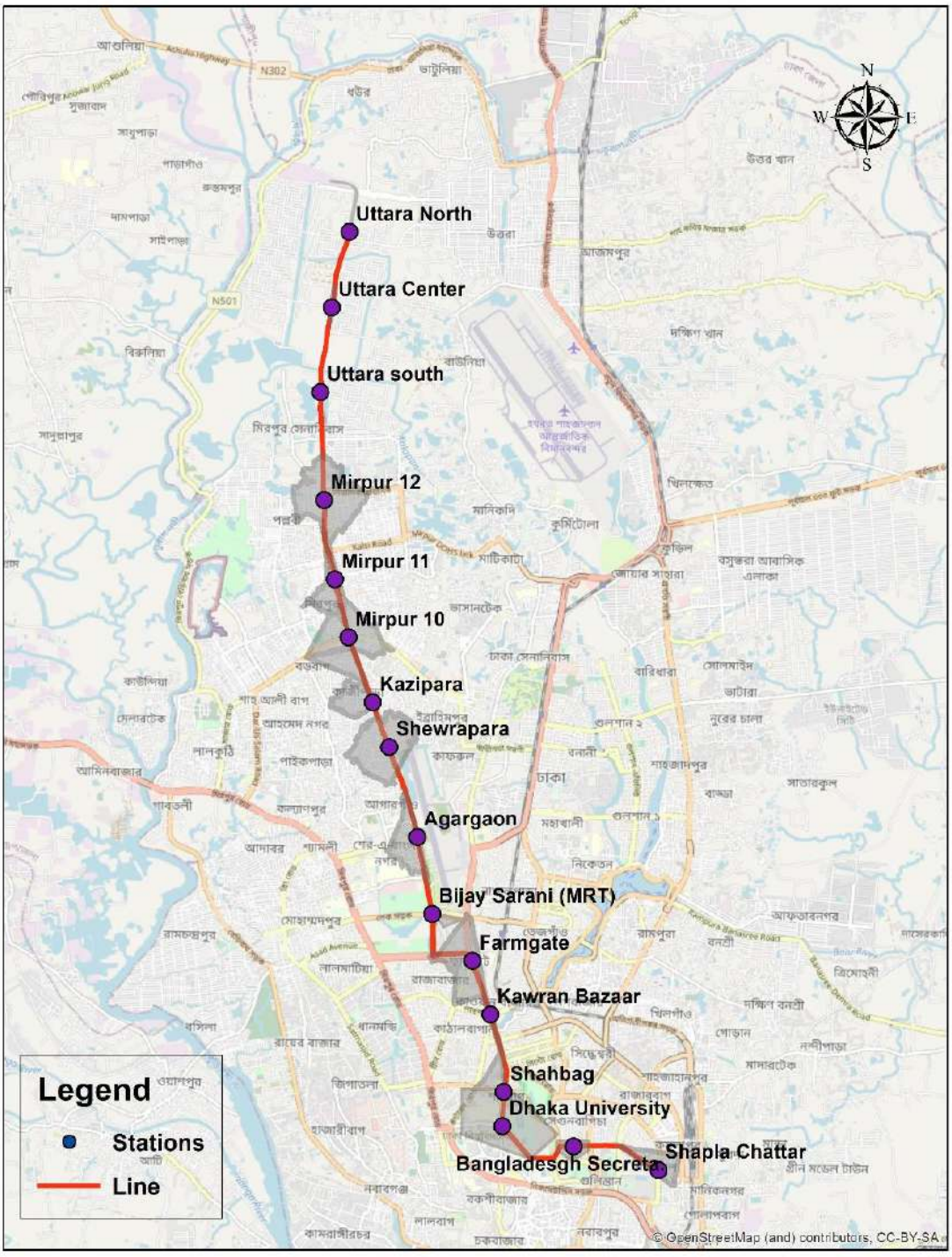
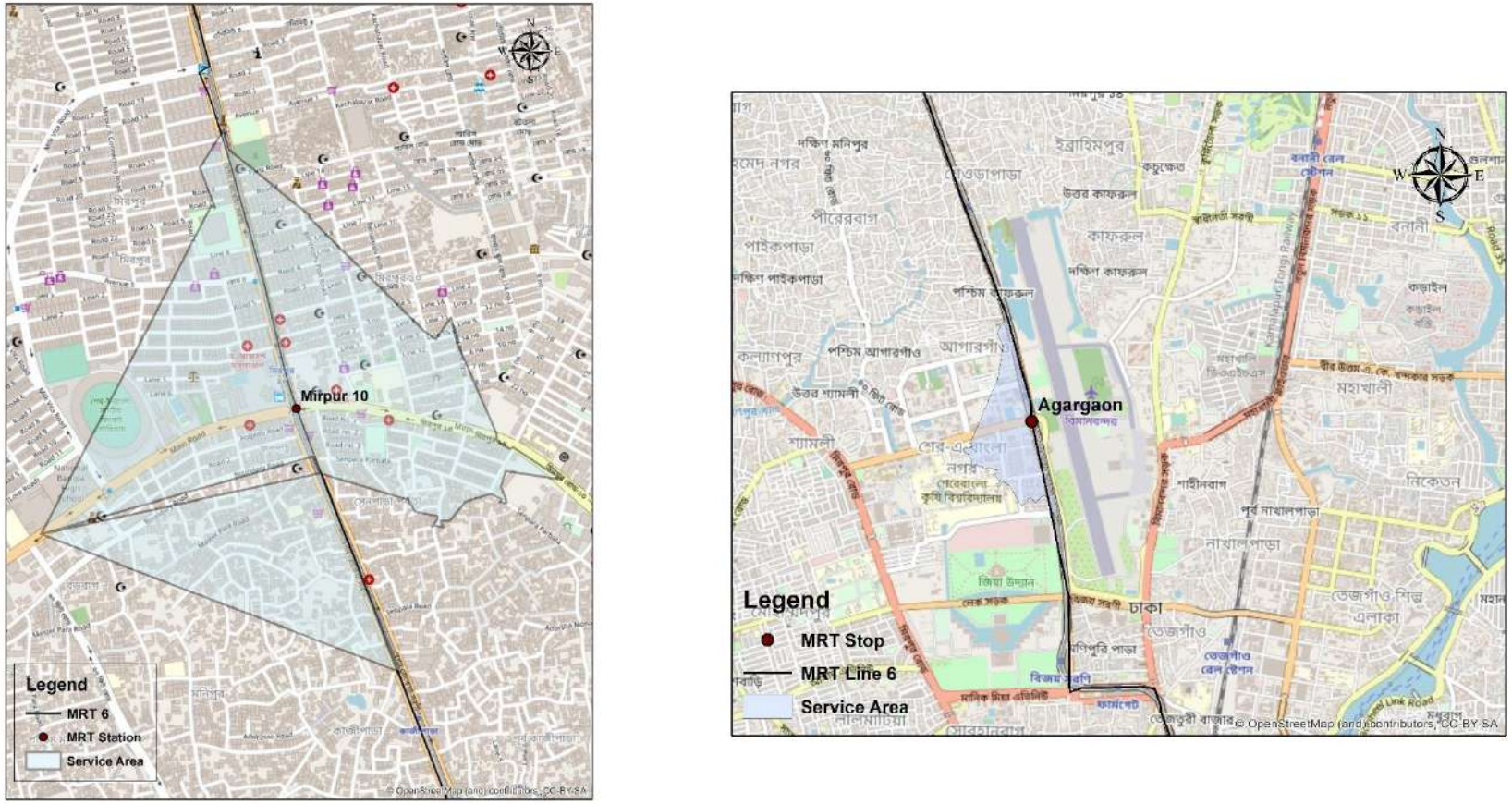


Figure 10:Service areas around MRT6 stations

The density of local streets or access roads defines the accessibility of stations. To understand the access road density around the stations, service area considering distance of 800 meters were generated using network analyst tool of ArcGIS. The access road length and number of

structures within service area were calculated. Here a detailed image of service area around active MRT stations is provided, for better understanding.



(Source: Author, 2022)

Figure 11: Service Area around Mirpur 10 and Agargaon MRT Station

Table 10 shows the details of the access road density and structure density within service areas around the stations.

Table 10: Road Density and Structure Density within 800 meters of Stops

Name of Stations	**Service Area (Sq. Km)**	**Access Road Density (km/Sq. km)**	**Overlapping Area with Other Stops (Sq. km)**	**Structure Density (Number/Sq. km)**
Agargaon	0.41	24.18	0	1248
Shewrapara	0.84	28.66	0	5245
Shapla Chattar	0.27	21.7	0	2194
Shahbag	0.35	18.78	Dhaka University-0.21 Kawran Bazar-0.0002	862
Mirpur 10	0.94	25.97	Kazipara- 0.00003 Mirpur 11- 0.0653	3495
Mirpur 12	0.98	22.5	Mirpur 11- 0.004	3528
Mirpur 11	0.32	28.79	Mirpur 12- 0.004	3703
Kazipara	0.28	29.99	Mirpur 10-0.00003	5262
Kawran Bazaar	0.03	102.36	Farmgate- 0.012	565
Farmgate	0.65	25.53	Bijay Sarani-0.0002	2759
Bijay Sarani (MRT)	0.05	23.96	Farmgate -0.0002	567
Uttara North	0.02	29.71	0	1539
Uttara Center	0.01	105.71	0	0
Uttara South	0	0	0	0
Dhaka University	1.26	16.91	Shahbag-0.21	454
Bangladesh Secretariat	0.13	13.81	0	995

According to Table 10, the Uttara South station is almost isolated from the rest of road network and there are also no structures as well. Along with this, the highest road density could be found within 800-meter service area of Uttara Center, but the structure density is almost zero. Whereas, at Kazipara station the access road density is very low than others, but the structure density is the highest among all. As there are many residential and mixed-use structures are located there. So, along the day, this area would work as a trip generator and attractor both. But on Kawran bazar area the road density is higher than others, but the structure density is quite

low as this area works as a CBD (Central Business District) and at the starting time of offices it works as a trip attractor and the ending time of office it works as trip generator.

5.2. Bus Rapid Transit (BRT) Line 3

BRT Line 3 is going to be the first Bus Rapid Transit System in Dhaka. In 2005 it was first mentioned in STP and in 2010 it was put as a high priority project. After that, in 2014 the design of the infrastructure started. It is divided into three phases and has a total length of 42.5 km.

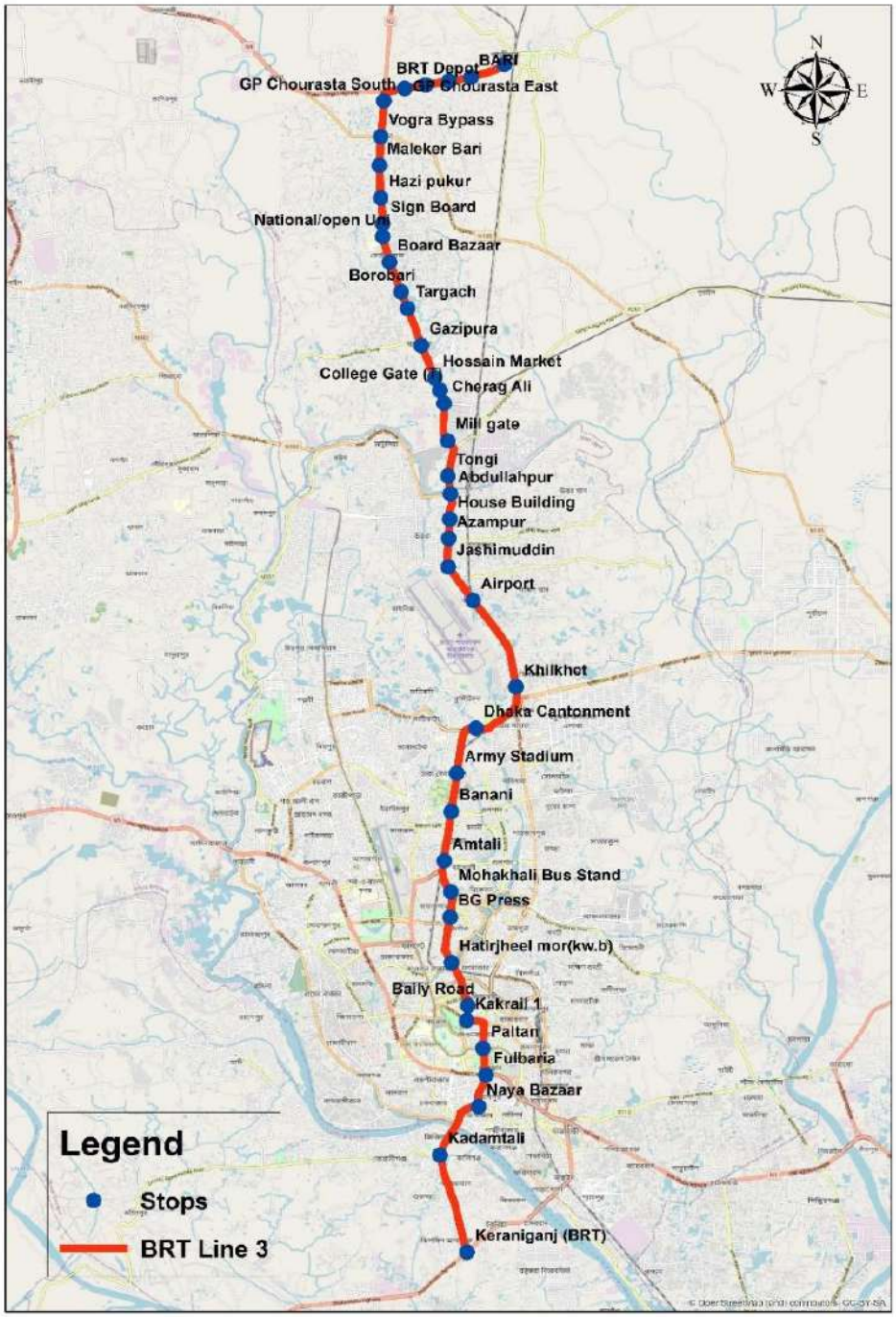


Figure 12:Alignment of BRT Line 3

5.2.1. Network Characteristics and Operational Features of BRT Line 3

Table 11: Network and operational aspects of BRT Line 3

Network Length (Km)	Stop Spacing (Km)	Operational Hour	Speed (Kmph)	Ridership	Headway	Access fare	Per Km Fare (BDT)
42.5	1.06	16	29	7,84,249 (PHPDT-2031)	3.5 min	10	2.5

(Source: BRTC, BUET, 2020; ALG; DevCon, 2017)

The BRT Line 3 has a length of 42 km. It starts at Gazipur Shibbari and ends up at Keraniganj Jhilmil Residenstial Area. There are 40 stops within the 42 km of BRT Line3. The average spacing length among the stops is 1.06 km. The accessible distance of BRT stops is 400 meter (Delbosc & Currie, 2011). The operational hour of the service would be 16 hours. But it is less than the standard level A graded service quality of transit facility (Brinckerhoff, 2013).

Initially the service would have a speed of 29 kmph. But gradually it may change during operational years in future. The headway of the service is 210 secs, so the frequency is 0.005 sec^{-1}. The access fare of the service will be equal to public bus service, but the "per km fare would be 2.5 BDT/km.

5.2.2. Overlapping and Connections with Other Transit Projects for BRT Line 3

The BRT Line 3 had overlaps with other transit projects. Table 12 provides the details of overalpping with bus route rationalization projects.

Table 12: Distribution of frequency of overlapping bus routes with BRT Line 3 Project

Transit Project	Overlapping Percentage (%)				
	0-20	21-40	41-60	61-80	81-100
Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work	62	23	25	16	7
Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka	19	5	6	1	0

According to Table 12, the old public bus route rationalization project has 62 routes which have overlapping percentage from 0 to 20% and there are seven routes having overlapping percentage more

than 80%. But in case of new bus route rationalization project the scenario is different. Only 19 routes are found having overlapping percentage between 0 to 20% whereas a single route is found which has overlapping percentage more than 61%.

Along with this, BRT Line 3 crosses MRT Line 5 North at Banani and MRT Line 5 South at Hatirjheel. However, it crosses MRT Line 6 at Paltan. Along with this, BRT Line 3 overlaps with MRT Line 1 from Airport to Kuril having a length of 2.95 km.

5.2.3. Road Density and Structure Density within 400 meters of Stops

According to Delbosc & Currie, 2011; Lemans, 2016 the accessible distance for bus and BRT stops would be 400 meters. Following this, service areas around the 40 BRT stops were generated and access road density along with structure density are measured. Table 13 provides the details of the access road density and structure density within service areas around the stops.

Table 13: Road Density and Structure Density within 400 meters of Stops

Name of Stop	**Service Area (Sq.Km)**	**Road Density (km/sq. km)**	**Overlapping Area with Other Stops (Sq. km)**	**Structure Density (Number/Sq.Km)**
Abdullahpur	0.048	37.27	0	2875
Airport	0	0	0	0
Amtali	0.01	99.97	0	0
Army Stadium	0	0	0	0
Arong milk factory	0.014	28.77	0	1214
Azampur	0.333	24.24	0	1694
Baily Road	0.055	21.79	0	618
Banani	0.365	21.75	0	1063
BARI	0.084	10.32	0	869
BG Press	0.006	135.48	0	0
Board Bazaar	0.001	38.6	0	12000
Borobari	0.018	31.16	0	3333
BRT Depot	0.01	23.99	0	1900
Cherag Ali	0.326	15.61	0	2448
College Gate	0	0	0	0
Dhaka Cantonment	0.019	41.37	0	0
Fulbaria	0.003	171.77	0	0
Gazipura	0.004	295.53	0	0
GP Chourasta East	0.397	16.16	GP Chourasta South= 0.0089	2972

GP Chourasta South	0.261	18.89	GP Chourasta East= 0.0089	3314
Hatirjheel mor(kw.b)	0.463	14.93	0	1376
Hazi pukur	0.001	56.8	0	8000
Hossain Market	0.001	229.33	0	12000
House Building	0	0	0	0
Jashimuddin	0.001	426.61	0	0
Kadamtali	0.048	20.93	0	7083
Kakrail	0.34	11.65	0	862
Keraniganj (BRT)	0.429	12.25	0	394
Khilkhet	0.001	137.27	0	0
Maleker Bari	0.005	53.94	0	4000
Mill gate	0.166	12.54	0	741
Mohakhali Bus Stand	0.015	34.96	0	733
National/open University	0.332	21.23	0	2855
Naya Bazaar	0.317	26.49	0	6486
Paltan	0.009	43.56	0	1111
Shib Bari Chourasta	0.411	12.29	0	2119
Sign Board	0	0	0	0
Targach	0.299	11.5	0	1903
Tongi	0.311	16.85	0	2492
Vogra Bypass	0.016	43.68	0	4125

According to Table 13, five stops among 40, has no service areas. These stops are Airport, Army Stadium, College Gate, House Building, Sign Board. Areas around these stops are occupied with different land uses, i.e; Airport stop is close to the Airport Railway Station and Shah Jalal International Airport. These two landmarks occupied most of the areas around this BRT stop and movement along this corridor is specially regulated following these, that is why, the density of access road is zero and there is no service area in this stop. Similar goes for Army Stadium as well.

Although the highest number of structures are within the service areas of Naya Bazar and Gazipur Chourasta East stops, whereas the structure density (number/ sq. km) is high around Board Bazar and Hossain Market stops. As road density is quite less around these stops that is why, the service area is small, and the structure density is high.

5.3. Mass Rapid Transit (MRT) Line 1

5.3.1. Network Characteristics and Operational Aspects of MRT Line 1

Table 14:Network and operational aspects of MRT Line 1

Network Length (Km)	**Stop Spacing (Km)**	**Operational Hour**	**Speed (Kmph)**	**Ridership**	**Headway**	**Access fare**	**Per Km Fare (BDT)**
29	1.61	18	39 on 2035	21,117,000 pax.km/day (2035)	3 min	20	4.5

The proposed MRT Line 1 has a total length of 29 km. It has two parts. The underground section starts from Airport and ends up at Kamalapur, it has a total length of 18.8 km. Whereas, the elevated section starts from Notun Bazar and ends up at Purbachal, it has a total length of 11.8 km.

The entire corridor has 18 stops, among them 11 are on underground section and 7 are on elevated part. The average spacing of the stops is about 1.61 km. It would have an operational hour of 18 hours which is higher than BRT 3, but equal to MRT 6.

Rest of parameters such as headway, access fare and per km fare are equivalent to MRT Line 6.

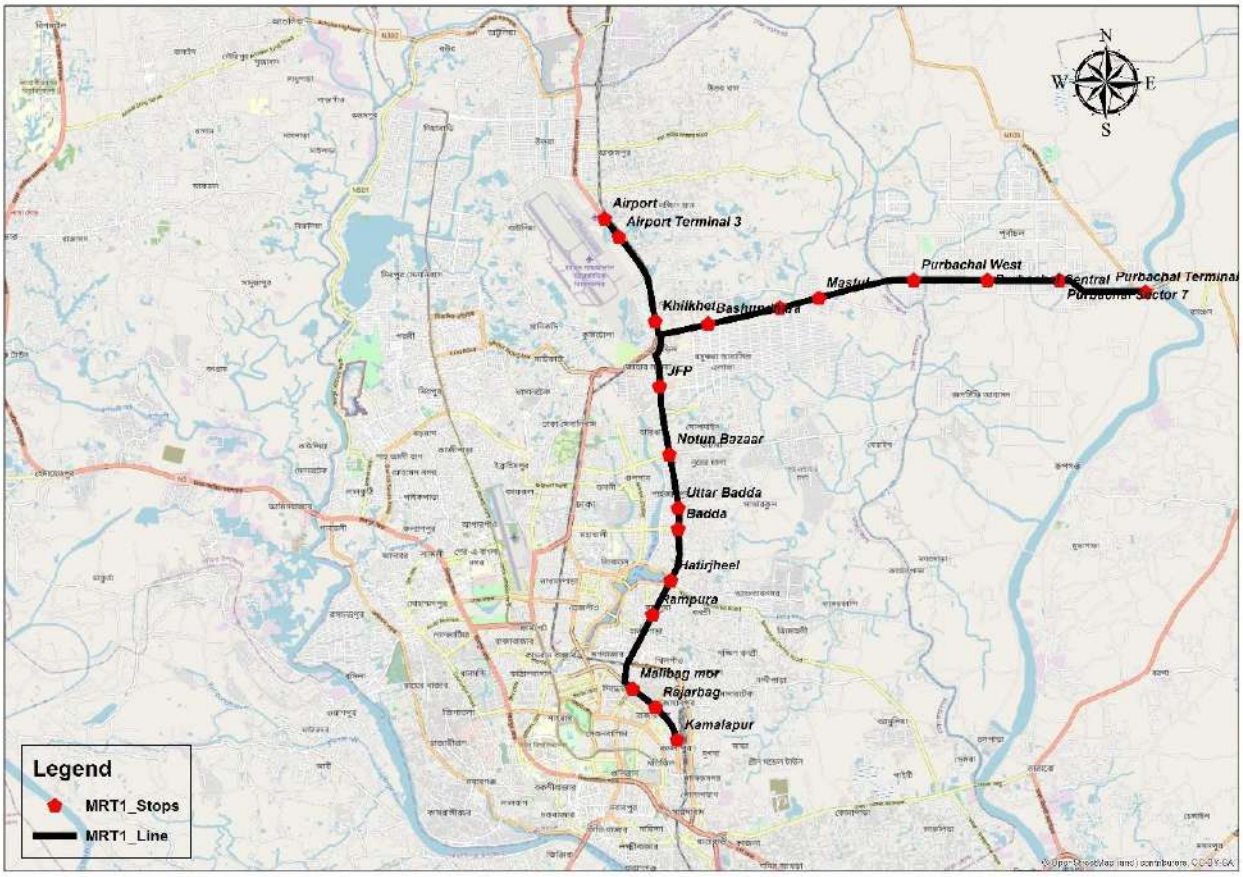


Figure 13: Alignment of MRT Line 1

5.3.2. Overlapping and Connections with Other Transit Projects for MRT Line 1

Table 15: Distribution of frequency of overlapping bus routes with MRT Line 1 Project

Transit Project	**Overlapping Percentage (%)**				
	0-20	**21-40**	**41-60**	**61-80**	**81-100**
Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work	46	28	8	4	0
Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka	12	4	2	0	0

Considering the BRT Line 3 and MRT Line 6 projects, the MRT Line 1 had a smaller number of overlapping bus routes on its' corridor. In case of previous bus route restructure project, there were 46 routes which had overlapping percentage less than 20%, whereas, in new bus

route restructure project the number is 12. Specially on the east part of MRT1 route there is no overlapping bus route. Apart from this, MRT1 has crossings with BRT3, BRT7, MRT 5 (North and South both).

5.3.3. Road Density and Structure Density within 800 meters of Stops of MRT Line 1

Following the accessible distance of MRT stations, the service areas around the MRT stations were calculated and based on this, the road density and structural density around the stations were calculated.

Table 16: Road and structure density within 800 meters of MRT1 stations

Name of the Station	**Road Density (Km/Sq. Km)**	**Overlapping Area with Other Stops (Sq. km)**	**Structure Density (Number/Sq.Km)**
Airport	14.29	Airport Terminal 3: 1.1	1180
Uttar Badda	25.03	Notun Bazar: 0.121 Badda: 1.18	4343
Hatirjheel	21.64	Rampura: 0.55 Badda: 0.175	3313
Rajarbag	24.93	Malibag mor: 0.86 Kamalapur: 0.53	2367
Notun Bazaar	20.49	Uttar Badda: 0.121	2887
Khilkhet	24.8	Basundhara: 0.16	3199
Kamalapur	21.24	Rajarbag: 0.53	2210
Badda	26.14	Hatirjheel: 0.175 Uttar Badda: 1.18	4927
Rampura	25.61	Hatirjheel: 0.55	4343
Malibag mor	22.75	Rajarbag: 0.86	2927
JFP	21.66	0	3323
Purbachal West	10.94	0	148
Purbachal Terminal	8.39	0	594
Airport Terminal 3	13.34	Airport: 1.1	729
Purbachal Sector 7	14.23	0	4
Purbachal Central	14.69	0	125
Mastul	7.08	POHS Bashundhara: 0.5	277
POHS Bashundhara	11.62	Mastul: 0.5	212
Bashundhara	17.21	Khilkhet: 0.16	1328

According to Table 16, the highest value of road density can be found around Badda station of MRT 1. The value is more than 26 km/sq.km. Although on this area the structure density is quite less than other service areas. The highest value of structure density belongs to Uttar Badda, the value is around 4927 structure/sq. km. On this regard, this area can be considered as a highly densified area.

5.4. Mass Rapid Transit (MRT) Line 5 North

5.4.1. Network Characteristics and Operational Aspects of MRT Line 5 North

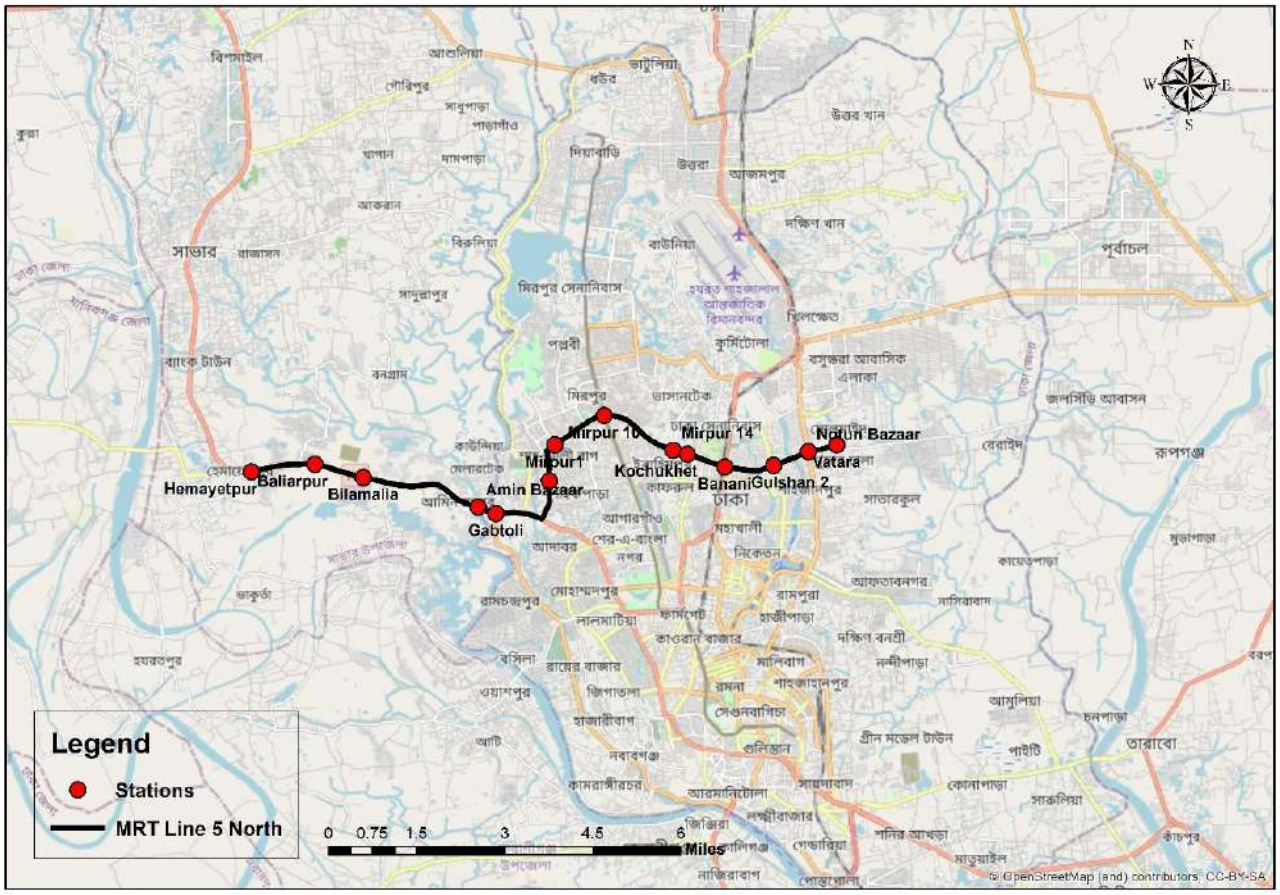


Figure 14: Alignment of MRT Line 5 North

Table 17: Network and operational aspects of MRT Line 5 North

Network Length (Km)	Stop Spacing (Km)	Operational Hour	Speed (Kmph)	Ridership	Headway	Access fare	Per Km Fare (BDT)
20	1.42	16	35 on 2035	PHPDT 28,600 on 2035	3 min	20	4.5

(Source: Almec Corporation., Oriental Consultants Global Co., Ltd., Nippon Koei Co., Ltd., Katahira and Engineers International, 2018)

The MRT line 5 North starts from Vatara and ends up at Hemayetpur having a total length of 20 km. On this corridor there are 14 stops within 20 km length. The average stop spacing is 1.42 km.

It would have an operational hour of 16 hours. However, the headway, access fare and transfer penalty are equivalent to the line 6 and 1.

5.4.2. Overlapping and Connections with Other Transit Projects for MRT Line 5 North

The MRT line 5 North has overlapped with other transit projects. Table 18 provides the details of overlapping with bus route rationalization projects.

Table 18:Distribution of frequency of overlapping bus routes with MRT Line 5 North Project

Transit Project	**Overlapping Percentage (%)**				
	0-20	**21-40**	**41-60**	**61-80**	**81-100**
Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work	105	22	1	0	0
Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka	9	6	1	0	0

According to Table 18, the old public bus route rationalization project has 105 routes which have overlapping percentage from 0 to 20% and there are 22 routes having overlapping percentage more than 21%. But in case of new bus route rationalization project the scenario is different. Only nine routes are found having overlapping percentage between 0 to 20% whereas only 1 route is found which has overlapping percentage more than 41%. Apart from this, MRT5 North has crossings with BRT3, MRT6, MRT1.

5.4.3. Road Density and Structure Density within 800 meters of Stops of MRT Line 5 North

Following the accessible distance of MRT stations, the service areas around the MRT stations were calculated and based on this, the road density and structural density around the stations were calculated.

Table 19:Road and structure density within 800 meters of MRT5 North stations

Name of Stations	**Road Density (Km/sq. km)**	**Overlapping Area with Other Stops (Sq. km)**	**Structure Density (Number/Square Km)**
Dar_us_Salam	27.19	0	4081
Amin Bazaar	13.58	Gabtoli: 1.186	4128
Mirpur1	29.11	Mirpur 10: 0.006 Dar_us_Salam: 0.53	4783
Notun Bazaar	20.38	Vatara: 0.79 Gulshan 2: 0.49	2853
Mirpur 10	26.96	Mirpur 1: 0.006	4509
Banani	19.01	Kochukhet: 0.379 Mirpur 14: 0.052 Gulshan 2: 0.148	848
Hemayetpur	11.72	0	2957
Gabtoli	14.48	Amin Bazaar: 1.186	3633
Mirpur 14	24.8	0	4251
Baliarpur	8.04	Bilamalia: 0.125	1327
Gulshan 2	17.45	Notun Bazaar: 0.49 Banani: 0.148	848
Bilamalia	10.57	Baliarpur: 0.125	107
Kochukhet	22.01	Banani: 0.379 Mirpur 14: 1.323	3116
Vatara	22.32	Notun Bazaar: 0.79	4365

According to the Table 19, the highest road density and structure density could be found around the Mirpur 1 Station. Along with this, almost similar trend could be found around the station of Mirpur 10 as well. These two areas are also famous for mixed land use and many important govt. and non-govt. offices are situated on these places.

5.5. Mass Rapid Transit (MRT) Line 5 South

5.5.1. Network Characteristics and Operational Aspects of MRT Line 5 South

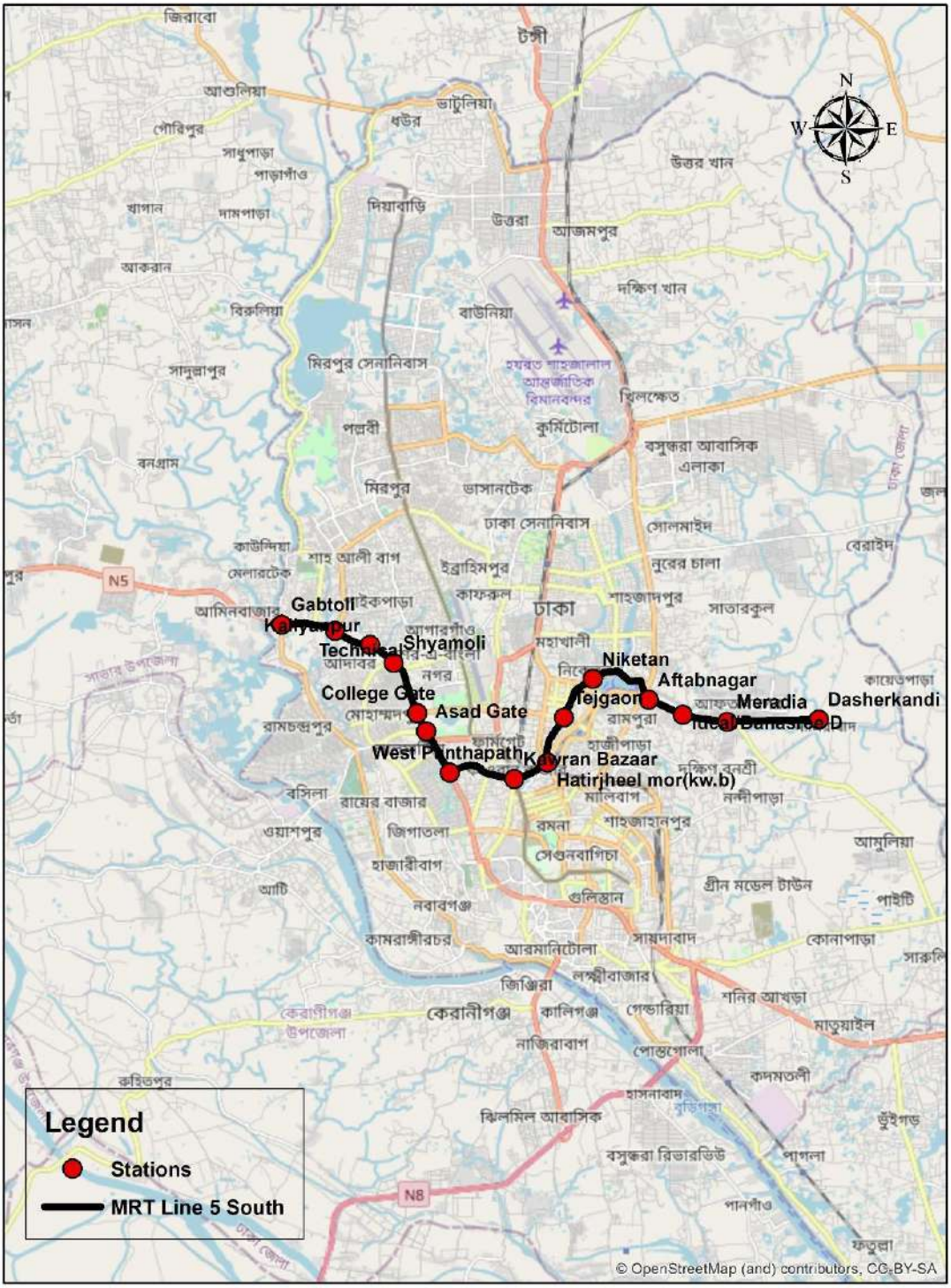


Figure 15: Alignment of MRT Line 5 South

Table 20: Network and Operational Aspects of MRT Line 5 South

Network Length (Km)	Stop Spacing (Km)	Operational Hour	Speed (Kmph)	Ridership	Headway	Access fare	Per Km Fare (BDT)
16.71	1.11	16	35 on 2035	PHPDT 28,600 on 2035	3 min	20	4.5

The MRT line 5 South has a length of 16.71 km. The line starts at Gabtoli and ends up at Aftabnagar. There are 15 stations within this 16.71 km route. The average stops spacing is about 1.11 km.

It would have an operational hour of 16 hours. However, the headway, access fare and transfer penalty are equivalent to the line 6 and 1.

5.5.2. Overlapping and Connections with Other Transit Projects for MRT Line 5 South

The MRT line 5 South has overlapped with other transit projects. Table 21 provides the details of overlapping with bus route rationalization projects.

Table 21: Distribution of frequency of overlapping bus routes with MRT Line 5 South Project

Transit Project	Overlapping Percentage (%)				
	0-20	21-40	41-60	61-80	81-100
Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work	94	28	9	0	0
Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka	23	2	0	0	0

According to Table 21, the old public bus route rationalization project has 94 routes which have overlapping percentage from 0 to 20% and there are 28 routes having overlapping percentage more than 21%. But in case of new bus route rationalization project the scenario is different. Only 23 routes are found having overlapping percentage between 0 to 20% whereas no route could be found having an overlapping percentage more than 41%. Apart from this, MRT5 South has crossings with BRT3, MRT6, MRT1.

5.5.3. Road Density and Structure Density within 800 meters of Stops of MRT 5 South

Following the accessible distance of MRT stations, the service areas around the MRT stations were calculated and based on this, the road density and structural density around the stations were calculated.

Table 22: Road and structure density within 800 meters of MRT5 South stations

Name of Stations	Road Density (Km/Sq. Km)	Overlapping Area with Other Stops (Sq. km)	Structure Density (Number/Sq.Km)
Asad Gate	18.97	College Gate: 1.253 West Panthapath: 0.373	1197
Shyamoli	23.16	Kallyanpur: 0.92 Technical: 0.004 College Gate: 0.186	3459
Meradia	21.64	Ideal/Banasree D: 0.444	1718
Kawran Bazaar	20.92	Hatirjheel mor(kw.b): 0.691	2575
Kallyanpur	24.04	Shyamoli: 0.92 Technical: 0.661	4641
Gabtoli	14.48	Technical: 0.223	3633
West Panthapath	22.2	Asad Gate: 0.373 Kawran Bazaar: 0.022	2080
College Gate	19	Shyamoli: 0.186 Asad Gate: 1.253	1526
Ideal/Banasree D	22.04	Aftabnagar: 0.678 Meradia: 0.444	2826
Technical	18.26	Gabtoli: 0.223 Kallyanpur: 0.661	3436
Hatirjheel mor(kw.b)	18.76	Kawran Bazaar: 0.691 Tejgaon: 0.367	2236
Tejgaon	16.1	Hatirjheel mor(kw.b): 0.367 Niketan: 0.354	1874
Niketan	15.11	Aftabnagar: 0.102 Tejgaon: 0.354	1825
Aftabnagar	21.75	Niketan: 0.102 Ideal/Banasree D: 0.678	3249
Dasherkandi	5.36	0	1111

According to Table 22, Highest Road density could be found around the Kallyanpur station. The highest structure density also belongs to the same place. There is a regional bus stop on

this point as well. People travelling to various parts of the country take their buses from this point.

Apart from this, the second highest value of structure density belongs to Gabtoli, although the value of road density is low in this area. However, on these areas the pre-dominant land use is mixed land use.

5.6. Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka

5.6.1. Network Characteristics and Operational Aspects

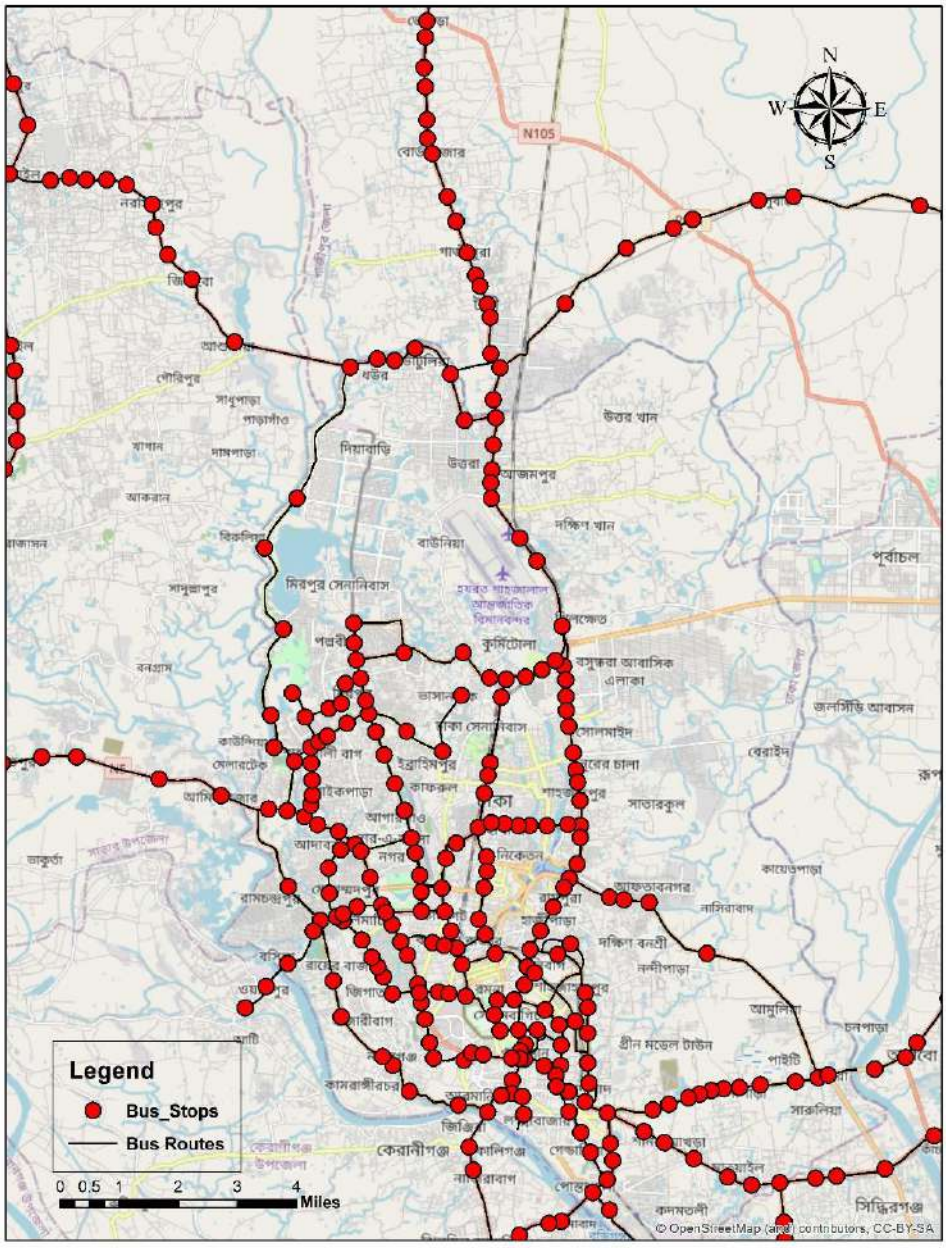


Figure 16: Alignment of newly rationalized bus routes

Table 23: Network and Operational Aspects of Newly Rationalized Bus Routes

Network Length (Km)	Stop Spacing (Km)	Operational Hour	Speed (Kmph)	Ridership	Headway	Access fare	Per Km Fare (BDT)
516. 42	1.29	16	29	-	10 min	10	2.15

(Source: Infrastructure Investment Facilitation Company (IIFC), 2020)

The entire bus route network has a length of 516. 42 km. It contains 44 routes in total covering entire Dhaka city along with its' surrounding sub-urban areas.There are total 400 bus stops within 516.42 km network. The average spacing among bus stops is about 1.29 km.

Although rest of the routes relate to each other, but there is a route which is not connected to any of the other routes. It has route number 23 and belongs to the cluster "South".

5.6.2. Overlapping and Connections with Other Transit Projects

The newly planned public bus routes have overlapping with other transit projects. The Table 24 provides the details of the overlapping percentage with other transit projects.

Table 24: Distribution of overlapping length of transit projects with new rationalized bus routes

Name of the transit project	Overlapping length (Km)	% Of project network length
MRT1	15.08	52
BRT3	37.84	89.04
MRT5_N	14.4	72
MRT5_S	10.7	64.03
MRT6	13.95	69.4
BRT7	8.02	14.63

According to Table 24, MRT6 has an overlapping length of 13.95 km with newly proposed bus route network, which is about 69.4% of its total length. Along with this, BRT3 has overlapping percentage more than 80, which means that there will be several public bus routes operational on the BRT 3 corridor. However, BRT7 has the least overlapping percentage. It means that, there will be very few bus routes which are operational on BRT 7 corridor.

5.6.3. Road Density and Structure Density within 400 meters of Stops

There are more than 500 bus stops which are planned in this corridor. Road and structure density calculations are done for all these bus stops, but to represent the scenario few bus stops are selected and Table 25 shows the details.

Table 25: Distribution of road and structure density within 400 meters of bus stops

Name of Stops	Structural Density (Number/Sq. Km)	Overlapping Area with Nearby Stops (Sq. km)	Road Density (length/sq. km)
Abdullahpur	2599	Tongi: 0.129	22.73
Housebuilding	1897	0	24.79
Azompur	1646	Rajlaksmi: 0.231	23.04
Khilkhet	3238	0	26.78
Rampura Bridge	2020	Rampura: 0.275 Merul: 0.165	16.33
Jhatrabari	4539	Jonopath Mor: 0.033	27.24
Kakoli	965	Shainikclub: 0.239	19.29
Farmgate	2110	0	21.97
Shahbagh	583	Kataban: 0.148	11.84
Palton	1329	Pressclub: 0.13 Dainik Bangla: 0.13	18.65
Gulistan Park	2135	Joy Kali Mandir: 0.09	17.4
Golapshah Mazar	762	Banga bandhu Avenue: 0.42	12.91
Sadarghat-Gabtoli road	7676	Section: 0.22	26.14
Gabtoli	5029	Mazar road: 0.127	15.67
Azimpur	1116	Dhakeshari Mandir: 0.17	22.5
Fullbaria	2685	Bangshal: 0.09	20.36
Mirpur-1	4157	Janata Housing: 0.11 Salimuddin road market: 0.177 Zoo Road: 0.3 Konabari: 0.08	26.13
Mirpur-10	3397	Original 10: 0.142 Al Helal: 0.112 Mirpur-2: 0.045	27.03
Mirpur-11	6038	Purobi: 0.121 Chalantika Mour: 0.1739 Original 10: 0.142	29.95

Kalshi	8317	0	31.66
Gazipur Chowrasta	4167	Gazipur Chowrasta East: 0.05 Gazipur Chowrasta South: 0.297	22.78
Vogra Bypass Bus Stop	3628	0	17.8

According to Table 25, the highest structural density could be found around Kalshi stop. It is an area with predominant residential and mixed land use. Along with this, Mirpur 11 also has high structural density. Apart from this, areas around these two stops also have high road density. These areas are also known for various commercial activities as well.

5.7. Dhaka Bus Network and Regulatory Reform Implementation Study and Design Work

5.7.1. Network Characteristics and Operational Aspects

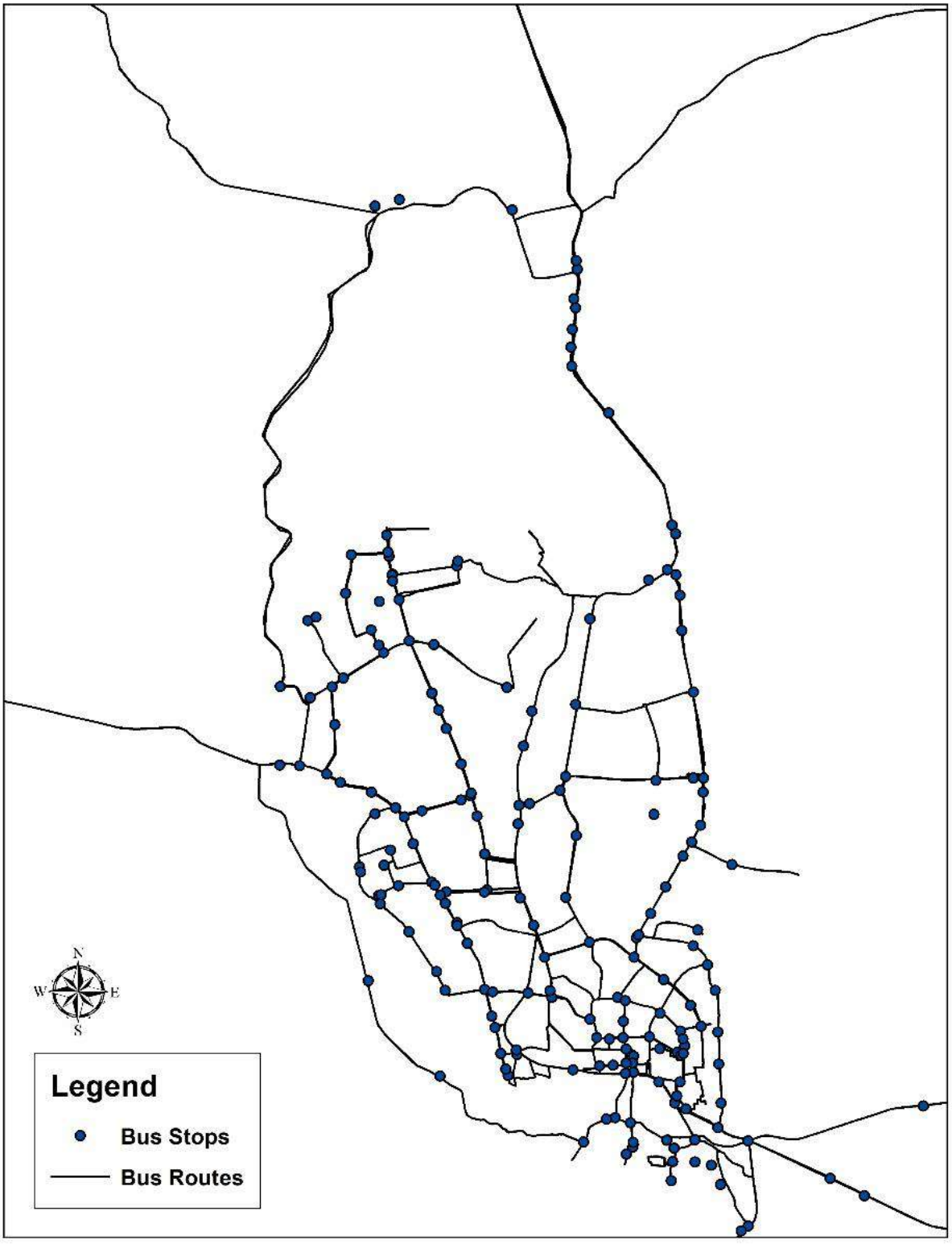


Figure 17:Alignment of old rationalized bus routes

Network Length (Km)	Stop Spacing (Km)	Operational Hour	Speed (Kmph)	Ridership	Headway	Access fare	Per Km Fare (BDT)
629.72	3.21	16	16	-	10 min	10	2.15

The bus route network has a length of 629.72 km. It contains 160 routes in total covering entire Dhaka city along with its' surrounding sub-urban areas. There are 196 bus stops within 629.72 km network. The average spacing among stops is 3.21 km which is quiet higher than usual.

5.7.2. Overlapping and Connections with Other Transit Projects

The existing bus routes have overlapping with other transit projects. Table 26 provides the details of the overlapping ratio with other transit projects.

Table 26: Overlapping Analysis of Existing Bus Routes

Transit Project	Overlapping ratio				
	0-0.2	0.21-0.40	0.41-0.60	0.61-0.80	0.81-1
BRT3	62	23	25	16	7
BRT7	26	0	3	0	0
MRT1	46	28	8	4	0
MRT2	82	28	16	7	0
MRT4	56	0	0	0	0
MRT5_North	105	22	1	0	0
MRT5_South	94	28	9	0	0
MRT6	81	27	8	8	2

According to Table 26 there are 105 routes having overlapping ratio less than 0.20 which are aligned on MRT5 North. Along with this, there are 94 routes aligned on MRT5 South having an overlapping ratio 0.20. Since these two transit routes are east-west aligned, so there were so many intersections with other north-south aligned bus routes. On BRT7 corridor least number of bus routes could be found having overlapping length. As BRT7 route is outside the city corporation area, that is why least number of bus routes could be found having overlapping with this.

According to the findings, the transit projects had greater overlapping on existing bus route network than the proposed new one. Moreover, the existing bus routes have higher overlapping ratio within themselves as well. In these circumstances, the project of new proposed bus routes minimizes the overlapping issue.

5.7.3. Road Density and Structure Density within 400 meters of Stops

There are about 196 bus stops within Dhaka city area. Road and structure density calculations are done for all these bus stops, but to represent the scenario the following bus stops are selected and Table 27 shows the details.

Table 27: Distribution of road and structure density within 400 meters of bus stops

Name of Bus stops	**Structure density (Number/Sq. km)**	**Overlapping Area with Nearby Stops (Sq. km)**	**Road density (length/ sq. km)**
Azimpur	1013	Dhakeswari: 0.132 Etimkhana: 0.23 Nilkhet: 0.09	22.02
Airport	338	0	14.96
Abdullahpur	2434	Tongi Bridge: 0.357 Mascot Plaza: 0.052	22.55
Adabor	3604	Kallyanpur: 0.146 Shishumela: 0.081 Shaymoli: 0.177	26.32
Bangla Motor	2034	Kawranbazar: 0.02	19.47
City College	1319	Science Lab:0.37	16.97
Demra Crossing	1505	Demra Ghat: 0.12 Sarulia: 0.07	15.89
Dhour	1393	Ashulia: 0.129	9.77
Fulbaria	2090	Sergent Ahad Police Box: 0.376 Bangabazar: 0.12 Phonix Road: 0.27	18.24
Jatrabari	4520	Jonopath: 0.04	27.26
Taltola	3337	Khilgaon: 0.23	26.69
Mirpur 10	3399	Mirpur 2: 0.085	27.28
Mirpur 13	4000	0	28.09
Manik Mia Avenue	810	Asad Gate: 0.225 Dhanmondi 27: 0.31 Dhanmondi Boys school: 0.398 Khamarbari: 0.008	19.7
Mouchak	2671	Malibagh: 0.184 Rajarbagh: 0.007	21.94
Mugda para	2396	Kamlapur: 0.224	15.67
Merul Badda	3666	Rampura Bridge: 0.194	20.77
Natun rasta	2328	0	20.64

Shahbagh	328	Kataban: 0.141	11.14
TT para	4340	0	17.79

According to Table 27, the highest value of structure density could be found around the Jatrabari stop. Apart from this, the highest value of road density could be found around Mirpur 13 bus stop. Both Jatrabari and Mirpur 13 are famous for mixed land use. There are several commercial and residential structures on these areas.

Chapter 6: Assessing the traffic impact of BRT and MRT networks on the proposed bus route network

In Dhaka, seven transit projects are planned considering the future travel demand of the growing population. Some of these transit projects would end very soon, and when these will be operational the traffic volume along these corridors would be higher. On this chapter the estimated traffic impacts created due to transit projects would be discussed.

6.1. Bus Rapid Transit (BRT) Line 3

The BRT Line 3 has a corridor of 40 km. On this corridor 39 proposed bus routes were found which had overlapping length on this corridor. It is mentioned in the operation plan of BRT Line 3 that, there are several bus routes which overlapped with BRT Line 3 corridor, and to make the BRT system effective, three scenarios of operation plan has been derived. These scenarios are: i) Full coordinated operation with overlapped bus routes, ii) Partial and coordinated operation with overlapped bus routes and iii) No coordination among them. While in Dhaka the bus route rationalization project is on implementation stage, and the BRT Line 3 and bus route rationalization project do not have any integration plan with each other. Considering this issue, the study tries to discover the consolidated traffic impact of BRT and bus routes.

On BRT Line 3 corridor there are 39 bus routes and on these routes about **21,255** buses would be plying considering types such as standard buses of 50 seats, 26-40 seats, articulated buses, and AC standard buses. Following the capacity of the buses the total value is calculated. On this objective the study considers the impact for one trip only.

Table 28 provides the distribution of fleets following the overlapped bus routes and their overlapping length.

Table 28: Overlapped Bus Routes Aligned with BRT Line 3 and Fleet Distribution

Route Number	Overlapping Length (km)	Standard Bus (50 Seat)	A/C Bus (50 seat)	36/40 Seat	50 Seat (reconstructed)	Total	Passengers in Total (1 trip)
7C	0.2	75	40	138	46	299	16,560
3B	13.15	125	70	204	68	467	25,980
16D	0.59	500	195	281	94	1070	61,390
17	12.66	100	40	150	50	340	18,900
4B	0.48	115	31	88	31	265	15,020
14B	0.57	430	230	497	172	1329	74,770
9B	0.48	273	140	367	124	904	50,570
4C	0.2	115	31	88	31	265	15,020
7A	3.1	75	40	138	46	299	16,560
6	0.53	147	86	384	132	749	41,100
13	0.72	430	230	497	172	1329	74,770
2B	13.15	60	30	102	34	226	12,540
9A	0.48	68	30	107	36	241	13,390
14A	0.53	430	230	497	172	1329	74,770
1A	16.64	100	50	83	27	260	14,770
16B	0.2	500	195	281	94	1070	61,390
3A	8.92	125	70	204	68	467	25,980
1C	14.73	507	225	310	101	1143	65,480
15B	16.64	150	70	136	46	402	22,760
2A	10.23	60	30	102	34	226	12,540
11A	0.72	110	65	102	33	310	17,580
16C	8.92	120	45	94	31	290	16,460
12A	8.92	100	45	120	44	309	17,340
12A	8.92	100	45	120	44	309	17,340
4A	0.2	115	31	88	31	265	15,020
13	0.72	430	230	497	172	1329	74,770
24	0.1	0	5	44	16	65	3,460
1B	13.6	132	75	165	53	425	23,850

18	1.51	100	40	150	50	340	18,900
15A	6.83	150	70	136	46	402	22,760
11B	0.49	70	60	160	55	345	19,100
5	2.01	147	86	384	132	749	41,100
12B	13.15	100	45	120	44	309	17,340
16A	0.49	120	45	94	31	290	16,460
11C	0.2	70	60	160	55	345	19,100
7B	2.01	75	40	138	46	299	16,560
1D	4.32	507	225	310	101	1143	65,480
19	0.13	195	92	392	131	810	44,680
8	1.72	68	30	107	36	241	13,390

(Source: Infrastructure Investment Facilitation Company (IIFC), 2020)

From Table 28 it is found that, there are 19 routes which have overlapping length less than a km, it means these routes have crossings on the BRT Line 3 corridor. Among the 40 stops of BRT Line3, the crossings could be found around six stops which are listed in Table 29. Around these stops there should be turning facilities or move through option for buses so that the buses can turn and move through on these stop areas. In this part, bus routes having overlapping length less than a km are crossing ones and routes having overlapping length more than 1 km are considered as passing through ones.

Table 29: Distribution of routes on BRT Line3 stops following their overlapping character

Name of BRT Line 3 Stop	**Number of Crossing Bus Route**	**Number of Passing Through Bus Route**
Abdullahpur	1	17
Amtali	2	7
Paltan	8	4
Fulbaria	1	4
Kakrail	4	0
Keraniganj	1	3

Apart from these 6 stops, rest of the 34 stops have overlapping bus routes which pass through the corridor.

On the BRT Line 3, the Peak Hour Peak Direction Traffic (PHPDT) for 2031 stands out to be 13,997, at full coordinated similar fare scenario in 2031. If the bus routes and BRT Line 3 operates at the same time, per hour passenger is estimated to be 12,08,947.

Apart from this while assessing the traffic impact it is required to assess the surrounding land use as well. Considering accessibility distance land use within 400 meter of BRT line 3 has been analyzed and their details is provided into Table 30. For better understanding the blow-up area around Amtali BRT Stop has been provided here.

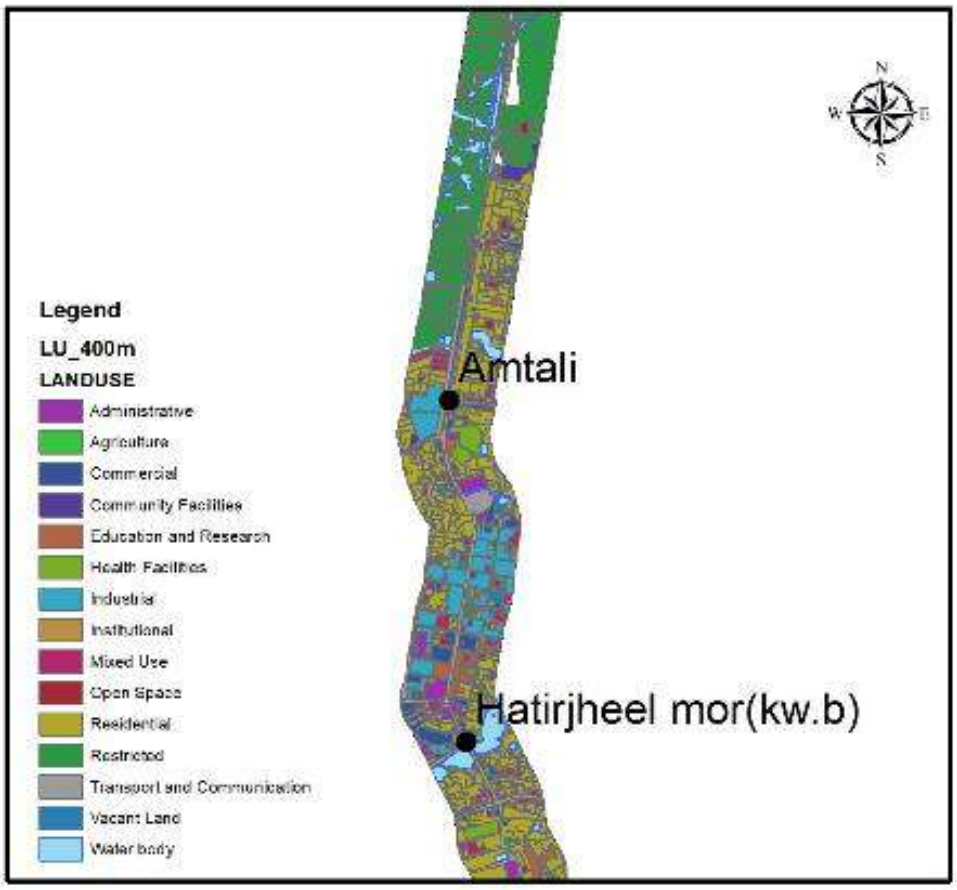


Figure 18: Land use distribution within 400-meter buffer of BRT Line

Table 30: Distribution of land use within 400m accessible area of BRT Line

Land use type	**Area_Sq. Km**	**Percentage**
Administrative	0.55	1.83
Agriculture	0.31	1.03
Commercial	2.3	7.66
Community Facilities	0.48	1.6
Education and Research	1.65	5.5
Health Facilities	0.19	0.63
Industrial	2.83	9.43
Institutional	0.03	0.1
Mixed Use	2.61	8.7
Open Space	0.34	1.13
Residential	11.44	38.12
Restricted	2.98	9.93
Vacant Land	1.2	4
Water body	3.1	10.33
Grand Total	30.01	100

(Source: RAJUK, 2020)

According to the Table 30, the highest percentage of land use belong to residential use, following which the second highest percentage belongs to mixed use and industrial use. According to, Badoe & Miller, 2000 and Zhang et al., 2017 high density of mixed and commercial land use has a great impact on traffic scenario. In case of BRT Line 3, along with residential land use, industrial, mixed and commercial land use have high percentage of share, and these generate massive number of traffic considering their necessity. In short, it can be said that the surrounding land use distribution contributes to the traffic share of the BRT Line 3 corridor.

6.2. Mass Rapid Transit (MRT) Line 6

On the 20 km corridor of MRT Line 6, 31 bus routes could be found which have overlapping lengths. In the service and operation plan prepared for MRT Line 6, there is no mention of the integration of MRT and public bus service. In this part, an attempt has been taken to assess the combined impact of MRT Line 6 and public bus routes on the corridor.

On the 31 overlapping bus routes, 10 routes have overlapping length less than a km, so these routes are crossing ones, apart from this, the rest of the 21 routes would work as passing through ones. The details of the overlapping 31 routes are provided into Table 31.

Table 31: Overlapped Bus Routes Aligned with MRT Line 6 and Fleet Distribution

Route_Number	Overlapping Length (km)	Bus (50 Seat)	AC Bus Seat (50)	36/40 seat	50 Seat (reconstructed)	Total Fleet	Total Passenger
9A	12.7	38	20	69	23	150	8,310
7C	8.18	43	23	41	14	121	6,850
9B	1.64	34	15	54	18	121	6,720
16C	1.69	75	35	68	23	201	11,380
11B	3.98	55	33	51	17	156	8,850
3B	1.53	30	15	51	17	113	6,270
10	8.32	34	15	54	18	121	6,720
13	0.41	33	15	40	15	103	5,780
11A	0.41	150	60	115	40	365	20,750
15B	0.2	115	40	16	9	180	10,640
3A	1.69	30	15	51	17	113	6,270
13	0.41	33	15	40	15	103	5,780
8	1.69	38	20	69	23	150	8,310
6	1.53	58	16	22	16	112	6,500
11C	2.22	55	33	51	17	156	8,850
14A	1.53	33	15	40	15	103	5,780
2B	0.82	33	20	51	17	121	6,750
4B	4.69	11	18	99	34	162	8,730
16D	3.97	60	23	47	16	146	8,290
12B	0.93	35	30	80	28	173	9,580
16B	5.27	60	23	47	16	146	8,290
14B	0.2	33	15	40	15	103	5,780
12A	5.3	35	30	80	28	173	9,580
16A	9.58	75	35	68	23	201	11,380
5	0.93	58	16	22	16	112	6,500
12A	5.3	35	30	80	28	173	9,580
2A	0.21	33	20	51	17	121	6,750
4A	2.58	11	18	99	34	162	8,730

7B	11.99	43	23	41	14	121	6,850
1B	4.63	100	50	83	27	260	14,770
1C	0.2	66	38	83	27	214	12,010

(Source: Infrastructure Investment Facilitation Company (IIFC), 2020)

According to Table 31, total 4,756 buses would be operational on this corridor. Among all these, standard buses of 50 seats, 26-40 seats, articulated buses and AC standard buses are included. Considering the capacity of these buses, total number of passengers following one trip stands out to be 2,67,330. According to operation and service plan of MRT Line 6, the passenger per day on MRT Line 6 would be 48,82,000. The operation hour of MRT Line 6 is about 18 hours. So, the number of passengers per hour value would be 2,71,222.

In this case, the number of passengers on MRT Line 6 corridor stands out to be 5,38,552. It is required to be mentioned that, here number of trips considered is one for bus service and passenger demand for one hour of MRT Line 6 is considered.

Apart from these on MRT Line 6 there are 16 stations among which on five stations crossings could be found. These five stations are listed and the details of bus routes on these 5 stations are provided in Table 32.

Table 32:Distribution of routes on MRT Line 6 stops following their overlapping character

Name of BRT Line 3 Stop	**Number of Crossing Bus Routes**	**Number of Passing Through Bus Routes**
Shapla Chattar	4	9
Bangladesh Secretariat	1	10
Shahbag	5	10
Kawran Bazar	1	9
Bijay Sarani	1	5

According to Table 32 the number of bus routes crossing through the stations are less considering the BRT Line 3 alignment. Here, the highest of crossing routes could be found in Shahbag and Shapla Chattar. Both areas are famous for being the CBD areas of Dhaka, on which the number of bus routes and frequency of services are higher than usual places.

Along with this, the land use distribution surrounding the accessible 800-meter buffer of the corridor has been analyzed. Table 33 provides the details of surrounding land use along the MRT Line 6 corridor.

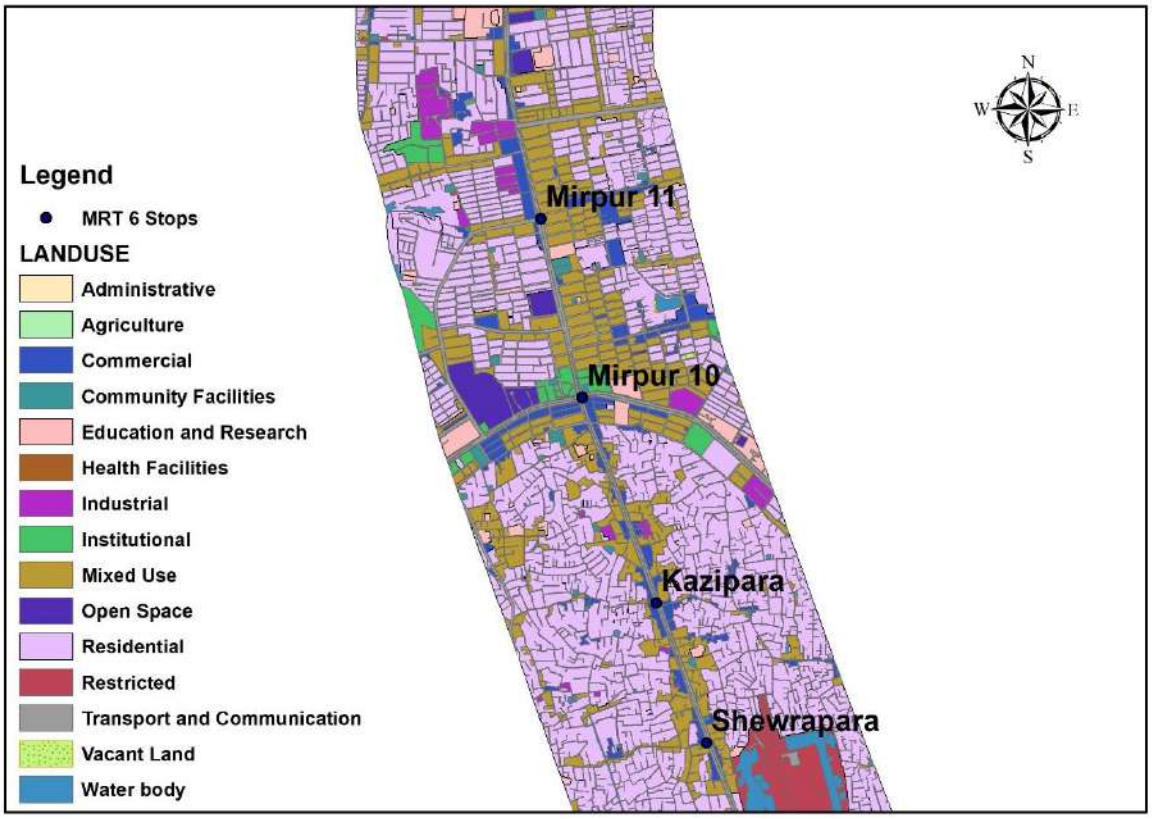


Figure 19: Land use distribution within 800-meter buffer of MRT6 station

Table 33: Distribution of land use within 800m accessible area of MRT Line 6

Land use type	**Area in sq km**	**Percentage**
Administrative	0.9	3.18
Agriculture	0.04	0.14
Commercial	1.49	5.27
Community Facilities	0.31	1.1
Education and Research	1.63	5.76
Health Facilities	0.21	0.74
Industrial	0.54	1.91
Institutional	1.38	4.88
Mixed Use	2.36	8.35
Open Space	1.35	4.77
Residential	12.52	44.27
Restricted	2.68	9.48
Vacant Land	0.19	0.67
Water body	2.68	9.48
Grand Total	28.28	100

(Source: RAJUK, 2020)

In Table 33, the land use distribution along the accessible area of MRT Line 6 is provided. The highest percentage of land use share goes to residential use. Followed by mixed land use, and these two categories of land use carries a good share in traffic generation. Moreover, as the MRT Line 6 continues till Uttara third phase, and an ample amount of land is still vacant on that area. That is why, the share of open space is also high in here.

6.3. Mass Rapid Transit (MRT) Line 1

The MRT Line 1 has a total length of 29 km, and it has two alignments, the underground section starts from Airport and ends up at Kamalapur and the elevated section starts from Notun Bazar and ends up at Purbachal. On this 29 km corridor 22 routes could be found having overlapping length. Along with this, 22 routes are aligned on the Airport to Kamalapur corridor, whereas no overlapping routes can be found on Notun Bazar to Purbachal corridor. Since most of the bus routes in Dhaka are north-south aligned and MRT Line 1 Notun Bazar to Purbachal corridor is on east-west alignment and even on existing structure no public bus route could be found following this alignment.

The details of overlapping bus routes on MRT Line 1 north-south alignment are provided in Table 34.

Table 34: Overlapped Bus Routes Aligned with MRT Line 1 and Fleet Distribution

Route Number	Overlapping Length (Km)	Bus (50 Seat)	AC Bus Seat (50)	36/40 seat	50 Seat (reconstructed)	Total Fleet	Total Passenger
1A	5.63	275	100	62	21	458	26860
2A	8.56	33	20	51	17	121	6750
11C	0.22	55	33	51	17	156	8850
14A	1.72	33	15	40	15	103	5780
3B	3.48	30	15	51	17	113	6270
15B	4.73	115	40	16	9	180	10640
6	1.72	58	16	22	16	112	6500
3A	3.48	30	15	51	17	113	6270
9A	0.22	38	20	69	23	150	8310
2B	3.48	33	20	51	17	121	6750
7C	2.25	43	23	41	14	121	6850
14B	0.96	33	15	40	15	103	5780
12A	3.48	35	30	80	28	173	9580
1C	13.04	66	38	83	27	214	12010
15A	13.79	115	40	16	9	180	10640
9B	0.22	34	15	54	18	121	6720
8	6.14	38	20	69	23	150	8310
1B	3.48	100	50	83	27	260	14770
12B	3.48	35	30	80	28	173	9580
4A	0.93	11	18	99	34	162	8730
16C	3.48	75	35	68	23	201	11380
12A	3.48	35	30	80	28	173	9580

(Source: Infrastructure Investment Facilitation Company (IIFC), 2020)

Among the 22 overlapping bus routes five routes could be found having overlapping length less than one km, it means that, these routes could be accounted as routes which pass through only. These routes could be found on stations named Malibag mor,Rajarbag and Kamalapur.

The details of bus routes on these 3 stations are provided in Table 35.

Table 35: Distribution of routes on MRT Line 1 stops following their overlapping characteristics.

Name of MRT Line 1 Stop	**Number of Crossing Bus Route**	**Number of Passing Through Bus Route**
Malibag Mor	1	5
Rajarbag	1	4
Kamalapur	3	2

According to Table 35 the highest number of crossings through routes can be found in Kamalapur station. Kamalapur is well known for its' Railway Station and many regional bus counters are also located there. Apart from this, these city bus routes also have stops here and people travelling from Kamalapur towards different parts of Bangladesh come to the station, travelling via city buses as well.

The Table 34 provides the distribution of fleets considering their capacity. However, following their capacity the total number of passengers traveling on these routes is 2,06,910 passenger/trip. Along with this, the total demand for MRT Line 1 corridor stands out to be 13,80,077 passenger/trip.

Apart from this, an 800-meter buffer was developed around each MRT stations and the land use within the buffer area has been analyzed. The distribution of land use within each station accessible area has been shown in Table 36.

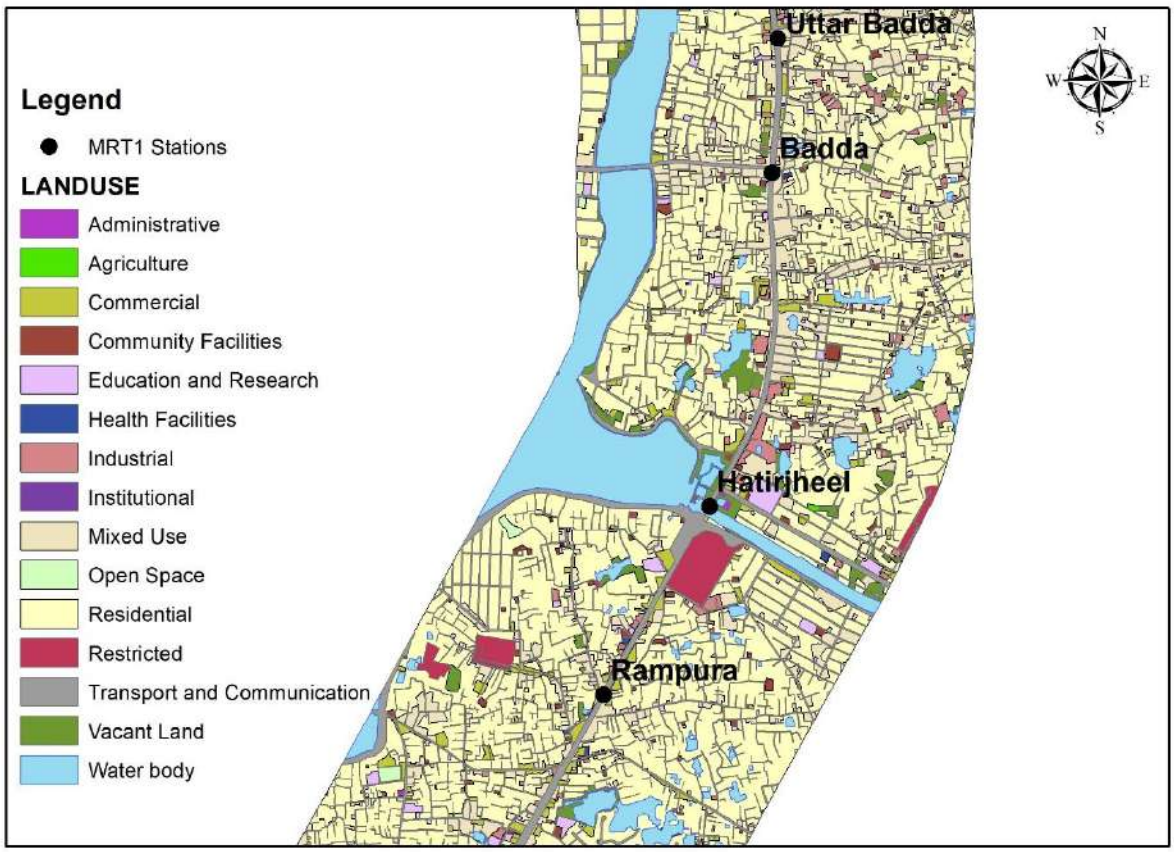


Figure 20: Land use within 800 meters of MRT Line 1

Table 36:Distribution of land use within 800m accessible area of MRT Line 1

Land use type	**Area_Sq_km**	**Percentage (%)**
Administrative	0.13	0.34
Agriculture	0.65	1.71
Commercial	1.01	2.65
Community Facilities	0.24	0.63
Education and Research	0.48	1.26
Health Facilities	0.08	0.21
Industrial	0.29	0.76
Institutional	0.01	0.03
Mixed Use	2.21	5.81
Open Space	0.19	0.5
Residential	15.04	39.53
Restricted	2.13	5.6
Vacant Land	11.21	29.47
Water body	4.35	11.43
Grand Total	38.04	100

(Source: RAJUK, 2020)

According to Table 36 the highest percentage of land use share belongs to residential use, which is about 39.53 %, after that the second highest share goes to vacant land and it is about 29.47% , as most of the land on east part of the MRT Line 1 are vacant and there are many waterbodies as well.

6.4. Mass Rapid Transit (MRT) Line 5 North

The MRT Line 5 North has an alignment starting from Vatara and ends up at Hemayetpur having a total length of 20 km. On this 20 km corridor there are 14 stations. However, in total 29 bus routes could be found having an overlap on MRT 5 North corridor. Among these 29 routes, 13 routes could be found having overlapping length less than one km. So, the number of routes crossing through in this corridor is higher than rest of the MRT services. As MRT line 5 North has an east-west oriented alignment that is why, most of the north-south oriented bus routes have crossings on the MRT Line 5 North corridor. The details of the overlapped bus routes are provided in Table 37.

Table 37:Overlapped Bus Routes Aligned with MRT Line 5 North and Fleet Distribution

Route Number	Length (Km)	Bus (50 Seat)	AC Bus Seat (50)	36/40 seat	50 Seat (reconstructed)	Total	Total Passenger
1C	0.2	66	38	83	27	214	12010
7B	0.21	43	23	41	14	121	6850
1B	0.2	100	50	83	27	260	14770
12B	0.2	35	30	80	28	173	9580
3A	12.27	30	15	51	17	113	6270
7C	2.44	43	23	41	14	121	6850
2B	0.2	33	20	51	17	121	6750
12A	0.21	35	30	80	28	173	9580
6	8.48	58	16	22	16	112	6500
12A	0.21	35	30	80	28	173	9580
16D	2.51	60	23	47	16	146	8290
10	0.21	34	15	54	18	121	6720
5	8.48	58	16	22	16	112	6500
16C	2.05	75	35	68	23	201	11380
1D	1.01	66	38	83	27	214	12010
4B	8.48	11	18	99	34	162	8730
9A	0.21	38	20	69	23	150	8310
3B	8.68	30	15	51	17	113	6270
15A	0.2	115	40	16	9	180	10640
4A	8.48	11	18	99	34	162	8730
8	5.39	38	20	69	23	150	8310
1A	0.2	275	100	62	21	458	26860
7A	2.4	43	23	41	14	121	6850
15B	0.2	115	40	16	9	180	10640
16B	2.4	60	23	47	16	146	8290
9B	2.4	34	15	54	18	121	6720
16A	2.54	75	35	68	23	201	11380
2A	0.2	33	20	51	17	121	6750

4C	8.48	11	18	99	34	162	8730

(Source: Infrastructure Investment Facilitation Company (IIFC), 2020)

Following the details of Table 37, it can be said that, considering the demand, in total 4,802 buses will be plying in MRT Line 5 North corridor. Among them, 50 seat standard buses, 50 seats reconstructed buses, 36-40 seat buses, articulated ones all are included.

Apart from these, overlapping bus routes which are considered as the routes passing through only could be found on the stations of Mirpur 10, Banani and Notun Bazar and these stations could be accounted as points for transferring from one mode to another. However, in existing scenario, many transit users could be found availing transits from these points. Apart from this, MRT Line 5 North would have a crossing with MRT Line 6 at Mirpur-10 and another one with MRT Line-1 at Notun Bazar.

The details of bus routes overlapped on these 3 stations are provided in Table 38.

Table 38:Distribution of routes on MRT Line 5 North stops following their overlapping characteristics.

Name of MRT Line 5 North Stop	**Number of Crossing Bus Route**	**Number of Passing Through Bus Route**
Mirpur 10	5	5
Banani	5	1
Notun Bazar	3	1

According to Table 38 it seems that, the number of bus routes crossing through Mirpur 10 and Banani stations are same. However, all these three stations are famous for being central places with ample transfer options from one mode to another. However, since multiple transit lines such as BRTs, buses and MRTs would have crossings on one station, so these stations should have ample space to accommodate the traffic.

However, following the total number of fleets on the corridor would have a total traffic of 2,70,850 passengers, considering one trip for each overlapping bus route. However, the MRT Line 5 both North and South corridor has a total demand of 24,04,000 on 2035 (Almec Corporation., Oriental Consultants Global Co., Ltd., Nippon Koei Co., Ltd., Katahira and Engineers International, 2018). Considering all these the land use surrounding the 800-meter accessible distance of the corridor has been studied, the Table 39 provides the details of the land use.

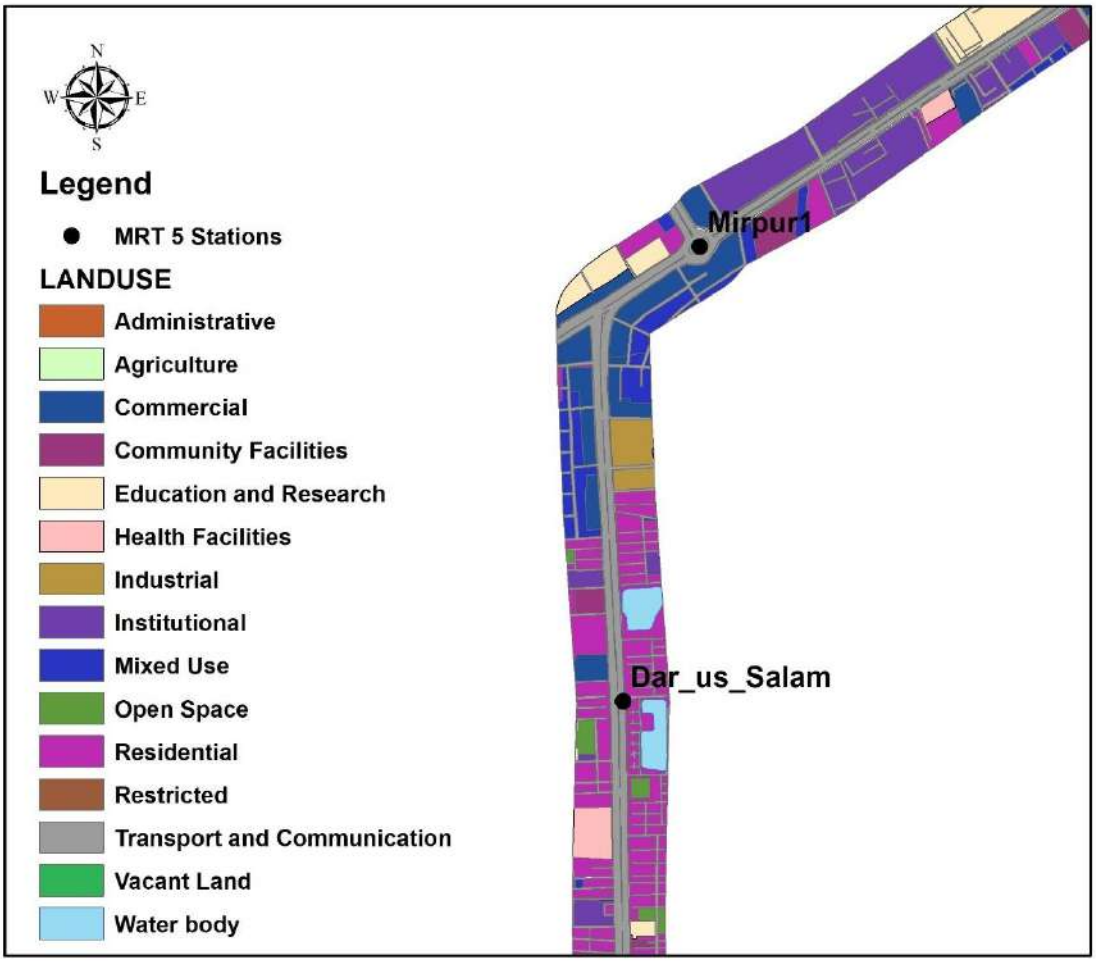


Figure 21: Land use distribution within 800 meters of MRT Line 5

Table 39: Distribution of land use within 800m accessible area of MRT Line 5 North

Land Use Type	**Area (Sq. km)**	**Percentage (%)**
Administrative	0.004	0.13
Agriculture	0.269	8.91
Commercial	0.502	16.63
Community Facilities	0.032	1.06
Education and Research	0.144	4.77
Health Facilities	0.04	1.33
Industrial	0.092	3.05
Institutional	0.21	6.96
Mixed Use	0.276	9.15
Open Space	0.063	2.09
Residential	0.547	18.12
Restricted	0.305	10.11
Vacant Land	0.018	0.6
Water body	0.516	17.1
Grand Total	3.018	100

(Source: RAJUK, 2020)

According to Table 39 the highest percentage of land use belongs to residential use, after that the second highest share goes to commercial land use. The share of mixed use is also high, and these land uses have impact on the traffic of this corridor. Apart from this, as this transit service is very close to cantonment area, that is why the percentage of restricted land use is also high in this part. However, the percentage of administrative land use is least in here.

6.5. Mass Rapid Transit (MRT) Line 5 South

The MRT line 5 South corridor has a length of 16.71 km, and it starts from Gabtoli and ends up at Aftabnagar. On this corridor there are 15 stations. On this 15 km corridor, almost 33 routes are found which have overlapping length. Among these 33 bus routes 13 routes could be found which have overlapping length less than one km. These routes could be accounted as the routes which would cross the corridor only. The details of the overlapping 33 routes are provided in Table 40.

Table 40:Overlapped Bus Routes Aligned with MRT Line 5 South and Fleet Distribution

Route Number	Overlapping Length (Km)	Bus (50 Seat)	AC Bus Seat (50)	36/40 seat	50 Seat (reconstructed)	Total	Total Passenger
15B	0.36	115	40	16	9	180	10640
7B	0.21	43	23	41	14	121	6850
13	1.34	33	15	40	15	103	5780
7C	0.21	43	23	41	14	121	6850
10	1.11	34	15	54	18	121	6720
12B	0.46	35	30	80	28	173	9580
4C	6.04	11	18	99	34	162	8730
16D	4.76	60	23	47	16	146	8290
4B	5.37	11	18	99	34	162	8730
3B	3.35	30	15	51	17	113	6270
8	4.05	38	20	69	23	150	8310
12A	0.49	35	30	80	28	173	9580
13	1.34	33	15	40	15	103	5780
11C	1.34	55	33	51	17	156	8850
4A	5.37	11	18	99	34	162	8730
2B	1.11	33	20	51	17	121	6750
6	5.99	58	16	22	16	112	6500
12A	0.49	35	30	80	28	173	9580
9A	0.21	38	20	69	23	150	8310
7A	4.76	43	23	41	14	121	6850
1B	0.21	100	50	83	27	260	14770
16A	0.21	75	35	68	23	201	11380
16B	4.1	60	23	47	16	146	8290
5	6.04	58	16	22	16	112	6500
9B	4.76	34	15	54	18	121	6720
3A	1.5	30	15	51	17	113	6270
2A	2.85	33	20	51	17	121	6750
1C	0.34	66	38	83	27	214	12010

15A	0.34	115	40	16	9	180	10640
14A	3.13	33	15	40	15	103	5780
1A	0.36	275	100	62	21	458	26860
11B	0.68	55	33	51	17	156	8850
1D	1.01	66	38	83	27	214	12010

According to Table 40, in total 5,222 buses would be found within the corridor following different categories such as standard 50 seat buses, reconstructed 50 seat buses, articulated ones and so on. However, these 13 crossing routes could be found crossing the corridor on 4 different stations and these are Shyamoli, Asad gate, Kawran bazar, Hatirjheel. The details of the overlapping routes on these four stations are provided in Table 41.

Table 41:Distribution of routes on MRT Line 5 South stops following their overlapping characteristics.

Name of MRT Line 5 South Stop	**Number of Crossing Bus Route**	**Number of Passing Through Bus Route**
Shyamoli	2	11
Asad Gate	2	11
Kawran Bazar	6	4
Hatirjheel Mor	2	1

According to the Table 41, the highest number of routes crossing could be found in Kawran Bazar. As this area is known as the largest kitchen market of Dhaka city and many business centers and commercial structures could be found here. Apart from this, as these stations would work as transfer points for many from one mode to another, so these stations require to have ample space to accommodate the passenger traffic who would take transfer at these stations.

However, following the capacity of fleets on the overlapping bus routes the total number of passengers within this corridor would be 2,94,510. Here one trip of each overlapping bus route is considered. The MRT Line 5 (both North and South) corridor has a total demand of 2,40,400. So, the total number of passenger traffic on MRT Line 5 corridor (North and South) would be 5,65,360 which is quite higher than rest of the corridors.

Following this, the distribution of land use within the MRT Line 5 South corridor has been studied. Similar to the other transit lines an accessible buffer of 800 meter around the corridor has been prepared. The distribution of land use around the corridor is provided in Table 42.

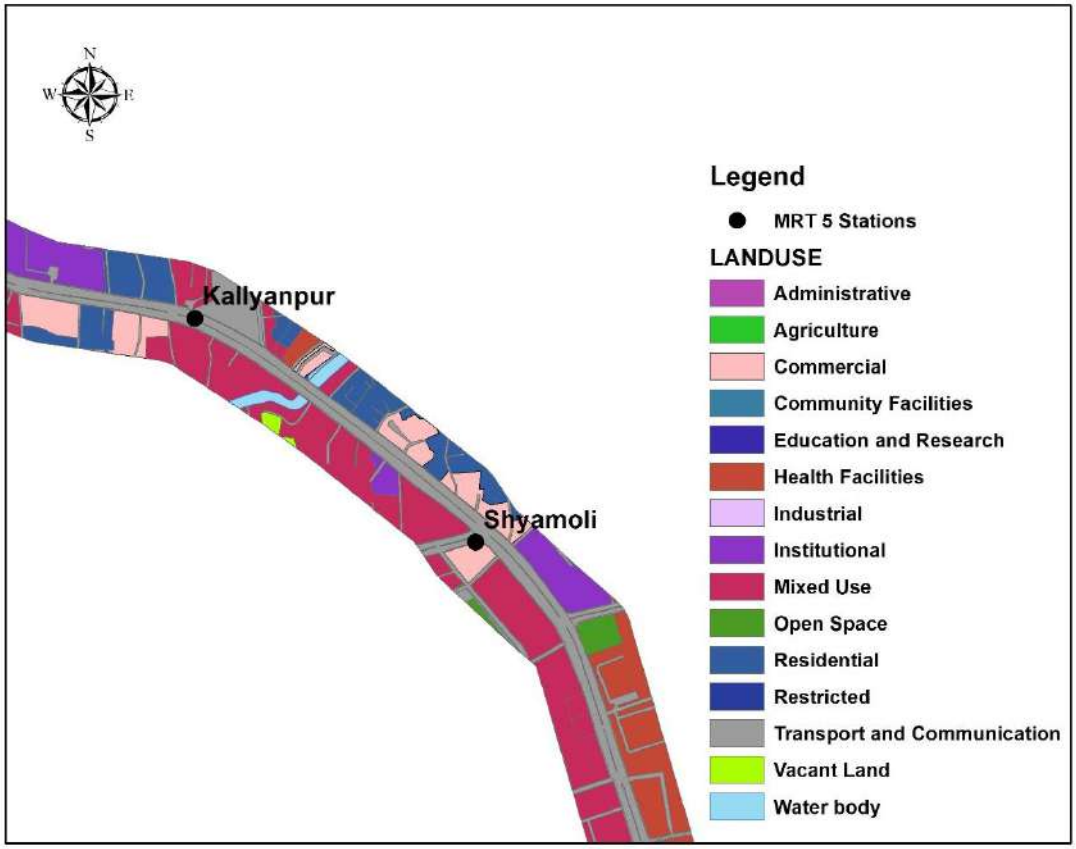


Figure 22: Land use within 800 meters of MRT Line 5

Table 42: Distribution of land use within 800m accessible area of MRT Line 5 South

Land use Category	**Area in Sq. Km**	**Percentage**
Administrative	0.03	1.11
Agriculture	0.05	1.85
Commercial	0.34	12.59
Community Facilities	0.03	1.11
Education and Research	0.1	3.7
Health Facilities	0.07	2.59
Industrial	0.14	5.19
Institutional	0.21	7.78
Mixed Use	0.32	11.85
Open Space	0.03	1.11
Residential	0.62	22.96
Restricted	0.05	1.85
Vacant Land	0.26	9.63
Water body	0.45	16.67
Grand Total	2.7	99.99

(Source: RAJUK, 2020)

According to the Table 42 the highest share of land use goes to residential, commercial, and mixed use and all these three works as the traffic generators. However, like MRT 5 North the percentage of waterbody is also high.

6.6. Vehicular and Passenger Traffic Estimates on Transit Corridors

On the above sections the overlapping bus routes on the BRT and MRT corridors has been identified and the number of vehicles planned to be plying on those corridors have been estimated. Based on these a comparative scenario has been developed following the estimated passenger and vehicular traffic on different BRT/MRT corridors created due to overlapping routes.

Table 43: Distribution of vehicular and passenger traffic created due to overlapping bus routes on BRT & MRT corridors.

Name of Transit Service	**Number of Overlapping Bus Routes**	**Vehicular Traffic (Public Bus)**	**Passenger Traffic (Public Bus users)**
BRT Line 3	39	21,255	11,94,950
MRT Line 6	31	4,756	2,67,330
MRT Line 1	22	3,658	2,06,910
MRT Line 5 North	29	4,802	2,70,850
MRT Line 5 South	33	5,222	2,94,510

According to the Table 43, the highest number of vehicular traffic generated due to overlapping bus routes could be found on BRT Line 3 corridor. Following which the number of passenger traffic on this corridor would be higher than other transit corridors. Among the MRT corridors, the highest number of overlapping routes could be found on MRT Line 5 South corridor and due to this, the number of passenger traffic is higher than rest of the MRT corridors. However, the least number of vehicular and passenger traffic could be found on MRT Line 1.

Chapter 7: Integration of Bus Routes, BRT and MRT

As mentioned, earlier in Dhaka, public bus is the only transit service and in near future MRT along with BRT services would be introduced. Moreover, rationalized bus routes are in a process of incorporation. This chapter provided results of simulation of different parameters of transportation considering the diverse combinations of the transit options in 2035.

7.1. Scenario 1: Existing Bus Routes

This is the base scenario. The scenario considered that no new intervention has taken place in Dhaka. On this scenario the existing active 160 bus routes were incorporated. On these routes there are different headways, but in Dhaka the average headway is about 10 minutes, whereas the operating speed varies from 12 kmph to 16 kmph. In this study the operating speed is 16 kmph. Along with this, the access fare is accounted to be BDT 10 and per km fare is BDT 2.15. Moreover, the Travel Time Cost (TTC) is taken to be 20.40 (BDT/Passenger hour). So, the perception factor was 0.34.

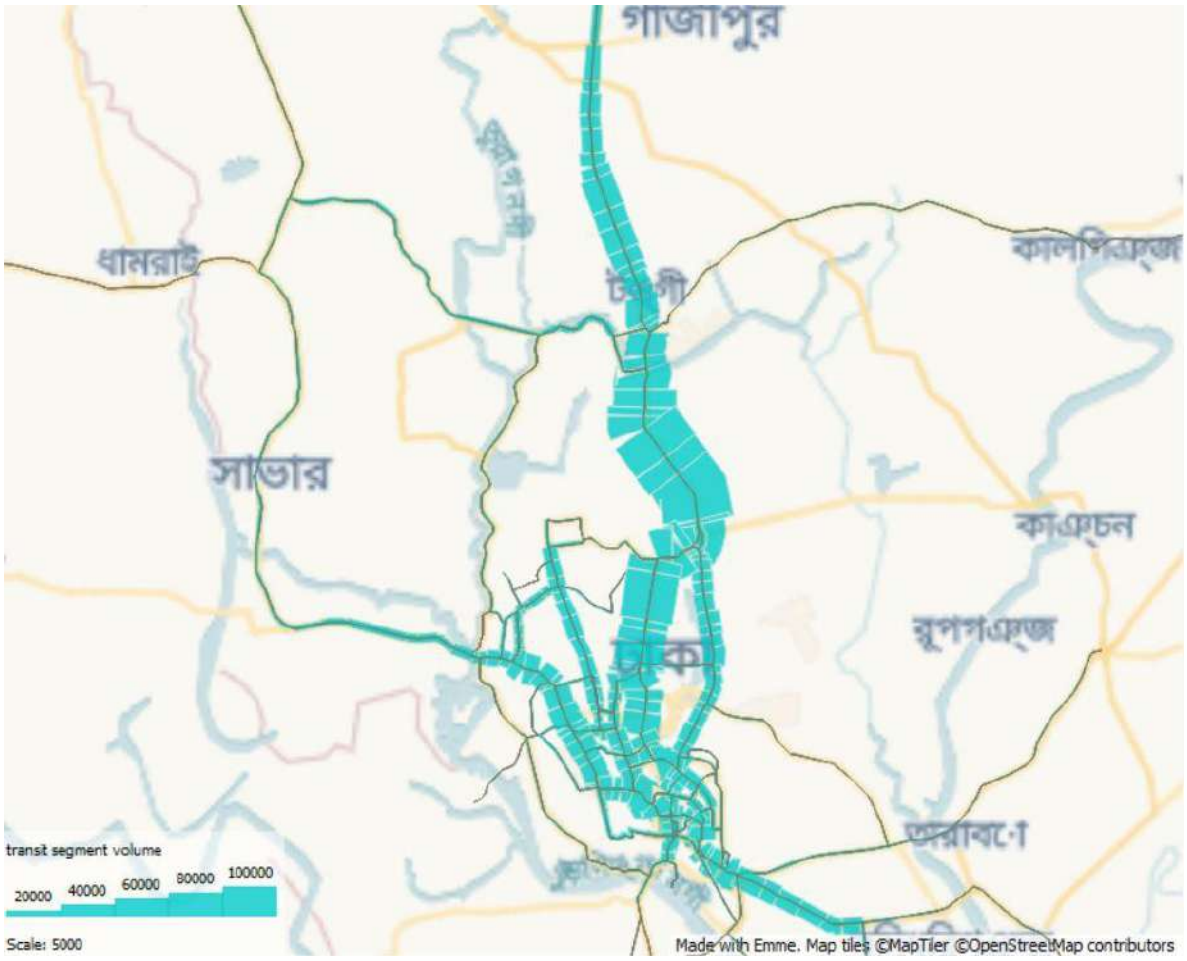


Figure 23: Segment wise transit volume for existing bus routes in 2035 peak period

From Figure 23 it can be seen that the major transit volume got generated in the segment starting from Abdullahpur and ends up at Kuril Bishwa Road. Then, moderate transit volume could be found from Zia Colony to Mohakhali Bus Stand segment. The distribution of transit volume following top 10 segments is provided in Table 44.

Table 44:Distribution of traffic volume on different segments of Dhaka for existing bus routes on 2035 peak period (Scenario1)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Airport	Jasimuddin	2.84	cbPN	48	288	10080	14400	124129	8.62	0
Kawla	Airport	1.68	cbPN	48	288	10080	14400	124129	8.62	0
Jasimuddin	Airport	2.84	cbPN	48	288	10080	14400	121707	8.45	0
Airport	Kawla	1.68	cbPN	48	288	10080	14400	121707	8.45	0
Azampur	Rajlaxmi	0.77	cbPN	47	282	9870	14100	121707	8.63	0
Rajlaxmi	Jasimuddin	0.92	cbPN	47	282	9870	14100	121707	8.63	0
Jasimuddin	Rajlaxmi	0.92	cbPN	47	282	9870	14100	119801	8.5	0
Khilkhet	Kawla	4.2	cbPN	48	288	10080	14400	1195A88	8.3	0
Rajlaxmi	Azampur	0.77	cbPN	47	282	9870	14100	118838	8.43	0
Kawla	Khilkhet	4.2	cbPN	48	288	10080	14400	116604	8.1	0

According to the above table, the highest passenger could be found on to Airport to Jasimuddin segment, following it the second highest number of passengers could be found on to Kawla to Airport segment. On these top 10 segments the average load factor value is very high comparing the usual which means that, almost all transit vehicles were highly crowded, and these vehicles were carrying passengers beyond their capacity. However, on these segments the passenger volume on auxiliary mode was zero. Moreover, number of transit lines on these segments are above 45. This is another reason, of high passenger volume. The number of passenger flow increases with the number of transit line passing through the corridor.

Apart from this, the number of moving transit vehicles in these segments is above 280, which is higher than usual. Apart from that, following the Table 44, the load factor values in all the segments were above 8, which means that, the network was congested following the load of the traffic. On this part, the boarding alighting of passengers and transfers need to be analyzed.

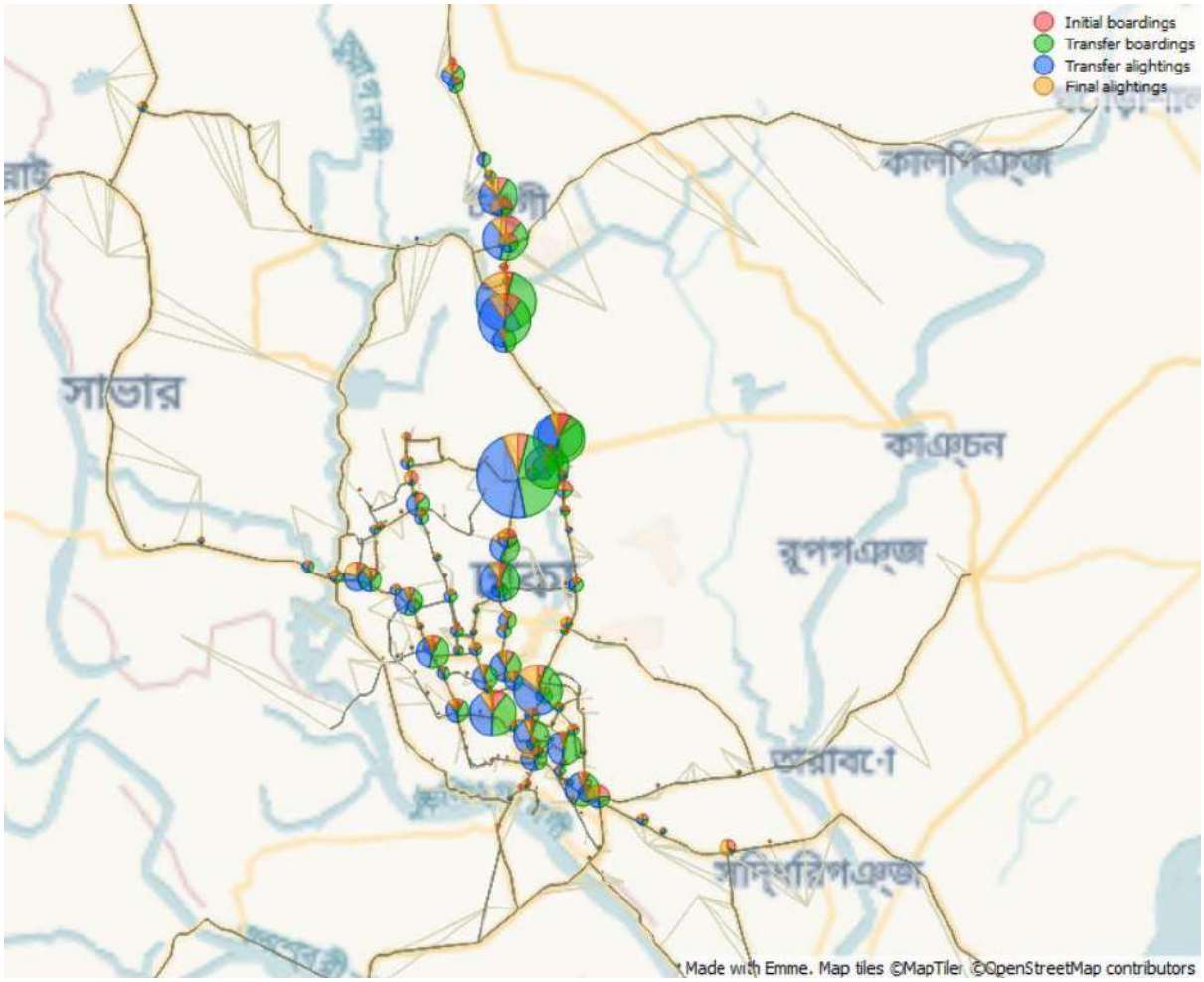


Figure 24: Distribution of boarding, alighting and transfer of passengers at different bus stops for 2035 Peak period.

According to the above figure the highest passenger distribution could be found on MES. Apart from that, most of the bus stops on Kuril to Abdullahpur segment has high volume of passengers.

Bus stops of bus stops on south-east side of Dhaka also have higher transit passenger volume. On north-west Dhaka except Gabtoli, Technical rest of the bus stops do not have significant distribution of passengers.

Table 45 shows the distribution of passengers on bus stops ranked based on passenger volume.

Table 45: Distribution of passengers following their boarding, alighting and transfer on different bus stops for existing bus route network for 2035 peak period (Scenario1)

Node	Boarding			Passing through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
MES	8573	94242	102815	70370	13304	101808	115111
Khilkhet South	9252	60637	69889	158694	7772	55955	63727
Shewra	6457	61940	68397	136083	1021	40952	41973
Azampur	15027	53347	68375	158793	12822	53902	66724
Housebuilding	5595	58829	64424	121634	21104	69625	90729
Khilkhet North	16593	46838	63431	172329	8926	42539	51465
Tongi Bypass	14549	48340	62889	52239	12606	40885	53491
Shahbagh	11740	49108	60847	76832	11116	48771	59887
Janapath Mor	5978	44940	50918	64685	3615	31925	35540
Mouchak	6409	44070	50479	76120	17635	60486	78121
Mohakhali	6125	41936	48061	123244	9186	47642	56828

On the above table total boarding, alighting following different bus stops is shown. It seems that, on MES bus stop, more than 100,000 people would board into public buses, and more than 70,000 people would have transfers, meaning that, these people had made another trip before, and it is their chained trip to reach destination. However, the number of final alighting passengers is more than 100,000 and the number of passengers who have alighted for taking transfer is also high. Apart from this, the total number of boarding and alighting passengers is quite close to each other.

In Khilkhet South, Shewra, Azampur, Housebuilding, Khilkhet North bus stops the number of passing through passengers are higher. In these bus stops, availability of other auto and auxiliary transit modes is less, moreover, the density of structures in the surrounding areas of these bus stops is also less, which means that, these areas are not active that much. However, considering the traffic growth rate in Dhaka over last 10 years, the travel demand matrix has been modified and used for understanding the traffic volume in changed circumstances.

Table 46: Distribution of transit traffic volume on top 10 segments (bus routes) following modified travel demand matrix (Scenario 1)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volum
Airport	Airport Terminal 3	1.68	cbPN	48	288	10080	14400	133868	9.3	0
Airport Terminal 3	Jashimuddin	2.84	cbPN	48	288	10080	14400	133868	9.3	0
Airport Terminal 3	Airport	1.68	cbPN	48	288	10080	14400	130687	9.08	0
Jashimuddin	Airport Terminal 3	2.84	cbPN	48	288	10080	14400	130687	9.08	0
Khilkhet	Airport	4.2	cbPN	48	288	10080	14400	128963	8.96	0
Rajlakhshmi	Jashimuddin	0.92	cbPN	47	282	9870	14100	128137	9.09	0
Azampur	Rajlakhshmi	0.77	cbPN	47	282	9870	14100	126436	8.97	0
Airport	Khilkhet	4.2	cbPN	48	288	10080	14400	125176	8.69	0
Khilkhet	Kuril Bishwa Road	0.3	cbPN	48	288	10080	14400	124347	8.64	16201
Kuril Bishwa Road	Khilkhet	0.3	cbPN	48	288	10080	14400	119760	8.32	16583

Following the Table *46* it seems that, the transit traffic volume remains high on the same segment as it was seen in Table *44*, however, the traffic volume got increased than before. Along with this, the boarding -alighting analysis is also done again considering the modified matrix. It is provided in Table *47*.

Table 47: Distribution of boarding-alighting on top 10 bus stops considering modified travel-demand matrix (Scenario 1)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
House Building	9348	81863	91211	109352	23726	94373	118099
Mill gate	20505	62045	82550	54516	17992	62028	80020
Zia colony	12871	68155	81026	101987	11308	57861	69168
Kakoli	17583	62097	79680	90852	13322	46698	60020
Khilkhet	10338	68823	79161	162986	7606	73610	81217
Jashimuddin	2550	71271	73821	168884	8313	84808	93120
Kuril Bishwa Road	16680	52400	69080	184230	10726	49979	60706
Shahbag	12229	55949	68178	90297	12849	53002	65851
Paltan	8879	48821	57699	104261	4508	49094	53603
Shewra	5554	51538	57092	150504	3660	52391	56051

Following the Table 47, it seems that, there is a change in the top ranked bus stops, in both conditions Shewra, Khilkhet, Shahbag, Housebuilding are common ones, rest has changed. Along with this, the boarding-alighting passenger number in later case increased than the first one.

7.2. Scenario 2: Rationalized Bus Routes

This scenario considered bus routes which are rationalized ones according to the "Revision and Updating of Previous Study Report on Bus Route Rationalization and Company based Operation of Bus Service in Dhaka" report. In total 42 transit lines, operating in different directions having speed of 21 kmph and headway of 10 minutes were added in this model. Similar to the previous scenario, the access fare is BDT 10 and per km fare is BDT 2.15. The perception factor is 0.34.

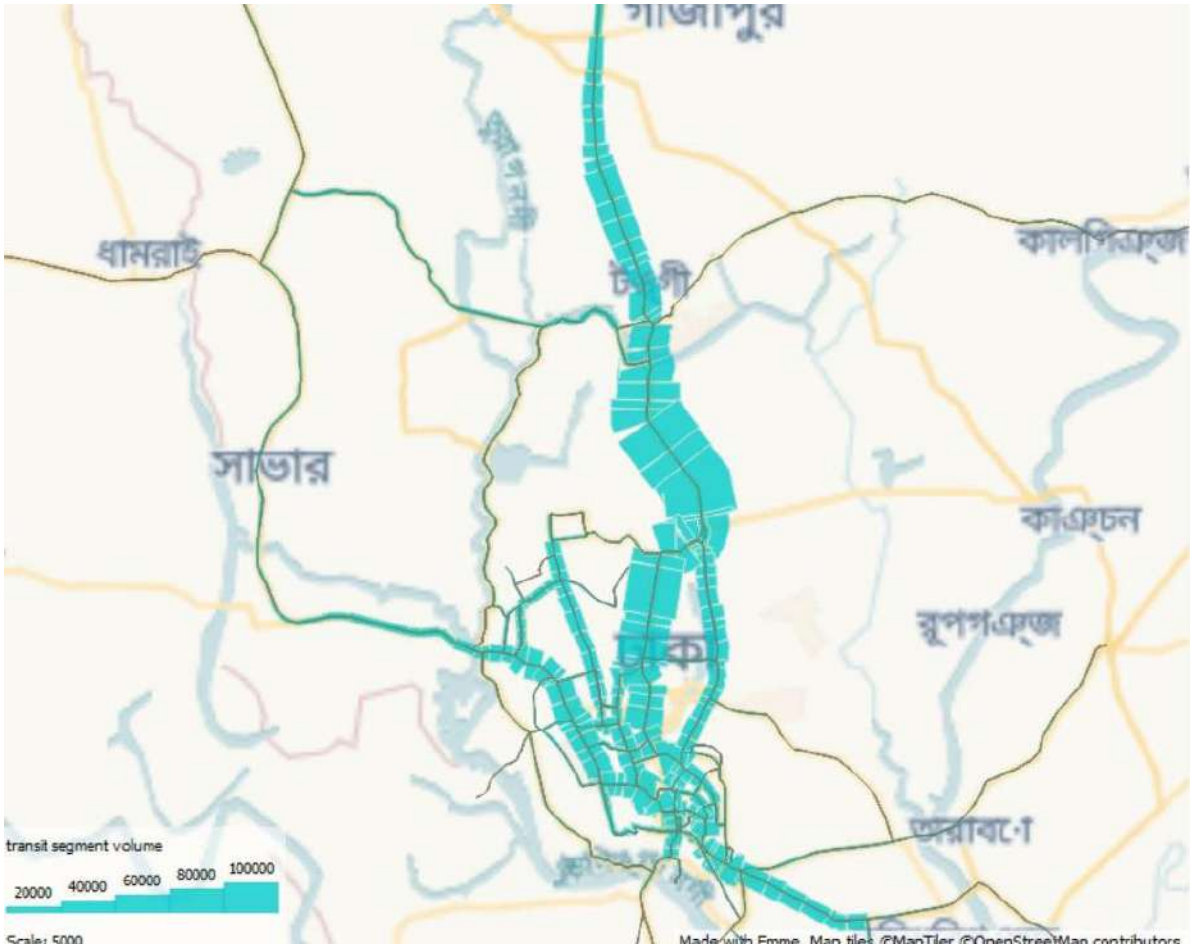


Figure 25: Segment wise transit volume for rationalized bus routes in 2035 peak period

On the Figure 25 the distribution of transit volume following rationalized bus routes is shown. The transit volume is higher on several corridors such as Kuril Bishwa Road to Abdullahpur segment, than the existing system. The highest volume could be found on Kuril Bishwa Road to Abdullahpur corridor. Along with this, volume is also higher on Sat Mashjid Road following Gabtoli and on west, it is also high on Jatrabari-Chittagong Road corridor.

On Table 48 the distribution of transit volume on top 10 segments is provided.

Table 48:Distribution of traffic volume on different segments of rationalized bus routes on 2035 peak period (Scenario 2)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Housebuilding	Abdulahpur	0.74	cbPN	16	96	3360	4800	54827	11.42	43713
Abdulahpur	Housebuilding	0.74	cbPN	16	96	3360	4800	53157	11.07	42115
Bishwa Road	Khilkhet	0.14	cbPN	14	84	2940	4200	52476	12.49	65458
Rajlaxmi	Jashimuddin	0.43	cbPN	12	72	2520	3600	45340	12.59	55554
Jashimuddin	Airport	1.32	cbPN	12	72	2520	3600	45340	12.59	64557
Airport	Kawla	0.78	cbPN	12	72	2520	3600	45340	12.59	61278
Jashimuddin	Rajlaxmi	0.43	cbPN	12	72	2520	3600	45108	12.53	57920
Airport	Jashimuddin	1.32	cbPN	12	72	2520	3600	45108	12.53	68747
Kawla	Airport	0.78	cbPN	12	72	2520	3600	45108	12.53	65458
Khilkhet	Kawla	1.95	cbPN	12	72	2520	3600	43856	12.18	65458

According to the above table the highest volume of passengers could be found in the Housebuilding to Abdullahpur segment. On this segment the value is more than 50000. However, on these top 10 segments, the average load factor is mostly above 11, which means that, like previous scenario, these buses would also be overly crowded. Moreover, on these segments the volume of passengers in auxiliary modes are also high, although on these segments the number of passing transit lines is about one-third considering the scenario-1.

It also means that the passenger volume in auxiliary modes increased as the number of transit vehicles decreased in these segments. At this phase the distribution of passengers at different bus stops would be studied.

Figure 26:Distribution of boarding, alighting and transfer of passengers at different bus stops for rationalized bus routes on 2035 Peak period

Following the Figure 26, the highest number of passengers could be found in Abdullahpur bus stop. At this bus stop, the number of initial boarding passengers is high considering transfer boarding, transfer alighting and final alighting. Along with this, the second highest value of passengers could be found into Asadgate bus stop. Gabtoli, Mohakhali, MES, Khilkhet, Shapla Chattar, Jatrabari, Chittagong Road are some of the bus stops which have significant number of passengers. On table the distribution of passengers on top 10 bus stops ranked based on the number of boarding passengers is provided.

Table 49:Distribution of passengers following their boarding, alighting and transfer on different bus stops of rationalized bus route network for 2035 peak period (Scenario 2)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Abdullahpur	51733	17064	68797	509	51286	16953	68240
Khilkhet South	24384	5964	30348	49502	5609	8284	13893
Manik Mia Avenue West	14703	14174	28877	47488	11734	15183	26916
Hemayetpur	18717	5318	24034	-	23300	5918	29219
Shahbag	9460	13401	22861	38675	9630	11703	21332
Technical	10190	7584	17774	34966	10484	8703	19187
MES	6625	10613	17239	15004	12242	9575	21817
Signboard	15258	412	15670	6246	19528	537	20065
Jatrabari	8081	7210	15291	43079	5285	6838	12122
Housebuilding	6455	8798	15253	80283	6482	8045	14527

According to the above table, the highest number of boarding passengers could be found in Abdullahpur, in here, the total number of initially boarding passenger is higher than transfer passengers. Mostly passengers, travelling to north-west side (Dhour, Beribadh) would take transfer here. Following this, the number of passing through passengers is less. Moreover, the value of final alighting passengers is higher than transfer alighting passengers.

Apart from this, the number of passing through passengers in Khilkhet South, Shahbag, Housebuilding, Jatrabari, Paltan, are quite high than usual, considering this, the number of total boarding-alighting passengers in these stops are less.

In case of Hemayetpur, the number of through passengers is zero, which means that, many bus routes have ended here and people take transfers to other auxiliary transits to reach their destination.

However, the modified matrix considering traffic growth has been used and the segments having high volume of transit traffic are listed and provided in Table 50.

Table 50: Distribution of transit traffic on top 10 segments of rationalized bus route network of scenario 2

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volum
House Building	Abdullahpur	0.74	cbPN	16	96	3360	4800	54219	11.3	51046
Abdullahpur	House Building	0.74	cbPN	16	96	3360	4800	52440	10.92	49180
Kuril Bishwa Road	Khilkhet	0.14	cbPN	14	84	2940	4200	51502	12.26	71087
Airport Terminal 3	Jashimuddin	1.32	cbPN	12	72	2520	3600	47285	13.13	74542
Airport	Airport Terminal 3	0.78	cbPN	12	72	2520	3600	47285	13.13	71087
Jashimuddin	Rajlakhshmi	0.43	cbPN	12	72	2520	3600	46677	12.97	64036
Airport	Khilkhet	0.14	cbPN	14	84	2940	4200	46579	11.09	71932
Rajlakhshmi	Jashimuddin	0.43	cbPN	12	72	2520	3600	46076	12.8	61533
Jashimuddin	Airport Terminal 3	1.32	cbPN	12	72	2520	3600	46076	12.8	71511
Airport Terminal 3	Airport	0.78	cbPN	12	72	2520	3600	46076	12.8	68026

Considering both Table 48 and Table 50, it seems that, the highest passenger distribution could be found within the same corridors in both cases. However, in the modified demand matrix the transit traffic flow has increased than the previous one.

Following this, the boarding-alighting analysis has also been done and it is provided in the Table 51.

Table 51: Distribution of passenger boarding-alighting on top 10 bus stops considering modified travel demand matrix of scenario-2

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Abdullahpur	45263	15508	60772	489	46566	15513	62079
Airport	17626	10280	27906	51341	14654	10052	24706
Lalmatia Aarong	7419	20091	27509	33732	11586	19679	31265
Shahbag	17617	9822	27439	42226	15991	16863	32854
Hemayetpur	19918	5323	25240	-	20506	6829	27334
Technical	8848	8927	17775	39565	6968	6916	13884
Zia colony	11292	6025	17317	16690	11170	8921	20091
Badda	10421	5920	16341	18524	4142	2820	6962
Sign Board_NG	14748	564	15312	6027	19543	589	20132
House Building	6001	7993	13994	81263	5988	7411	13399

Considering both Table 49 and Table 51, it seems that, there are changes in the distribution of top ranked bus stops, except Abdullahpur, Shahbag, Sign Board, Hemayetpur, Technical rest has been changed. Along with this, the number of passenger distribution has increased in the later than before.

7.3. Scenario 3: Existing Bus Routes with BRT Line 3

On this scenario existing bus routes were considered along with BRT line 3. In case of BRT line 3 the operational speed is 29 kmph and a headway of 3 minutes is taken. However, in case of existing bus routes, operational parameters are kept same as scenario 1.

The distribution of transit volume following the entire network is shown in Figure 27.

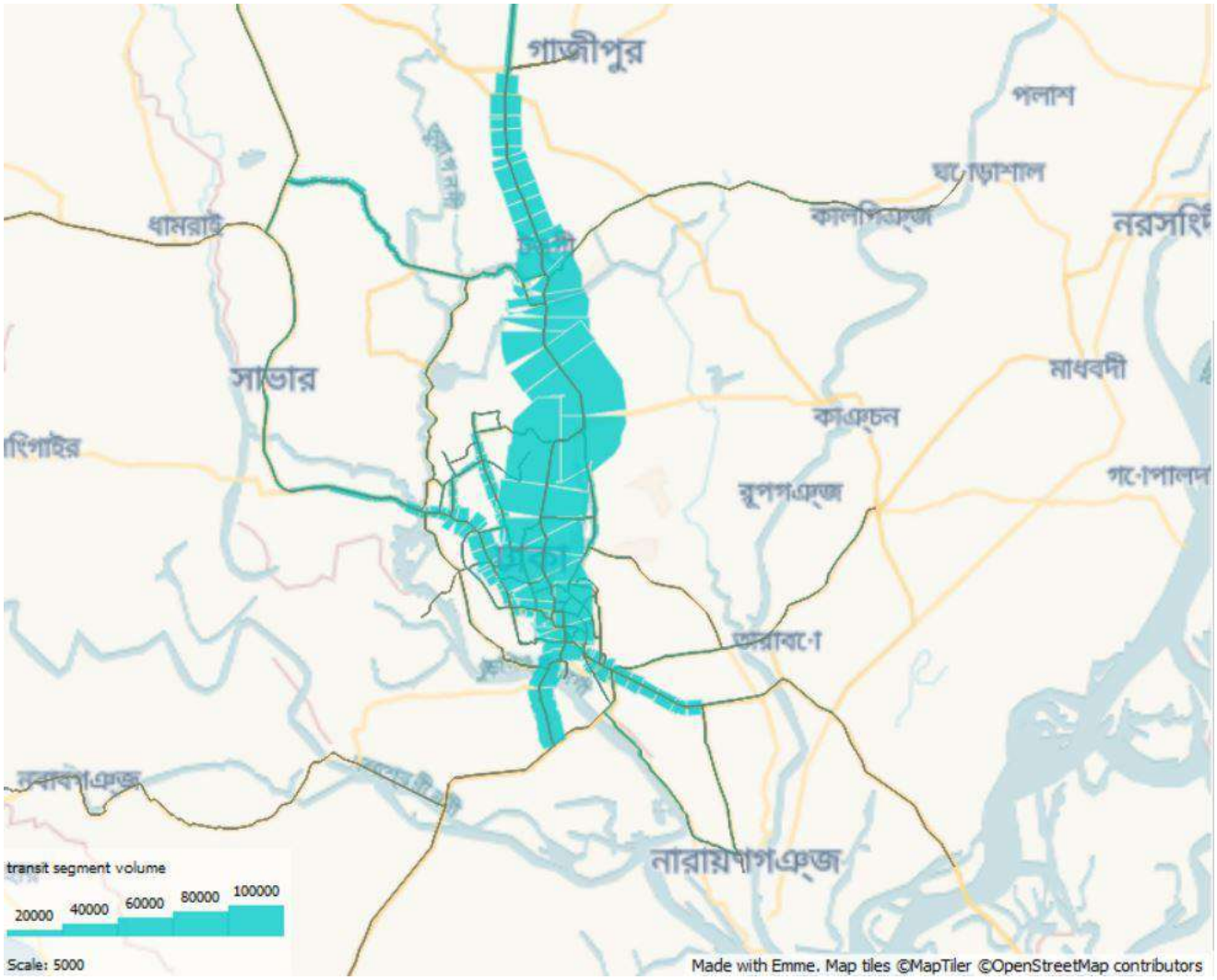


Figure 27:Segment wise transit volume for existing bus routes and BRT line 3 in 2035 peak period

According to the above figure the major distribution of transit volume could be found on BRT Line 3 (From Gazipur Shib bari to Keraniganj). Although within the four km segment of Gazipur Chourasta to Shib Bari, the transit volume is almost zero. In existing bus route network, no bus route could be found in this segment. Apart from this, within the bus route network significant transit volume could be found on Jatrabari-Chittagong Road corridor and Gabtoli -Motijheel corridor.

In BRT Line3 there 40 segments, among them top 10 segments are ranked following the transit volume and it is shown in Table 52.

Table 52:Distribution of transit volume on different segments of BRT Line 3 on 2035 peak period (Scenario 3)

From	To	Length	Modes	No. lines	No. vehicles	Seated capacity	Total capacity	Volume	Avg. Load	Aux. volume
Azampur	Housebuilding	0.7	B	1	20	1000	1300	145030	111.56	0
Jashimuddin	Azampur	0.78	B	1	20	1000	1300	145030	111.56	0
Airport	Jashimuddin	1.32	B	1	20	1000	1300	145030	111.56	0
Amtali	Banani	1.62	B	1	20	1000	1300	144970	111.52	0
Banani	Amtali	1.62	B	1	20	1000	1300	143777	110.6	0
Khilkhet	Airport	2.88	B	1	20	1000	1300	141799	109.08	0
Housebuilding	Azampur	0.7	B	1	20	1000	1300	141445	108.8	0
Azampur	Jashimuddin	0.78	B	1	20	1000	1300	141445	108.8	0
Jashimuddin	Airport	1.32	B	1	20	1000	1300	141445	108.8	0
Khilkhet	Dhaka Cantonment	2.04	B	1	20	1000	1300	139997	107.69	0

According to the above table, the average load factor on these BRT segments is very high. Especially in segments such as Azampur to Housebuilding, Jasimuddin to Azampur, Airport to Jasimuddin, Amtali to Banani the load factor value> 110. It means that these segments were overly crowded. It happened as the access fare of Bus network and BRT is equal and the transfer penalty is quite less, which is about BDT 0.35.

Moreover, the difference of speed in these two transit modes is significant, which is about 14 kmph. On the above-mentioned segments number of overlapping bus routes is higher, but the convenience of travelling in terms of speed and congestion is on BRT, that is why the load factor is high. Apart from this, transfer of modes on nearby BRT stations of these segments is significant. However, considering the modified travel demand matrix, the highest traffic volume could be found on the same segments as like Table *52*, and it can be seen in Table *53*.

Table 53: Distribution of passenger traffic on top 10 segments of BRT Line 3 following modified travel demand matrix of Scenario 3

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volum
Banani	Amtali	1.62	B	1	20	1000	1300	159741	122.88	0
Amtali	Banani	1.62	B	1	20	1000	1300	156742	120.57	0
Azampur	House Building	0.7	B	1	20	1000	1300	155411	119.55	0
Jashimuddin	Azampur	0.78	B	1	20	1000	1300	155411	119.55	0
Airport	Jashimuddin	1.32	B	1	20	1000	1300	155411	119.55	0
Khilkhet	Bishwa Road	2.04	B	1	20	1000	1300	153137	117.8	0
House Building	Azampur	0.7	B	1	20	1000	1300	152963	117.66	0
Azampur	Jashimuddin	0.78	B	1	20	1000	1300	152963	117.66	0
Jashimuddin	Airport	1.32	B	1	20	1000	1300	152963	117.66	0
Khilkhet	Airport	2.88	B	1	20	1000	1300	151929	116.87	0

Although 8 segments out of 10, remains same in both cases but the traffic volume has increased in later case than the previous one.

Along with this, the distribution of transit volume on bus route network exception of BRT Line 3 corridor is also analyzed and top 10 segments ranked based on transit volume is provided in Table 54.

Table 54:Distribution of traffic volume on different segments of existing bus routes on 2035 peak period (Scenario 3)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avg. Load	Aux. volume
Shahbag	Matsha Bhaban	0.99	cbPN	50	300	10500	15000	49806	3.32	114
Asad Gate	Manik Mia Avenue West	0.23	cbPN	36	216	7560	10800	49734	4.6	7821
Kalyanpur	Shyamoli	0.6	cbPN	32	192	6720	9600	49089	5.11	1678
Shyamoli	Shishumela	0.21	cbPN	34	204	7140	10200	48498	4.75	1542

Technical	Darussalam	0.44	cbPN	32	192	6720	9600	45287	4.72	251
Darussalam	Kalyanpur	0.61	cbPN	32	192	6720	9600	45287	4.72	322
College Gate	Asad Gate	0.81	cbPN	32	192	6720	9600	45038	4.69	1920
Janapath mor	Dholpur	0.16	cbPN	39	234	8190	11700	43799	3.74	21069
Shishumela	College Gate	0.79	cbPN	32	192	6720	9600	43752	4.56	0
Dholpur	Jatrabari	0.53	cbPN	39	234	8190	11700	43630	3.73	20799

In the above table, it is seen that, the highest number of transit volume could be found on to Shahbag to Matsha Bhaban corridor and second highest volume could be found on to Asad Gate to Manik Mia Avenue West segment. It is very important to note that the top segments ranked based on transit volume for existing bus route network is different from the scenario 1. Moreover, the load factors in these segments are less than 5 and the volume in auxiliary modes is also high in these segments. In Shahbag to Matsha Bhaban segment the volume in auxiliary mode is low, as the availability of auxiliary modes in this segment is low.

Moreover, while using the modified travel demand matrix the top 10 segments on bus route network remains almost same as the previous one , but the traffic volume on these segments have increased than before.

Table 55: Distribution of passenger traffic volume on top 10 segments of bus route network using modified travel demand matrix in scenario 3

From	**To**	**Length**	**Modes**	**No. lines**	**No.vehicles**	**Seated capacity**	**Total capacity**	**Volume**	**Avrg. Load**	**Aux. volum**
Shahbag	Matsha Bhaban	0.99	cbPN	50	300	10500	15000	53644	3.58	0
Asad Gate	Aarong	0.23	cbPN	36	216	7560	10800	52462	4.86	11500
Kallyanpur	Shyamoli	0.6	cbPN	32	192	6720	9600	49878	5.2	1458
Shyamoli	Kallyanpur	0.6	cbPN	32	192	6720	9600	49825	5.19	3490
Shyamoli	Shishumela	0.21	cbPN	34	204	7140	10200	49243	4.83	3639
Aarong	Asad Gate	0.23	cbPN	36	216	7560	10800	48896	4.53	11822
Shishumela	College Gate	0.81	cbPN	32	192	6720	9600	48885	5.09	1410

Technical	Darussalam	0.44	cbPN	32	192	6720	9600	48306	5.03	920
Darussalam	Kallyanpur	0.61	cbPN	32	192	6720	9600	48306	5.03	1011
Shishumela	Shyamoli	0.21	cbPN	34	204	7140	10200	47253	4.63	2317

In this phase, the boarding-alighting of passengers on the BRT stops would be analyzed. On Table 56 the top 10 BRT stops ranked following the number of boarding passengers is provided.

Table 56:Distribution of Passengers on Different BRT stops for 2035 Peak Period (Scenario 3)

Node	**Boarding Passengers**			**Through Passengers**	**Alighting Passengers**		
	Initial	**Transfer**	**Total**		**Final**	**Transfer**	**Total**
Millgate	27060	25360	52421	145748	28032	20730	48762
Fulbaria	19441	24876	44318	109905	18479	26434	44913
Hatirjheel	12976	30822	43798	203300	17002	30172	47174
Keraniganj	39709	3976	43685	-	31916	4441	36357
Khilkhet	22630	18739	41369	240427	19947	14309	34255
Gazipur Chourasta South	39971	351	40322	-	40565	251	40816
College Gate	29052	-	29052	140832	-	-	-
Tongi	28024	0	28024	213961	26837	1031	27868
Kakrail	12125	15367	27492	182539	12552	11853	24405
Paltan	5088	21973	27061	155926	5661	23612	29273

According to the above table, the highest boarding passengers could be found at Millgate BRT stop. Although at this stop the number of through passengers is more than 100000. Apart from this, the total number of boarding and alighting passengers is close.

In case of Keraniganj, the number of through passengers is zero, as it is the last stop of BRT Line 3. People travelling from other side of Buriganga towards north Dhaka can take this stop to board into BRT. Similar to this, the value of through passenger is also zero in Gazipur Chourasta South, as most people travelling to Gazipur alight into this stop. However, in case of using the modified travel- demand matrix the top 10 ranked BRT stops (based on total boarding passengers) remains almost same. In the previous calculation Paltan was included in the list but in the new one Amtali is included. Table 57 Shows the details.

Table 57: Distribution of passenger boarding-alighting on top 10 ranked BRT stops using modified travel-demand matrix in scenario 3

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Mill gate	34171	22397	56568	157454	35972	15962	51933
Keraniganj (BRT)	44566	1368	45934	-	35791	8429	44221
Khilkhet	29359	15867	45226	259839	22743	14225	36968
Hatirjheel mor(kw.b)	15502	29532	45034	223863	19698	33315	53013
Fulbaria	21281	23361	44643	121779	20800	24358	45159
GP Chourasta South	41980	308	42288	-	42558	235	42794
Amtali	15876	17267	33143	269504	15430	15473	30903
College Gate (T)	31373	-	31373	151983	-	-	-
Kakrail	13544	17822	31366	198518	13512	13815	27327
Tongi	30250	0	30250	230516	28977	1006	29983

Apart from the BRT stops the distribution of passenger boarding alighting in bus stops of existing bus route network is also analyzed and the top 10 ranked ones (ranked following boarding passenger number) is provided in Table 58.

Table 58: Distribution of passengers on different bus stops of existing bus network for 2035 peak period (Scenario 3)

Node	**Boarding Passengers**			**Through Passengers**	**Alighting Passengers**		
	Initial	**Transfer**	**Total**		**Final**	**Transfer**	**Total**
Janapath Mor	3647	35756	39403	41252	6630	21393	28023
Paltan	1345	32827	34173	40152	1148	31167	32315
Ashulia Bazar	11292	14621	25913	6144	4815	12934	17749
Tejgaon	3050	21561	24611	51671	3444	20464	23909
Technical	9780	13616	23396	57511	9197	10905	20102
Shishumela	2103	18817	20921	73011	1719	15242	16961
Jatrabari	13070	7647	20717	58736	9142	7326	16468
Shahbag	10675	10036	20711	69991	13278	12294	25572
Mirpur 10	7686	12816	20502	36821	10070	12493	22564
Manik Mia Avenue West	4253	15801	20053	78470	4958	17058	22016

According to the above table, the highest number of transit passengers boarding is found in Janapath mor and secondly in Paltan. In Janapath mor the number of transfer boarding passenger is high as people coming from south Dhaka changes their transit mode here based on their availability, similarly on this stop the number of transfer alighting passenger is also high.

Moreover, the bus stops which are listed in here as top ranked based on boarding passengers are different from bus stops of scenario 1 of existing bus route network. Due to adding the BRT Line 3, the distribution of passengers in transit modes changed. The figure shows a combined picture of distribution of passengers in both BRT stops and Bus stops.

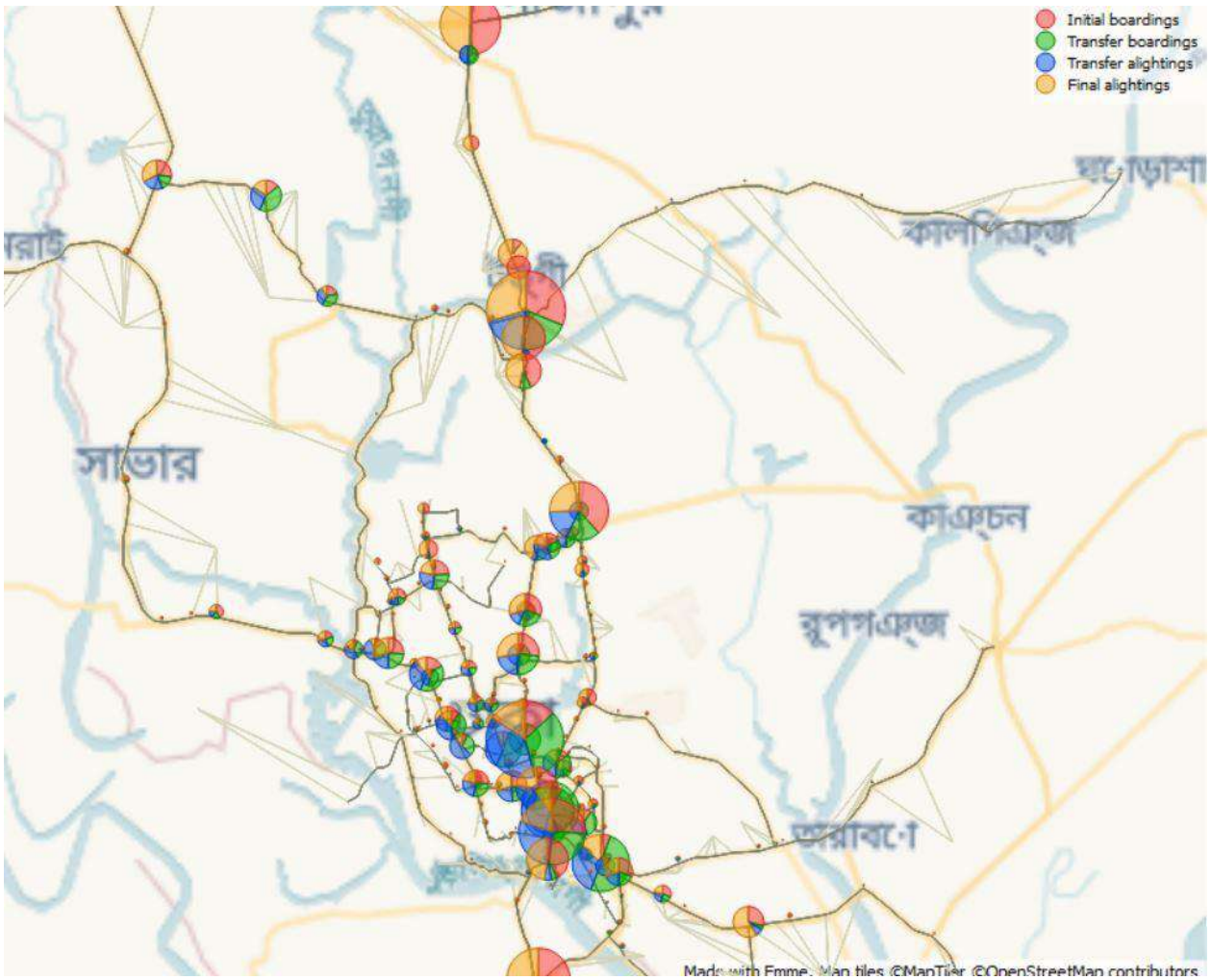


Figure 28: Distribution of Passengers in BRT and Existing Bus stops for Peak Period of Year 2035 (Scenario 3: Existing Bus Routes and BRT Line 3 only)

Following the above figure, the distribution of boarding, alighting and through passengers are high on Abdullahpur, Khilkhet, Hatirjheel, Keraniganj, Jatrabari. However, the bus stops and BRT stops which are mentioned in the above sections are seen in this figure. However, considering the modified travel demand matrix, the top 10 ranked bus stops has changed from the Table 58, and the newly included bus stops are Hatirjheel Mor, Kawaran Bazaar, Narshinghapur, Baipail.

Table 59: Distribution of passenger boarding-alighting on top 10 bus stops while considering the modified travel demand matrix for scenario-3

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Janapath mor	5358	34447	39805	40927	6560	27456	34016
Paltan	1601	35488	37088	44155	1492	36168	37661
Technical	11492	11697	23190	63017	8612	12779	21391
Hatirjheel mor(kw.b)	1815	20592	22407	10752	1377	13602	14978
Kawran Bazaar	3342	18990	22332	57749	3210	15088	18298
Shahbag	13438	8752	22190	75447	13139	10356	23495
Narshinghapur	5832	15956	21788	6586	6849	9993	16842
Shishumela	2983	18476	21459	87178	6760	18838	25598
Mirpur 10	9451	11592	21042	38869	8209	11669	19878
Baipail	13475	7095	20570	1226	9566	9797	19363

7.4. Scenario 4: Rationalized Bus Routes with BRT Line 3

On this scenario, rationalized bus routes along with BRT Line 3 is incorporated. Following the operational parameters of previous scenarios here, the operational speed of rationalized bus routes is taken to be 21 kmph, whereas for BRT it is 29 kmph. The headway value for rationalized bus routes is about 10 minutes and it is similar for BRT line 3. The access fare for both BRT and rationalized bus routes is about BDT 10, but in case of per km fare the value is BDT 2.15 for rationalized bus routes and BDT 2.50 for BRT.

The distribution of transit volume across different segments of the network is shown in Figure 29.

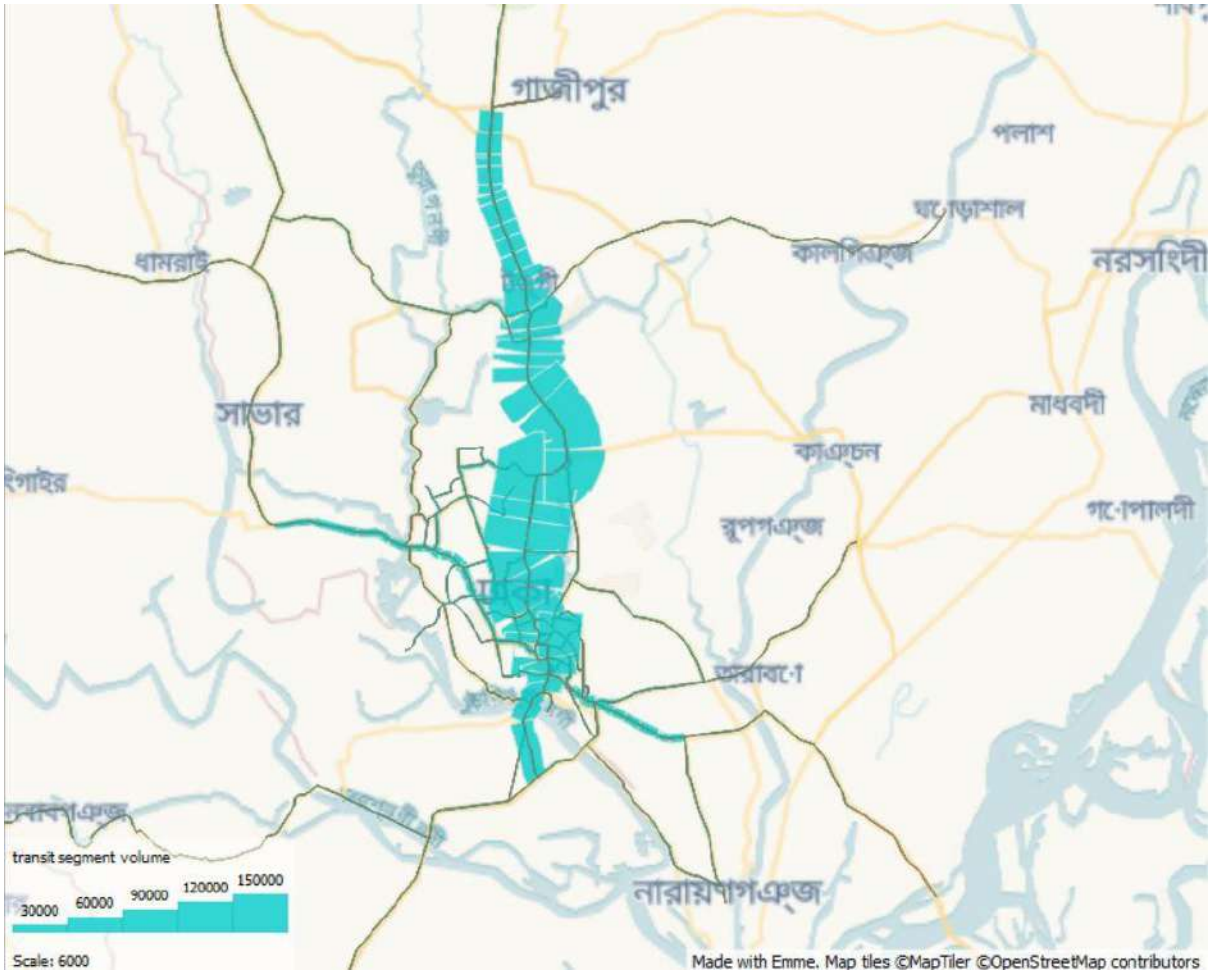


Figure 29: Segment wise transit volume for rationalized bus routes and BRT line 3 in 2035 peak period

According to the Figure 29, the majority of transit passenger volume could be found on the BRT Line 3 corridor. Apart from that, the volume is also high on Gabtoli to Chittagong Road corridor. On this part, the distribution of transit passenger volume on BRT Line3 corridor is analyzed and top 10 links ranked based on the transit passenger volume is provided in Table 60.

In BRT Line 3 corridor the highest volume of transit passengers could be found in the Banani to Amtali segment. On this segment the transit volume is more than 150000 and the load factor is about 132, and on reverse direction similar could be found. However, this was also visualized in scenario-3 as well.

Table 60:Distribution of transit volume on different segments of BRT Line 3 on 2035 peak period (Scenario 4)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Banani	Amtali	1.62	B	1	20	1000	1300	171074	131.6	0
Dhaka Cantonment	Army Stadium	1.67	B	1	20	1000	1300	167080	128.52	0
Army Stadium	Banani	0.98	B	1	20	1000	1300	167080	128.52	0
Amtali	Banani	1.62	B	1	20	1000	1300	163569	125.82	0
Army Stadium	Dhaka Cantonment	1.67	B	1	20	1000	1300	159306	122.54	0
Banani	Army Stadium	0.98	B	1	20	1000	1300	159306	122.54	0
Amtali	Mohakhali Bus Stand	1.03	B	1	20	1000	1300	149473	114.98	0
Mohakhali Bus Stand	BG Press	0.87	B	1	20	1000	1300	148949	114.58	0
BG Press	Hatirjheel Mor	1.3	B	1	20	1000	1300	148641	114.34	0
Dhaka Cantonment	Khilkhet	2.04	B	1	20	1000	1300	148448	114.19	0

On the above table it is seen that in all segments the load factors are above 100, which means that, these segments are overly crowded. Although there are bus routes in these segments, the difference of penalty (per km fare) is very low, showing that people can get transfers easily and can transfer from bus to BRT for their convenience. That is why the load factors are very high in these segments although there are parallel bus routes. The details of transit traffic on BRT Line 3 corridor for scenario 4 are provided in Annexure E. However, as the modified travel demand matrix is considered, it seems that the top 10 ranked segments in both cases are same, although the volume of passenger traffic increased than before.

Table 61: Distribution of passenger traffic on top 10 ranked segments of BRT line 3 corridor considering modified travel-demand matrix for scenario-4

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Banani	Amtali	1.62	B	1	20	1000	1300	184339	141.8	0
Amtali	Banani	1.62	B	1	20	1000	1300	179508	138.08	0
Dhaka Cantonment	Army Stadium	1.67	B	1	20	1000	1300	176532	135.79	0
Army Stadium	Banani	0.98	B	1	20	1000	1300	176532	135.79	0
Army Stadium	Dhaka Cantonment	1.67	B	1	20	1000	1300	172435	132.64	0
Banani	Army Stadium	0.98	B	1	20	1000	1300	172435	132.64	0
Amtali	Mohakhali Bus Stand	1.03	B	1	20	1000	1300	162857	125.27	0
Mohakhali Bus Stand	BG Press	0.87	B	1	20	1000	1300	162288	124.84	0
BG Press	Hatirjheel mor(kw.b)	1.3	B	1	20	1000	1300	161901	124.54	0
Dhaka Cantonment	Khilkhet	2.04	B	1	20	1000	1300	160407	123.39	0

Following it, the distribution of transit volume on bus roue network is analyzed and top 10 ranked segments are listed below:

Table 62::Distribution of traffic volume on different segments of rationalized bus routes on 2035 peak period (Scenario 4)

From	To	Length	Modes	No. lines	No. vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Manik Mia Avenue	Asad gate	0.23	cbPN	12	72	2520	3600	29043	8.07	23316
Shyamoli	Shishu Mela	0.21	cbPN	13	78	2730	3900	27346	7.01	13258
Dholpur	Janapath Mor	0.16	cbPN	13	78	2730	3900	26510	6.8	30755
Dholpur	Jatrabari	0.53	cbPN	14	84	2940	4200	26292	6.26	22880
Janapath Mor	Dholpur	0.16	cbPN	13	78	2730	3900	26149	6.7	22888
Shishu Mela	Shyamoli	0.21	cbPN	13	78	2730	3900	25170	6.45	20506
Jatrabari	Dholpur	0.53	cbPN	14	84	2940	4200	24462	5.82	33023

Technical	Darussalam	0.44	cbPN	11	66	2310	3300	23569	7.14	17162
Darussalam	Technical	0.44	cbPN	11	66	2310	3300	23418	7.1	20184
Bijoy sarani	Farmgate	0.04	cbPN	8	48	1680	2400	22246	9.27	7747

Following the above table, the transit volume is highest on Manik Mia Avenue-Asad gate segment, following it the second highest value can be found on Shyamoli-Shishu Mela segment. However, compared to scenario-3, the top 10 segments of scenario-4 is almost similar. In these segments, the average load factors are above 6. Apart from this, the volume on auxiliary modes is also high in these segments. It means that many trips are made on pedestrian and non-motorized vehicles. In Bijoy Sarani-Farmgate segment the value of auxiliary volume is low, as this place works as the destination for many, and transit services are easily available from there. Moreover, the top 10 ranked segments on rationalized bus route network get changed while the modified travel demand matrix is considered. The traffic volume increased than before and the segments changed as well.

Table 63: Distribution of passenger traffic on top 10 segments of rationalized bus route network considering modified travel demand matrix for scenario 4

From	**To**	**Length**	**Modes**	**No. lines**	**No.vehicles**	**Seated capacity**	**Total capacity**	**Volume**	**Avrg. Load**	**Aux. volum**
Shyamoli	Shishumela	0.21	cbPN	13	78	2730	3900	29546	7.58	15209
Shishumela	Shyamoli	0.23	cbPN	12	72	2520	3600	25506	7.08	28398
Technical	Darussalam	0.44	cbPN	11	66	2310	3300	25342	7.68	19450
Jatrabari Ideal	Jatrabari	0.53	cbPN	14	84	2940	4200	24635	5.87	28264
Doyaganj	Jatrabari Ideal	0.16	cbPN	13	78	2730	3900	24608	6.31	35142
Jatrabari Ideal	Doyaganj	0.16	cbPN	13	78	2730	3900	24400	6.26	28270
Jatrabari	Jatrabari Ideal	0.53	cbPN	14	84	2940	4200	24110	5.74	35739
Kazla	Jatrabari	1.1	cbPN	8	48	1680	2400	23910	9.96	9445
Sonir Akhra	Kazla	0.65	cbPN	8	48	1680	2400	23910	9.96	5117
Sign Board_NG	Saddam Market	0.79	cbPN	10	60	2100	3000	23697	7.9	3380

On this part the distribution of transit volume on BRT stops are studied and shown in

Table 64.

Table 64:Distribution of Passengers on Different BRT stops for 2035 Peak Period (Scenario 4)

Node	Boarding Passengers			Through Passengers	Alighting Passengers		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel	47625	18598	66224	208133	45108	25372	70479
Fulbaria	31725	28004	59729	126675	32236	18259	50494
Dhaka Cantonment	41858	11383	53241	262287	20169	13038	33208
Mill gate	44455	8192	52647	147467	39390	9672	49061
GP Chourasta South	47244	451	47694	-	47920	418	48338
Paltan	32950	13569	46519	189626	31032	19642	50673
Keraniganj	38386	4384	42770	-	43635	6165	49800
Amtali	29126	10047	39173	273869	31399	7554	38953
Khilkhet	26023	3732	29754	246930	36597	4543	41140
Tongi	28099	555	28655	217220	26886	656	27542

Following the above table, the highest value of transit passengers could be found in Hatirjheel. At this BRT stop, the total number of boarding and alighting passengers is almost similar, whereas the number of passing through passengers is more than 1,50,000. Following the number of passing through passengers, the highest value can be found at Amtali BRT stop and second highest is on Dhaka Cantonment Stop. At these stops, parallel bus routes are available, so transfer option is also available. In Fulbaria, the number of boarding transfer passengers is high, where is initial boarding passenger number is less than half to it. Apart from this, while considering the modified travel demand matrix, the distribution of passenger traffic on top 10 BRT stops remained almost same as the previous one, whereas only one stop got included in the list which is College Gate instead of the stop Tongi.

Table 65: Distribution of boarding-alighting on top 10 BRT stops considering modified travel demand matrix for scenario 4

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel mor(kw.b)	48920	16822	65742	232402	50240	24010	74250
Fulbaria	35929	27206	63135	138364	33055	22530	55585

Mill gate	51062	6622	57684	159253	42747	10250	52996
Paltan	34510	18293	52802	206994	34538	22084	56622
Dhaka Cantonment	36224	16320	52544	284395	22108	15067	37175
GP Chourasta South	51101	398	51499	-	51736	452	52188
Keraniganj (BRT)	41771	6543	48313	-	46932	6210	53142
Amtali	30712	17046	47757	294608	32366	9341	41707
Khilkhet	29413	3624	33037	268135	40653	3749	44402
College Gate (T)	31688	-	31688	152517	-	-	-

The distribution of transit passenger volume in bus stops is also analyzed. Table 66 shows the top 10 bus stops ranked following their total boarding passengers.

Table 66:Distribution of passengers on top ranked bus stops of rationalized bus Network for 2035 peak period (Scenario 4)

Node	**Boarding Passengers**			**Through Passengers**	**Alighting Passengers**		
	Initial	**Transfer**	**Total**		**Final**	**Transfer**	**Total**
Paltan	1725	20023	21748	11573	1240	14212	15452
Hemayetpur	15614	4911	20525	-	10435	4865	15300
Signboard	17480	594	18074	5986	13744	485	14229
Janapath Mor	3159	13988	17147	33535	2793	11856	14649
Sarc Fountain (Tejgaon)	1436	15290	16726	16483	1250	6920	8170
Technical	7234	7902	15135	32783	6365	7721	14086
Jatrabari	3732	11252	14984	35168	7197	18655	25852
Saidabad	3518	7722	11241	31718	2283	10847	13130
Shahbag	6983	3315	10298	26041	10848	2224	13072
Science lab	5490	4259	9749	17964	5135	3639	8774

Following the Table 66, the highest number of passengers could be found on to Paltan, on BRT line 3 corridor, it is also the stop where highest number of passengers could be found. Since Paltan is very close to Motijheel, and many administrative and commercial establishments can be found there, the number of work trips and non-work trips are high in here. After this, the second highest value can be found in Hemayetpur. However, the number of transfer passengers is zero here.

Considering the distribution of scenario 2, the distribution of passenger has changed a bit, as the BRT system has been added in this phase. A complete picture of passenger distribution considering both BRT and Rationalized Bus Routes is provided in the Figure 30.

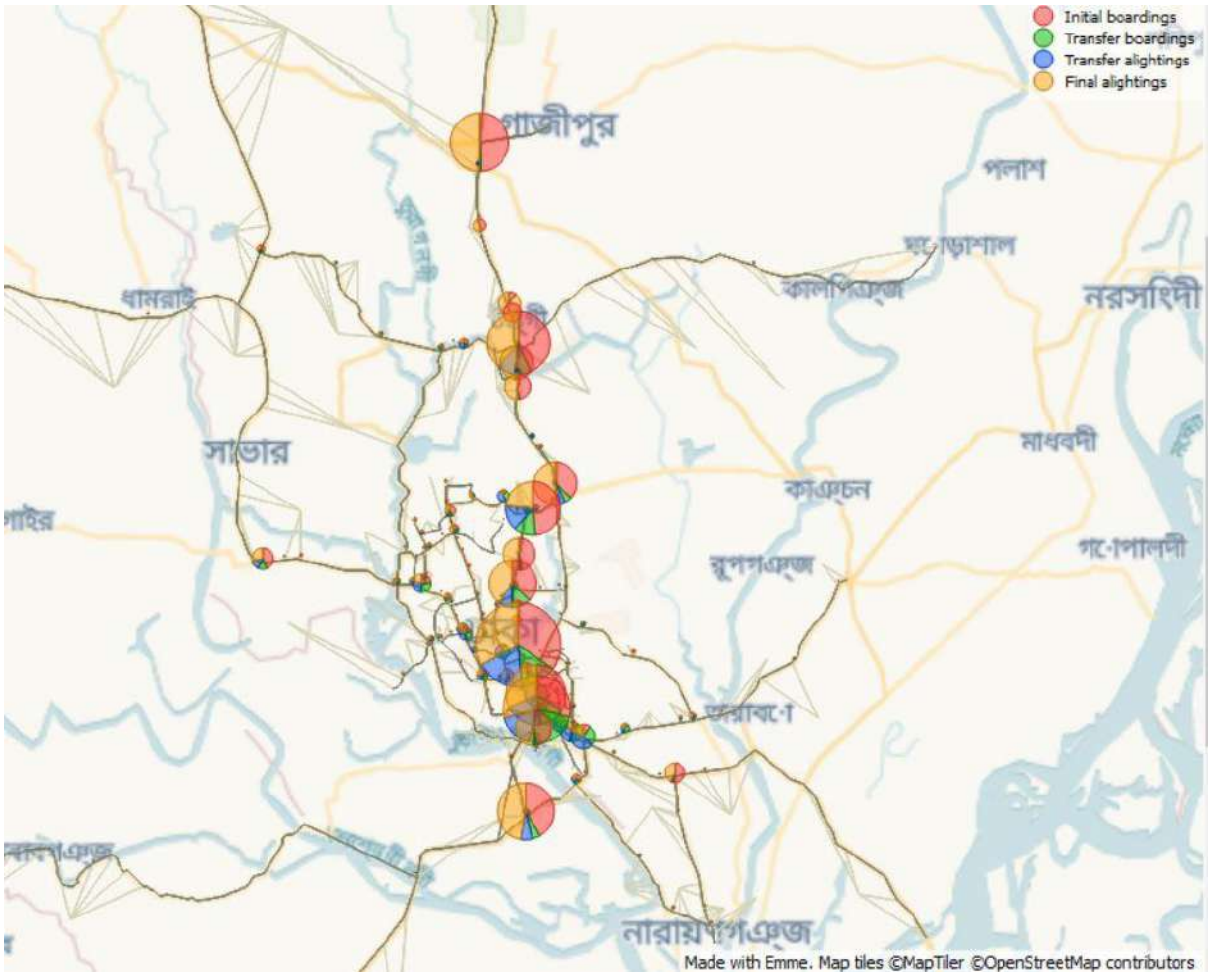


Figure 30:Distribution of passengers in BRT stops and rationalized bus stops for peak period of 2035 (Scenario 4)

According to the above figure, Abdullahpur, Khilkhet, Hatirjheel, Keraniganj, Gabtoli and Jatrabari have a high distribution of boarding, alighting, and through passengers.

Apart from this, considering the modified travel demand matrix, the top 10 bus stops of rationalized bus route network got changed, although most of them remained same, 4 new bus stops got into the list and the passenger volume increased.

Table 67: Distribution of boarding alighting on top 10 bus stops of rationalized bus route network considering modified travel demand matrix for scenario 4

	Boarding			**Passing**	**Alighting**		
Node	**Initial**	**Transfer**	**Total**	**through**	**Final**	**Transfer**	**Total**
Sign Board_NG	20438	748	21186	6258	16255	554	16809
Hemayetpur	15668	5157	20826	-	10820	5275	16095
Technical	8559	9573	18132	30571	6263	9441	15704
Kawran Bazaar	1105	16206	17311	15079	1413	5199	6612
Shahbag	13900	3152	17052	25658	12764	3017	15781
Jatrabari	3990	11518	15508	36807	7258	11837	19095
Mirpur 11	10965	2641	13606	8799	6357	2258	8615
Saidabad	2433	10613	13046	30126	3020	11442	14462
Shyamoli	4746	7086	11833	37962	3836	6289	10124
Zia Colony	85	11476	11561	10191	40	9543	9583

7.5. Scenario 5: Existing Bus Routes with MRT Line 1,5 and 6

In this scenario the exiting bus route network along with MRT Line 1,5 and 6 were incorporated into this. In case of MRT system the speed is considered to be 34 kmph with a headway of 3.5 minutes. Apart from this, the rest of the operational characteristics for bus route network is kept same as scenario 1 and 3.

The distribution of transit volume following the entire network is shown in Figure 31.

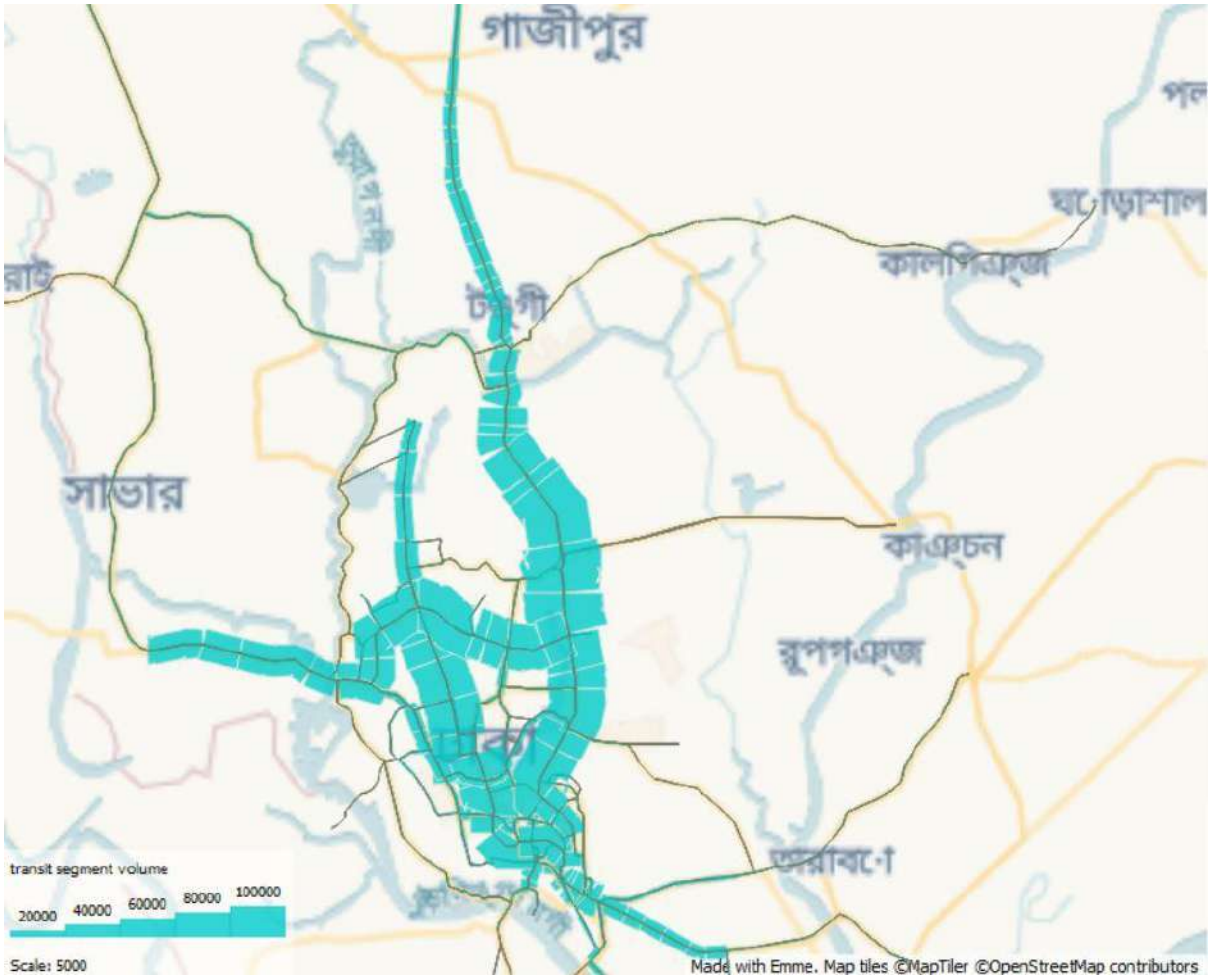


Figure 31:Segment wise transit volume for existing bus routes and MRT line 1,5 and 6 in 2035 peak period

Following the above figure, the highest volume of transit traffic could be found on MRT Line 1, 5 and 6 corridors. Apart from these MRT corridors the major volume could also be found on Chittagong road-Jatrabari corridor. Following the distribution of transit traffic on MRT corridors, the segments within these corridors are ranked based on the transit traffic volume and represented in Table 68.

Table 68:Top 10 segments on MRT 1,5 and 6 corridor following total number of transit traffic (Scenario5)

From	To	Corresponding MRT Line	Length	Modes	No. lines	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Jamuna Future Park	Natun Bazar	1	1.53	M	2	2743	3429	132903	38.76	0
Natun Bazar	Jamuna Future Park	1	1.53	M	2	2743	3429	130380	38.03	0
Khilkhet	Jamuna Future Park	1	1.87	M	1	1371	1714	124166	72.43	0
Jamuna Future Park	Khilkhet	1	1.87	M	1	1371	1714	123585	72.09	0
Airport Terminal 3	Airport	1	0.49	M	1	1371	1714	108298	63.17	0
Khilkhet	Airport Terminal 3	1	2.39	M	1	1371	1714	108298	63.17	0
Airport	Airport Terminal 3	1	0.49	M	1	1371	1714	104863	61.17	0
Airport Terminal 3	Khilkhet	1	2.39	M	1	1371	1714	104863	61.17	0
Kazipara	Shewrapara	6	0.86	M	1	1371	1714	102661	59.89	0
Badda	Uttar Badda	1	0.67	M	2	2743	3429	101024	29.47	0

Following the above table, the highest number of transit traffic could be found on Jamuna Future Park to Natun Bazar corridor, and it belongs to the MRT Line 1. On this segment the load factor is more than 35. However, among these segments the highest load factor could be found in Khilkhet to Jamuna Future Park segment. As there are parallel bus routes in this segment still the load factor value is more than 70. Apart from that, most of the segments with high transit volume could be found on MRT1 corridor and on rest of the MRT corridors the transit volume is not

that high. The details of transit traffic on MRT Line 1,5 and 6 corridors for scenario 5 is provided in Annexure E. However, when the modified transit demand matrix was used, most of the segments of top 10 ranked MRT segments (based on transit traffic volume) remained same, but a few got changed as well. Although almost all of them have higher transit traffic volume than the previous one.

Table 69: Distribution of transit traffic on top 10 ranked segments of MRT corridor considering modified transit travel demand matrix on scenario 5

From	To	Length	Modes	No. lines	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
JFP	Notun Bazaar	1.53	M	2	2743	3429	143204	41.77	0
Notun Bazaar	JFP	1.53	M	2	2743	3429	141901	41.39	0
JFP	Khilkhet	1.87	M	1	1371	1714	135220	78.88	0
Khilkhet	JFP	1.87	M	1	1371	1714	133238	77.72	0
Airport Terminal 3	Airport	0.49	M	1	1371	1714	117471	68.52	0
Khilkhet	Airport Terminal 3	2.39	M	1	1371	1714	117471	68.52	0
Airport Terminal 3	Khilkhet	2.39	M	1	1371	1714	112837	65.82	0
Shewrapara	Agargaon	0.86	M	1	1371	1714	112600	65.68	0
Notun Bazaar	JFP	0.67	M	2	2743	3429	110743	32.3	0
Uttar Badda	Notun Bazaar	1.34	M	2	2743	3429	110619	32.26	0

Apart from the MRT corridors the transit traffic on other bus routes is also analyzed and provided in Table 70.

Table 70:Distribution of traffic volume on different segments of existing bus routes on 2035 peak period (Scenario 5)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Jashimuddin	Airport	2.84	cbPN	48	288	10080	14400	97813	6.79	11420
Housebuilding	Airport	1.51	cbPN	47	282	9870	14100	92989	6.59	0
Rajlaxmi	Jashimuddin	0.92	cbPN	47	282	9870	14100	92406	6.55	14278
Azampur	Rajlaxmi	0.77	cbPN	47	282	9870	14100	90499	6.42	14278
Airport	Jashimuddin	2.84	cbPN	48	288	10080	14400	88501	6.15	23700

Abdullahpur	Housebuilding	1.6	cbPN	44	264	9240	13200	86055	6.52	10917
Jashimuddin	Rajlaxmi	0.92	cbPN	47	282	9870	14100	82778	5.87	23848
Rajlaxmi	Azampur	0.77	cbPN	47	282	9870	14100	78270	5.55	23848
Azampur	Housebuilding	1.51	cbPN	47	282	9870	14100	71190	5.05	24029

According to the above table the highest number of transit passengers could be found onto Jashimuddin to Airport segment. On this segment the total value of transit traffic is about 98000 and the load factor is about 7. This segment is located just after the MRT1 corridor. Following the above table, it seems that, the top ranked segments selected based on transit traffic are those on which no MRT lines could be found, that is why on these corridors transit users has only one option and they have to get into buses. That is why, on these segments the load factors are high, but not as much as the MRT ones.

Along with this, it seems that, the top ranked segments based on transit traffic volume remained same as previous case, but the traffic volume got increased in each segment and it is shown in Table 71.

Table 71: Distribution of transit traffic on top 10 ranked segments of existing bus route network considering modified travel demand matrix on scenario 5

From	**To**	**Length**	**Modes**	**No. lines**	**No.vehicles**	**Seated capacity**	**Total capacity**	**Volume**	**Avrg. Load**	**Aux. volume**
Jashimuddin	Airport	2.84	cbPN	48	288	10080	14400	105041	7.29	12463
Rajlakhshmi	Jashimuddin	0.92	cbPN	47	282	9870	14100	98849	7.01	15813
Airport	Jashimuddin	2.84	cbPN	48	288	10080	14400	96328	6.69	25989
Azampur	Rajlakhshmi	0.77	cbPN	47	282	9870	14100	90670	6.43	15813
Jashimuddin	Rajlakhshmi	0.92	cbPN	47	282	9870	14100	89738	6.36	27623

House Building	Azampur	1.51	cbPN	47	282	9870	14100	89440	6.34	10556
Rajlakhshmi	Azampur	0.77	cbPN	47	282	9870	14100	87908	6.23	27623
Azampur	House Building	1.51	cbPN	47	282	9870	14100	86679	6.15	17337
Abdullahpur	House Building	1.6	cbPN	44	264	9240	13200	81914	6.21	21442
House Building	Abdullahpur	1.6	cbPN	44	264	9240	13200	71688	5.43	33589

Following this, the boarding-alighting, and transfers on MRT stops and bus stops are analyzed.

Table 72:Top 10 stops on MRT 1,5 and 6 corridor following total number of transit boarding passenger (Scenario 5)

Node	Corresponding MRT Line	Boarding			Passing Through	Alighting		
		Initial	Transfer	Total		Final	Transfer	Total
Airport	1	1597	103267	104863	-	7124	101174	108298
Natun Bazar	1	-	83688	83688	-	-	70609	70609
Mirpur 10	6	575	77991	78566	74079	-	71005	71005
Mirpur 10	5_North	74	73554	73628	86020	-	79200	79200
Natun Bazar	5_North	-	68537	68537	152636	-	81147	81147
Shapla Chattar	6	4676	45777	50453	-	3791	46291	50083
Hemayetpur	5_North	41216	6617	47833	-	40445	6959	47404
Sainik Club	5_North	27432	14410	41841	120801	27507	13696	41204
Shyamoli	5_South	8990	30721	39712	-	-	-	-
Kamalapur	6	9901	26798	36699	-	10948	32906	43854

According to the above table the highest number of boarding passengers could be found at the Airport MRT stop. At this stop the number of through passing passengers is zero, and initial boarding and final alighting passengers are less. However, the number of transfer passengers in both categories is high. Airports work as transit hub for many, people travelling north of Dhaka can easily take BRT, apart from this, railway system and bus services are also available here. That is why the rate of transfer is high in here.

Following this, the number of through passengers is high on Natun Bazar and Sainik club, whereas on other MRT stops the value is null. However, when the modified travel demand matrix was used, the list of top ranked MRT stations remained almost similar, although a few got included in the list and passenger traffic volume increased in this case.

Table 73: Distribution of passenger traffic on top 10 ranked MRT stations considering modified travel demand matrix on scenario 5

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Airport	11821	101016	112837	-	3739	113732	117471
Notun Bazaar	-	90601	90601	-	-	76005	76005
Mirpur 10	753	85065	85818	79826	-	75151	75151
Shapla Chattar	5365	48928	54293	-	3414	52184	55598

Hemayetpur	44285	7713	51998	-	44370	6784	51155
Banani	29722	15320	45042	129632	29706	15246	44952
Kamalapur	9944	32715	42658	-	8868	40530	49397
Shyamoli	10289	31540	41829	-	-	-	-
Malibag mor	3849	31254	35103	114738	4909	32231	37140
Shahbag	12938	19835	32773	145582	13114	22601	35716

Following this the distribution of transit passengers on different bus stops is analyzed and provided in Table 74.

Table 74:Top 10 stops on existing bus routes following total number of transit boarding passenger (Scenario 5)

	Boarding			**Passing**	**Alighting**		
Node	**Initial**	**Transfer**	**Total**	**Through**	**Final**	**Transfer**	**Total**
Azampur	11788	89095	100883	60805	20705	89750	110454
Airport	135	85359	85494	7377	205	94134	94339
Shapla Chattar	1549	67836	69385	21991	1982	70455	72437
Janapath Mor	3947	51538	55486	59870	6227	52460	58687
Jatrabari	15600	28951	44551	60995	15242	22129	37371
College gate	13372	24080	37451	18588	5408	26648	32056
Malibagh	501	34689	35190	7006	634	33319	33952
Station Road	13193	19770	32962	47363	7943	27744	35688
Tongi Bypass	6688	26058	32746	45640	4777	16125	20902
Shahbag	1869	26479	28348	10784	1738	19257	20995

According to the above table, the highest number of boarding passengers could be found onto Azampur, which is more than 100000 and the number of final alighting passengers is also close to it. The number of through passengers is high on Jatrabari, Janapath Mor, Station Road, Tongi Bypass. Apart from this, the number of alighting passengers could be found high on Azampur, Airport, Shapla Chattar, Janapath mor and so on.

Figure 32 shows the complete distribution of transit passengers in both bus and MRT stops.

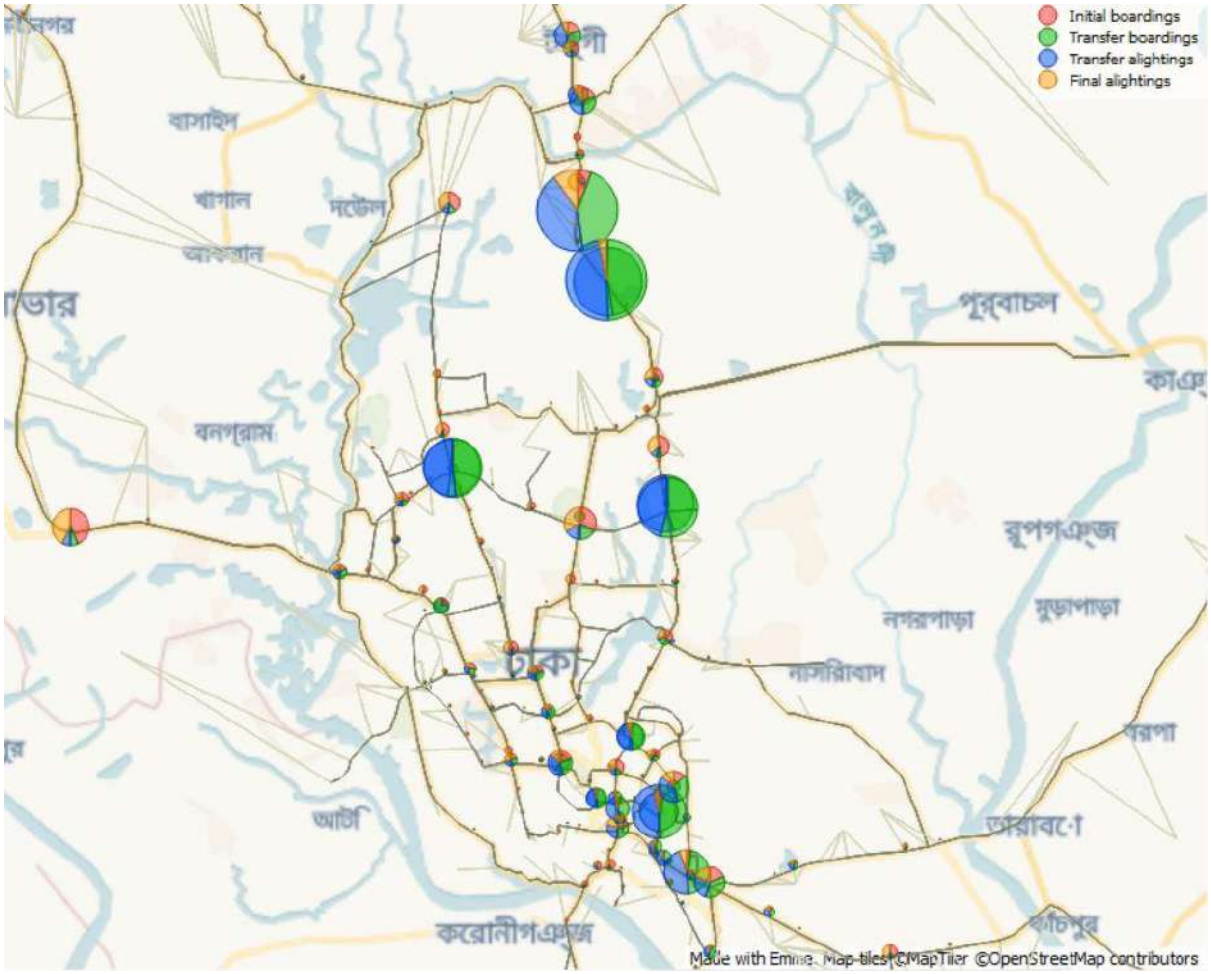


Figure 32: Distribution of passengers in MRT and existing bus stops for peak period of 2035 (Scenario 5)

Following the above figure, the distribution of transit passengers is high on Mirpur 10, Natun Bazar, Airport, Jashimuddin, Shapla Chattar, Jatrabari stops. In the Airport both MRT and bus stop have a high number of transit passengers.

However, considering the modified travel demand matrix, the list of top ranked bus stops got changed a bit, a few new ones got included in the list and these are, Millgate, Jatrbari Ideal, Fullbaria. Table 75 Shows the details of it.

Table 75: Distribution of passenger traffic on top 10 ranked bus stops considering modified travel demand matrix on scenario 5

	Boarding				**Alighting**		
Node	**Initial**	**Transfer**	**Total**	**Passing through**	**Final**	**Transfer**	**Total**
Azampur	6487	95374	101861	75488	15867	85992	101859
Airport	491	91890	92381	8614	118	101155	101273
Shapla Chattar	1966	80000	81966	25253	1979	71411	73390

Jatrabari Ideal	7323	69364	76687	41059	8577	65313	73890
Jatrabari	17219	22011	39230	57349	21284	31118	52402
College Gate (T)	5896	31196	37093	38218	12707	17240	29947
Malibag mor	593	33401	33994	6611	796	32403	33199
Station Road	4458	29402	33860	60937	11079	38316	49394
Mill gate	9625	23903	33529	58868	13577	19053	32630
Fulbaria	12949	20186	33135	31552	14800	14765	29565

7.6. Scenario 6: Rationalized Bus Routes with MRT Line 1,5 and 6

In this scenario 42 rationalized bus routes along with MRT Line 1, 5 and 6 are incorporated. Similar to scenario 5, the operational characteristics of MRT are kept same and for rationalized bus routes scenario 4 is followed. In here, the access fare for MRT is BDT 20, and for rationalized bus routes it is BDT 10.

The distribution of transit traffic following both MRT, and rationalized bus routes is provided in Figure 33.

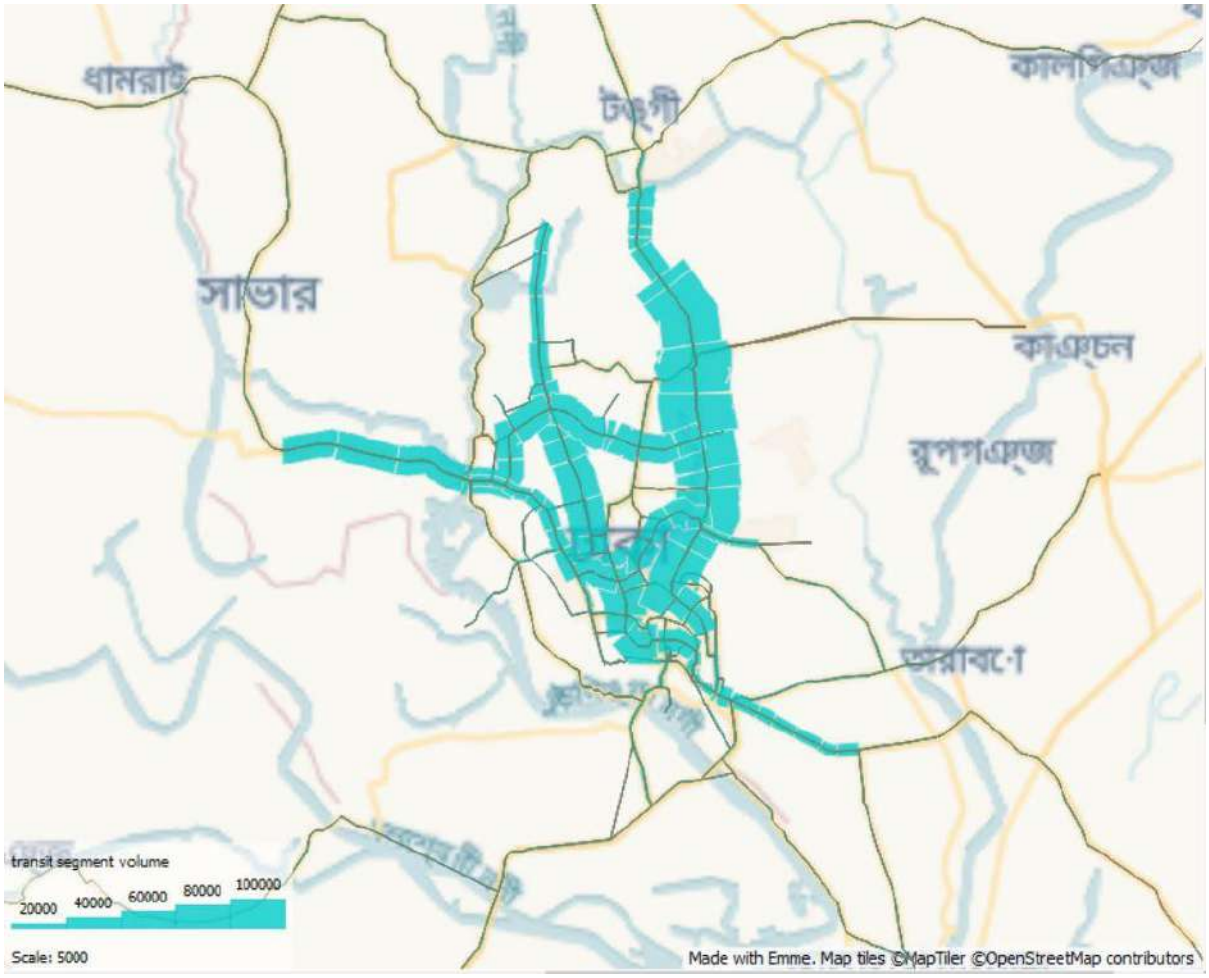


Figure 33:Segment wise transit volume for rationalized bus routes and MRT line 1,5 and 6 in 2035 peak period

Following the above figure, it seems that the transit volume is high on Khilkhet to Kamalapur corridor. Along with this, the volume also gets high on Hemayetpur to Chittagong Road corridor. Apart from this, the Mirpur Road, Sat Mashjid Road, Jatrabari-Chittagong Road has transit volume. This figure represents a combined picture of MRT lines along with rationalized bus routes.

In Table 76 the distribution of transit traffic on MRT corridors, the segments within these corridors are ranked based on the transit traffic volume.

Table 76:Top 10 segments on MRT 1,5 and 6 corridor following total number of transit traffic (Scenario 6)

From	To	Corresponding MRT Line	Length	Modes	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Jamuna Future Park	Natun Bazar	1	1.52	M	2743	3429	124944	36.44	0
Natun Bazar	Jamuna Future Park	1	1.52	M	2743	3429	122730	35.8	0
Jamuna Future Park	Khilkhet	1	1.87	M	1371	1714	118367	69.05	0
Khilkhet	Jamuna Future Park	1	1.87	M	1371	1714	117368	68.46	0
Badda	Uttar Badda	1	0.67	M	2743	3429	110048	32.1	0
Uttar Badda	Badda	1	1.34	M	2743	3429	109906	32.06	0
Badda	Uttar Badda	1	0.67	M	2743	3429	106428	31.04	0
Hatirjheel	Badda	1	1.52	M	2743	3429	106228	30.98	0
Badda	Hatirjheel	1	1.52	M	2743	3429	106010	30.92	0
Uttar Badda	Natun Bazar	1	1.34	M	2743	3429	105991	30.91	0

According to the above table, most of the segments having high transit volume are on MRT 1 corridor. Among these segments Jamuna Future Park to Natun Bazar segment has high transit volume and the average load factor on this segment is more than 35. However, the load factor values are more than 65 on Jamuna Future Park to Khilkhet segment in both directions. Although there is a provision for public bus service in this segment, still the transit volume is high. Apart from that, the volume in auxiliary modes is zero in all these segments, which means that, people travelling in this corridor either used public bus or MRT for travel. However, considering the modified transit travel demand, the top 10 ranked MRT

segments have changed, and new segments have been included in the list. The transit traffic flow has been increased than previous case and it is shown in the

Table 77: Distribution of transit passenger traffic on top 10 segments of MRT lines considering modified travel demand matrix of scenario 6

From	To	Length	Modes	No. lines	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volum
Notun Bazaar	Uttar Badda	1.52	M	2	2743	3429	135873	39.63	0
Uttar Badda	Notun Bazaar	1.52	M	2	2743	3429	133915	39.06	0
JFP	Khilkhet	1.87	M	1	1371	1714	129178	75.35	0
Khilkhet	JFP	1.87	M	1	1371	1714	127311	74.26	0
Badda	Uttar Badda	0.67	M	2	2743	3429	119518	34.86	0
Uttar Badda	Notun Bazaar	1.34	M	2	2743	3429	119315	34.8	0
Uttar Badda	Badda	0.67	M	2	2743	3429	115503	33.69	0
Hatirjheel	Badda	1.52	M	2	2743	3429	115330	33.64	0
Badda	Hatirjheel	1.52	M	2	2743	3429	114842	33.5	0
Airport Terminal 3	Airport	0.49	M	1	1371	1714	110206	64.29	0

Along with this the transit volume in public bus service is also analyzed and represented in Table 78.

Table 78:Distribution of traffic volume on different segments of Dhaka for rationalized bus routes on 2035 peak period (Scenario 6)

From	To	Length	Modes	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Housebuilding	Abdullahpur	0.74	cbPN	3360	4800	53410	11.13	41001
Jashimuddin	Rajlaxmi	0.43	cbPN	2520	3600	49566	13.77	48814
Airport	Jashimuddin	1.32	cbPN	2520	3600	49566	13.77	61670
Rajlaxmi	Azampur	0.36	cbPN	2520	3600	49392	13.72	48814
Azampur	Housebuilding	0.7	cbPN	2520	3600	46384	12.88	48814
Abdullahpur	Housebuilding	0.74	cbPN	3360	4800	38477	8.02	52545
Rajlaxmi	Jashimuddin	0.43	cbPN	2520	3600	31959	8.88	60341

Jashimuddin	Airport	1.32	cbPN	2520	3600	31959	8.88	75108
Housebuilding	Azampur	0.7	cbPN	2520	3600	31447	8.74	60341
Azampur	Rajlaxmi	0.36	cbPN	2520	3600	31447	8.74	60341

According to the above Table, the highest number of transit passengers could be found on Housebuilding to Abdullahpur segment. Following this, the second highest value could be found in Jashimuddin to Rajlaxmi segment. On all these segments the load factors are not very high, mostly they are less than 14. Moreover, considering the modified travel demand matrix it seems that, the list of top 10 ranked transit segments following rationalized bus route network remained same and the volume of transit traffic increased than previous case. Table 79 shows the details of it.

Table 79: Distribution of transit traffic on top 10 segments of rationalized bus route network following modified travel demand matrix for scenario 6

From	**To**	**Length**	**Modes**	**No. lines**	**Seated capacity**	**Total capacity**	**Volume**	**Avrg. Load**	**Aux. volume**
House Building	Abdullahpur	0.74	cbPN	16	3360	4800	55667	11.6	46698
Airport	Jashimuddin	1.32	cbPN	12	2520	3600	54159	15.04	66392
Jashimuddin	Rajlakhshmi	0.43	cbPN	12	2520	3600	54064	15.02	53961
Rajlakhshmi	Azampur	0.36	cbPN	12	2520	3600	52889	14.69	53961
Azampur	House Building	0.7	cbPN	12	2520	3600	49105	13.64	53961
Abdullahpur	House Building	0.74	cbPN	16	3360	4800	48966	10.2	49879
Rajlakhshmi	Jashimuddin	0.43	cbPN	12	2520	3600	45859	12.74	57057
Jashimuddin	Airport	1.32	cbPN	12	2520	3600	45859	12.74	70335

Azampur	Rajlakhshmi	0.36	cbPN	12	2520	3600	45343	12.6	57057
House Building	Azampur	0.7	cbPN	12	2520	3600	42471	11.8	57057

However, it is noticed that the segments which have high volume of transit passengers travelling via public bus are out of MRT system and on these segments the value of passengers using auxiliary modes is also high.

On this note, the boarding alighting and transfer of passengers on different MRT and bus stops are analyzed.

Table 80:Top 10 stops on MRT 1,5 and 6 corridor following total number of transit boarding passenger (Scenario 6)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Airport	63221	33653	96873	-	50556	50267	100823
Notun Bazar	4723	44870	49593	-	3655	39905	43559
Hemayetpur	41338	2711	44049	-	41118	3193	44311
Hatirjheel	5902	37960	43863	143825	5189	37676	42865
Kamlapur	17134	23116	40250	-	17187	20742	37929
Mirpur 10	4836	32282	37118	67873	3917	33635	37552
Shapla Chattar	20638	16364	37001	-	24221	16075	40296
Jamuna Future Park	30705	332	31037	212274	27547	276	27823
Banani	27032	1963	28995	68841	31179	1549	32728
Malibag Mor	24067	3842	27909	98998	25086	4640	29726

Following the Table 80 the highest number of passenger boarding could be found onto Airport MRT stop. Although both boarding and alighting values are high, the number of through passengers is zero.

Not only in Airport, but also in Notun Bazar, Hemayetpur, Kamlapur, Shapla Chattar the number of through passengers is zero. Among these stops, Hemayetpur, Shapla Chattar, Airport works as the ending stops as well. In these stops the number of final boarding and alighting passengers is high.

However, the number of transfer passengers in Jamuna Future Park stop is very high whereas, number of passengers got less in both boarding and alighting, it happened as the MRT Line 1 is parted into two corridors. So, people who used traveling from other parts of Dhaka taking transfer at Jamuna Future Park, to continue their travel at Basundhara do not need to do this, rather they can continue the entire journey within one MRT Line. However, considering the modified travel demand matrix, the top 10 MRT station list developed based on transit traffic remained almost same, a few stations such as Mirpur 11 and Shapla Chattar got included and the volume got increased. Table 81 shows the details.

Table 81: Distribution of transit traffic on top 10 MRT stations considering modified travel demand matrix for scenario 6

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Airport	58325	47826	106151	-	55549	54657	110206
Notun Bazaar	5046	48401	53448	-	4004	42971	46975
Hemayetpur	44865	2532	47397	-	45211	3152	48363
Hatirjheel	6354	39228	45582	155633	5470	39441	44910
JFP	3297	41824	45121	203850	3971	47368	51339
Kamalapur	21523	22043	43566	-	19529	21016	40544
Aftabnagar	4573	38813	43387	19922	5615	38625	44240
Mirpur 10	6076	33593	39670	73232	5165	36164	41329
Mirpur 11	3789	34490	38279	83179	3421	32302	35723
Shapla Chattar	21085	16515	37600	-	25514	18165	43680

Apart from this, the boarding alighting on bus stops are also analyzed.

Table 82:Top 10 stops on rationalized bus routes following total number of transit boarding passenger (Scenario 6)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Abdullahpur	34957	15144	50102	310	43448	15612	59060
Airport	913	42381	43294	14325	498	25321	25819
Sign Board	22987	972	23959	3986	21125	767	21892
Shapla Chattar	1240	18093	19333	14662	1361	12627	13988
Janapath Mor	2511	13743	16254	38827	3958	9558	13516
TT Para	1575	11394	12969	9959	1732	6939	8670
Jatrabari	5095	6778	11873	50218	7235	6039	13274
Housebuilding	1013	7571	8584	76273	1072	7516	8588
Shahbagh	4192	3960	8153	14353	4192	4186	8378
Jhilmil	5064	2772	7836	-	4365	3037	7401

Based on the above table the highest number of passenger boarding, alighting could be found on Abdullahpur. Along with this, passenger volume is also high on Airport bus stop, which

means that, both MRT and bus stop would remain busy in this corridor. People travelling North of Dhaka (Gazipur, Tongi) can take transfer here and get into buses for traveling north.

On this note, a complete picture of MRT and bus stops on rationalized corridor is provided in Figure 34.

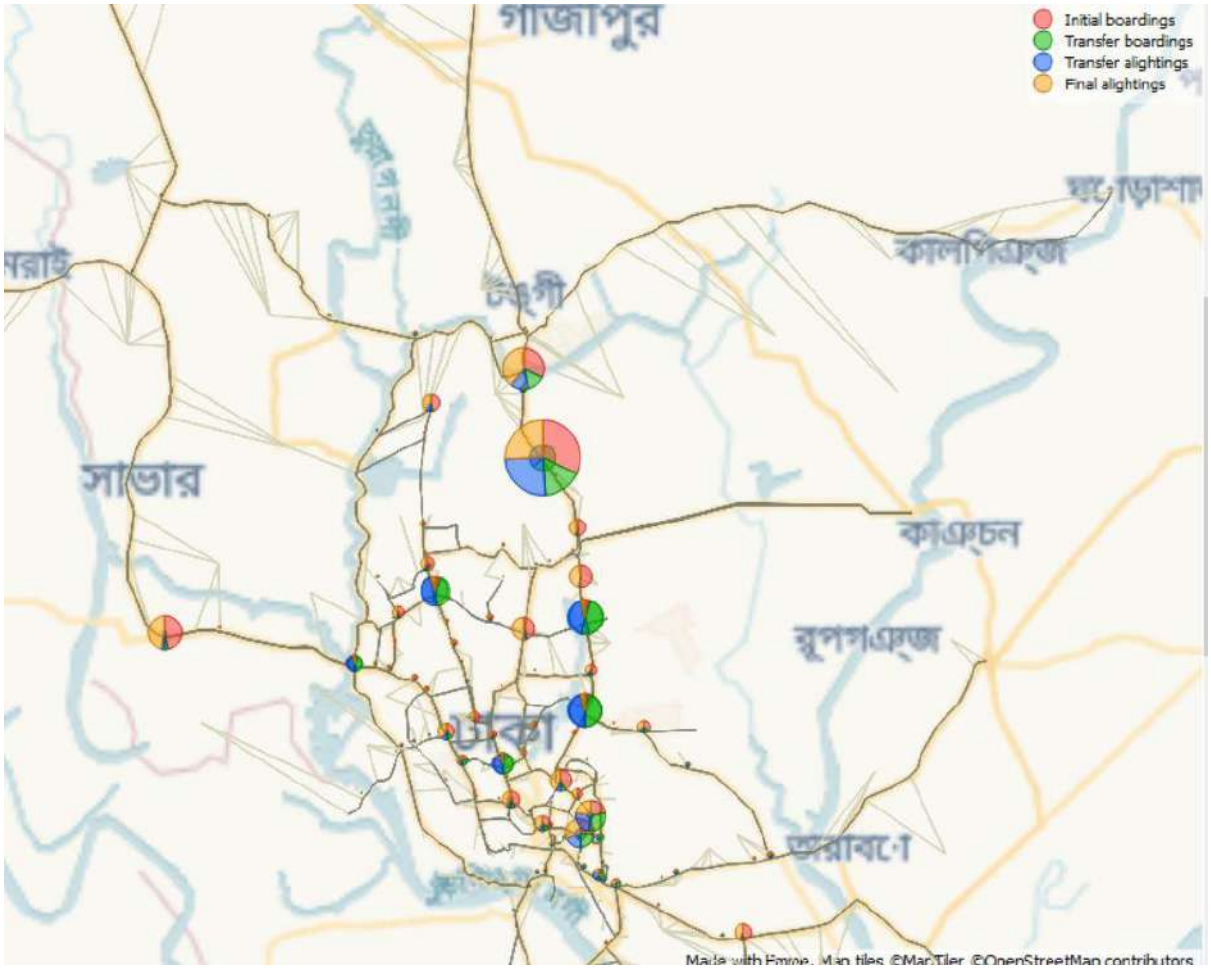


Figure 34:Distribution of passengers in MRT and rationalized bus stops for peak period of 2035 (Scenario 6)

Following the above figure, the distribution of transit passengers is high on Mirpur 10, Natun Bazar, Airport, Abdullahpur, Hemayetpur, Kamlapur stops. In Airport both MRT and bus stop have high number of transit passenger. Similar to other scenarios, the modified travel demand matrix is used, and most of the bus stops are listed into top 10 bus stop list (developed based on passenger boarding) are similar but a few got included which are Jatrabari Ideal, Manik Nagar, Swamibag, Staff Quarter. Table *83* shows the details.

Table 83: Distribution of passenger traffic on top 10 bus stops considering modified travel demand matrix for scenario 6

Node	Boarding			Passing through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Abdullahpur	45331	16049	61380	276	44724	16494	61218
Airport	923	47507	48430	12894	501	40374	40875
Sign Board_NG	22477	1035	23512	3555	21813	869	22681
Jatrabari	10365	11736	22101	43001	5826	7427	13253
Shapla Chattar	907	16857	17765	16771	1289	18280	19569
Jatrabari Ideal	1670	11832	13502	44317	1514	9041	10555
Manik Nagar	1643	9066	10709	7835	1959	5798	7757
Shahbag	4300	5876	10176	15702	6021	6321	12342
Swamibag	1366	8070	9436	33986	1536	7774	9310
Staff Quarter	5017	3282	8299	1037	4940	2810	7750

7.7. Scenario 7: Existing Bus Routes with MRT Line 1,5 and 6 and BRT Line 3

In this scenario all the existing bus routes, BRT Line 3 and MRT Line 1, 5 and 6 were incorporated. In the case of all BRT, MRT and bus routes the operational characteristics of these services are kept as other scenarios. Along with this, the access fares and segment fare rates are kept following other scenarios as well.

On this note, the distribution of transit passengers following public bus, BRT and MRT is provided in Figure 35.

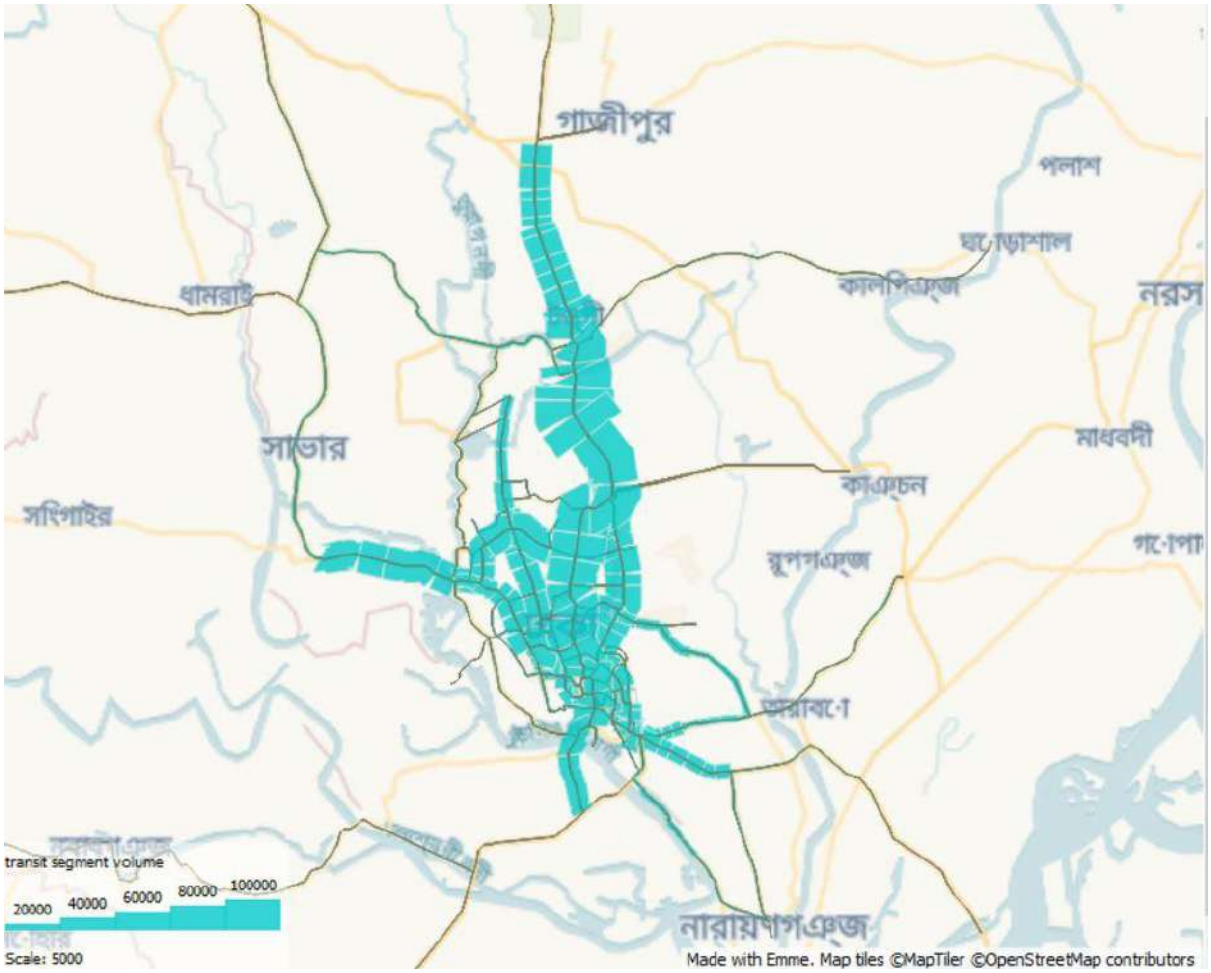


Figure 35:Segment wise transit volume for existing bus routes and MRT line 1,5, 6 and BRT line 3 in 2035 peak period

Following the Figure 35, the distribution of transit volume is high on Gazipur Chourasta to Keraniganj, and also on Mirpur Road, Badda road, Hemayetpur to Satmashjid road and so on. It seems that, the distribution of transit volume follows the alignment of MRT and BRT lines.

In this regard, the distribution of transit traffic on MRT corridors, the segments within these corridors are ranked based on the transit traffic volume and represented in Table 84.

According to this, the highest volume of transit traffic is concentrated in the corridor from Airport to Abdullahpur. On the segments starting from Airport to Housebuilding the average load factor values are more than 95. Apart from this, the transit traffic on those BRT segments which are out of any MRT corridor is high.

Table 84:Distribution of transit volume on different segments of BRT Line 3 on 2035 peak period (Scenario 7)

From	To	Length	Modes	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Azampur	Housebuiding	0.7	B	1000	1300	131235	100.95	0
Jashimuddin	Azampur	0.79	B	1000	1300	131235	100.95	0
Airport	Jashimuddin	1.32	B	1000	1300	131235	100.95	0
Housebuiding	Azampur	0.7	B	1000	1300	126400	97.23	0
Azampur	Jashimuddin	0.79	B	1000	1300	126400	97.23	0
Jashimuddin	Airport	1.32	B	1000	1300	126400	97.23	0
Housebuiding	Abdullahpur	0.74	B	1000	1300	120655	92.81	0
Abdullahpur	Tongi	0.5	B	1000	1300	117011	90.01	0
Tongi	Abdullahpur	0.5	B	1000	1300	114222	87.86	0
Abdullahpur	Housebuiding	0.74	B	1000	1300	113543	87.34	0

On all these segments the value of auxiliary transit traffic is zero, although several public bus services are available, people travel through the BRT service. However, it is seen that, when the modified travel demand matrix is used in this case, the list of top 10 segments considering the transit traffic remained same as the previous case although the volume got increase. It is shown in Table 85.

Table 85: Distribution of transit traffic on BRT line 3 corridor considering modified travel demand matrix for scenario 7

From	To	Length	Modes	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Azampur	House Building	0.7	B	1000	1300	142143	109.34	0
Jashimuddin	Azampur	0.79	B	1000	1300	142143	109.34	0
Airport	Jashimuddin	1.32	B	1000	1300	142143	109.34	0
House Building	Azampur	0.7	B	1000	1300	135995	104.61	0

Azampur	Jashimuddin	0.79	B	1000	1300	135995	104.61	0
Jashimuddin	Airport	1.32	B	1000	1300	135995	104.61	0
House Building	Abdullahpur	0.74	B	1000	1300	130483	100.37	0
Abdullahpur	Tongi	0.5	B	1000	1300	126266	97.13	0
Tongi	Abdullahpur	0.5	B	1000	1300	122617	94.32	0
Abdullahpur	House Building	0.74	B	1000	1300	121846	93.73	0

On this part, the transit volume on MRT corridor were analyzed. According to Table 86, the highest number of transit passengers could be found in Kawran Bazar to West Panthapath segment. In both directions the transit traffic is high. On these segments the load factors are high as well. Although there are availability of auxiliary transit modes and public bus services as well, people preferred to travel using MRT services.

Considering the distribution, the high volume of transit traffic could be found on MRT 1 corridor among other MRT lines. However, the highest transit traffic belongs to the segment Kawran Bazar to West Panthapath and the second highest value goes to the same segment in reverse direction.

Table 86:Top 10 segments on MRT 1,5 and 6 corridor following total number of transit traffic (Scenario7)

From	To	Corresponding MRT Line	Length	Modes	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Kawran Bazar	West Panthapath	5_South	1.62	M	1371	1714	64524	37.64	0
West Panthapath	Kawran Bazar	5_South	1.62	M	1371	1714	63344	36.95	0
Uttar Badda	Badda	1	0.67	M	2743	3429	60619	17.68	0
Badda	Hatirjheel	1	1.52	M	2743	3429	60405	17.62	0
Natun Bazar	Uttar Badda	1	1.34	M	2743	3429	60380	17.61	0
Badda	Uttar Badda	1	0.67	M	2743	3429	60294	17.59	0
Uttar Badda	Natun Bazar	1	1.34	M	2743	3429	60290	17.58	0
Hatirjheel	Badda	1	1.52	M	2743	3429	60100	17.53	0
Mirpur 14	Mirpur 10	5_North	2.33	M	1371	1714	57525	33.56	0
Kochukhet	Mirpur 14	5_North	0.51	M	1371	1714	57427	33.5	0

On most of the segments belonging to the top 10 rank, the average load factor values range between 17.5-17. 7. There are few segments such as Kawran Bazar to West Panthapath, Mirpur 14 to Mirpur 10, Mirpur 14 to Kochukhet the load factors are above 30. In these segments the MRT system would remain overcrowded. In this phase, the transit traffic distribution on public bus service would be studied. Moreover, considering the modified travel demand matrix, the list of top 10 MRT segments based on transit traffic got changed and a few new ones of MRT 1 corridor got included into this. Shows the details of it.

Table 87: Distribution of transit traffic on MRT corridor considering modified travel demand matrix for scenario 7

From	To	Length	Modes	No. lines	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volum
Kawran Bazaar	Hatirjheel mor(kw.b)	0.88	M	1	1371	1714	73723	43	0
Hatirjheel mor(kw.b)	Kawran Bazaar	0.88	M	1	1371	1714	73484	42.87	0
JFP	Notun Bazaar	1.53	M	2	2743	3429	71040	20.72	0

Kawran Bazaar	West Panthapath	1.62	M	1	1371	1714	70230	40.97	0
Khilkhet	JFP	1.87	M	1	1371	1714	69615	40.61	0
West Panthapath	Kawran Bazaar	1.62	M	1	1371	1714	67557	39.41	0
Uttar Badda	Notun Bazaar	1.34	M	2	2743	3429	65082	18.98	0
Uttar Badda	Badda	0.67	M	2	2743	3429	65081	18.98	0
Badda	Uttar Badda	0.67	M	2	2743	3429	65080	18.98	0
Hatirjheel	Badda	1.52	M	2	2743	3429	64894	18.93	0

Table 88: Distribution of traffic volume on different segments of existing bus routes on 2035 peak period (Scenario 7)

From	**To**	**Length**	**Modes**	**No. lines**	**No.vehicles**	**Seated capacity**	**Total capacity**	**Volume**	**Avrg. Load**	**Aux. volume**
Janapath Mor	Dholpur	0.34	cbPN	42	252	8820	12600	65221	5.18	0
Jatrabari	Dholpur	1.14	cbPN	42	252	8820	12600	62651	4.97	0
Dholpur	Janapath Mor	0.34	cbPN	42	252	8820	12600	59839	4.75	12
Dholpur	Jatrabari	1.14	cbPN	42	252	8820	12600	57486	4.56	0
TT para	Kamlapur	2.42	cbPN	8	48	1680	2400	45336	18.89	0
Manik Nagar	TT para	0.69	cbPN	6	36	1260	1800	42180	23.43	191
Golapbag Chourasta	Manik Nagar	1.17	cbPN	6	36	1260	1800	40704	22.61	0
TT para	Manik Nagar	0.69	cbPN	6	36	1260	1800	39154	21.75	0

Janapath Mor	Golapbag Chourasta	1.16	cbPN	6	36	1260	1800	39151	21.75	0
Manik Nagar	Golapbag Chourasta	1.17	cbPN	6	36	1260	1800	37958	21.09	0

Following the Table 88, the highest value of transit traffic goes to Janapath Mor to Dholpur and Jatrabari to Dholpur segments. On these segments the volume of transit traffic is more than 60,000. Along with this, on these segments there are no MRT and BRT lines, but the overlapping bus route number is more than 40, following which the transit traffic volume got very high. However, the average load factor value on segments having 42 overlapping bus routes ranges between 4.5 to 5. But in this table, there are segments on which the overlapping bus route number is less than 10 and, on these routes, the average load factor values range in between 18 to 23.

It seems that, with the number of increasing overlapping routes the value of average load factor also gets decreased. As passengers get more option to board on transit. However, unlike other cases the list of top 10 ranked segments of existing bus route network got changed than before case as the modified travel demand matrix is considered in this case. New segments were included, and the transit traffic volume increased. Shows the details of it.

Table 89: Distribution of transit traffic on top 10 segments of bus route network considering modified travel demand matrix for scenario 7

From	**To**	**Length**	**Modes**	**No. lines**	**No.vehicles**	**Seated capacity**	**Total capacity**	**Volume**	**Avrg. Load**	**Aux. volume**
Jatrabari Ideal	Doyaganj	0.34	cbPN	42	252	8820	12600	69605	5.52	0
Jatrabari	Jatrabari Ideal	1.14	cbPN	42	252	8820	12600	66833	5.3	0
Doyaganj	Jatrabari Ideal	0.34	cbPN	42	252	8820	12600	64925	5.15	574
Jatrabari Ideal	Jatrabari	1.14	cbPN	42	252	8820	12600	63034	5	0
Manik Nagar Bishwa Road	Manik Nagar	0.69	cbPN	6	36	1260	1800	45739	25.41	228
Kamalapur	Manik Nagar	2.42	cbPN	8	48	1680	2400	45177	18.82	0

Golapbag	Manik Nagar Bishwa Road	1.17	cbPN	6	36	1260	1800	44228	24.57	0
Doyaganj	Golapbag	1.16	cbPN	6	36	1260	1800	42663	23.7	0
Manik Nagar	Manik Nagar Bishwa Road	0.69	cbPN	6	36	1260	1800	42428	23.57	0
Golapbag	Doyaganj	1.16	cbPN	6	36	1260	1800	39145	21.75	0

In this phase, the boarding and alighting of MRT, BRT and bus stops would be studied for better understanding.

According to the Table 90, the highest number of passengers could be found onto Hatirjheel Mor MRT stop. On this stop the number of transfer boarding passengers is much higher than initial boarding passengers. It is because people living within Hatirjheel loop would transfer into circular bus and other auxiliary mode to travel their destination.

Apart from this, in the ranking table most of the MRT stops have less through passengers. But in the case of Jamuna Future Park Stop the number of through passengers is very high. Similar to boarding transfer passengers the alighting transfer passengers' number is also high on Hatirjheel Mor stop.

Table 90:Top 10 stops on MRT 1,5 and 6 corridor following total number of transit boarding passenger (Scenario 7)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel Mor	2534	53729	56262	35312	2615	54738	57353
Airport	-	51637	51637	-	-	40215	40215
Hemayetpur	41580	8463	50043	-	41295	7465	48761
Kamlapur	4927	38841	43767	-	6081	35440	41522
Notun Bazar	-	40056	40056	-	-	24651	24651
Mirpur 10	493	30541	31034	58442	-	27263	27263
Jamuna Future Park	25682	4690	30372	89570	21260	5440	26700
Banani	10744	14701	25445	56634	9408	28470	37877
Gabtoli	4364	20279	24644	-	3915	20037	23952
Asad Gate	15695	7879	23574	75996	16675	7543	24218

Considering the modified travel demand matrix, it seems that the list of top 10 MRT stations remains same as previous case although modified travel demand matrix has been used. In almost all the stops the passenger traffic has increased than before. Table 91 shows the details of it.

Table 91: Distribution of passenger traffic on top 10 ranked MRT stops using modified travel demand matrix on scenario 7.

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel mor(kw.b)	2732	58279	61011	38769	2820	58582	61401
Airport	-	55069	55069	-	-	43581	43581
Hemayetpur	45506	9071	54577	-	44013	8656	52669
Kamalapur	5346	42030	47377	-	6569	38478	45047
Notun Bazaar	-	43334	43334	-	-	27018	27018
Mirpur 10	610	32639	33249	63000	-	29354	29354
JFP	27731	5197	32928	96008	23946	5091	29038
Banani	11610	15702	27312	61666	10153	31307	41460
Gabtoli	2660	24254	26914	76322	3350	24155	27505
Asad Gate	16183	8984	25167	81680	17646	8055	25701

Along with this, the boarding and alighting on BRT stops were also studied. Table 92 shows the details of it.

Table 92:Top 10 stops on BRT 3 corridor following total number of transit boarding passenger (Scenario 7)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel Mor	2636	57356	59992	88775	3663	58410	62073
GP chourasta South	50851	-	50851	-	51509	-	51509
Banani	19732	27368	47100	133053	20915	13402	34316
Airport	-	44060	44060	161938	-	51637	51637
Keraniganj	31597	2651	34249	-	30592	5288	35880
Hossain Market	33158	-	33158	111752	33557	-	33557
Tongi	29356	-	29356	181177	28224	1498	29721
Naya Bazar	19428	9110	28537	72559	18328	9813	28141
House Building	23342	3243	26585	220470	24308	5.00E-03	24308
Paltan	-	23014	23014	112354	308	21262	21570

Following the Table 92, it seems that, similar to Table 90, the highest number of passenger could be found onto Hatirjheel Mor BRT stop. After this, the second highest value goes to GP Chourasta South BRT stop. But in this stop the transfer passenger value in both boarding and alighting is zero, it is because, people living in nearby areas board and alight from buses into GP Chourasta bus stop, whenever BRT Line 3 would be operational, people would prefer board and alight into system from this stop.

Apart from this, in Airport BRT stop, the initial boarding and alighting passenger number is zero similar to Table 90. Moreover, considering the modified travel demand matrix, the list of top 10 BRT stops remains almost same as the previous case, although two new stops named Amtali and Cherag Ali are included into this list. Table 93 shows the details of it.

Table 93: Distribution of transit traffic on top 10 stops of BRT Line 3 corridor considering modified travel demand matrix for scenario 7

Node	Boarding			Passing through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel mor(kw.b)	2853	61270	64124	97239	3970	63051	67020
GP Chourasta South	54911	-	54911	-	55616	-	55616
Banani	21298	30079	51377	144303	22593	14304	36897
Airport	-	47733	47733	175336	-	55069	55069
Keraniganj (BRT)	34394	3144	37538	-	34059	4392	38451
Cherag Ali	35807	-	35807	120669	36243	-	36243

Tongi	31698	-	31698	194638	30509	1791	32299
Naya Bazaar	20644	10245	30889	78462	19486	10890	30376
House Building	25215	3792	29006	237471	26518	1.00E-02	26518
Amtali	18607	5728	24335	151921	18536	5917	24453

On this phase, the boarding-alighting on bus stops in this scenario, would be analyzed. Table 94 provides the details of it.

Table 94:Top 10 stops on different bus routes following total number of transit boarding passenger (Scenario 7)

	Boarding			**Passing**	**Alighting**		
Node	**Initial**	**Transfer**	**Total**	**Through**	**Final**	**Transfer**	**Total**
Kamlapur	1540	42887	44427	3840	2544	46287	48832
Jatrabari	6166	34334	40499	77949	5718	35171	40889
Janapath mor	-	25769	25769	102048	374	25802	26176
Shapla Chattar	-	25094	25094	15008	296	24868	25164
Paltan	-	25091	25091	6327	1.00E-01	26842	26842
Signboard	16871	3188	20059	15235	14475	2029	16503
Dholpur	2570	16017	18587	104119	2365	16005	18370
Dhanmondi-32	658	16499	17157	2338	718	15668	16385
Meradia	-	17103	17103	165	-	16106	16106
Kakoli	25	16741	16767	-	23	13632	13655

Following the above table, the highest number of boarding passengers could be found on the Kamlapur bus stop and in here, the transfer boarding and alighting passenger numbers are also high. Since there is an MRT stop as well, people might take transfer to travel through another mode. However, the bus stops which are mentioned in the above table are all on those corridors where there is no BRT or MRT services, except Kamlapur and Shapla Chattar. Moreover, unlike other scenarios the list indicating distribution of transit traffic on top 10 bus stops remained almost same and 3 new stops named Jatrabari Ideal, West Panthapath, Rajmoni Hall got included.

Table 95: Distribution of passenger traffic on top 10 bus stops considering modified travel demand matrix on scenario 7

Node	Boarding			Passing through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Kamalapur	1662	46227	47889	4303	2767	49779	52546
Jatrabari	11508	33193	44701	83500	5170	35051	40221
Jatrabari Ideal	-	31792	31792	105877	530	32388	32918
Shapla Chattar	-	26769	26769	15347	396	25508	25904
Paltan	-	26565	26565	6876	2.00E-01	27630	27630
Dholpur	2771	18691	21463	111176	2465	18117	20582
West Panthapath	759	19180	19939	2815	813	17580	18393
Meradia	-	18134	18134	178	-	17364	17364
Sign Board_NG	14328	3123	17451	16638	17052	2913	19965
Rajmoni hall	17000	379	17379	651	16031	379	16410

However, the complete status of BRT, MRT and existing bus routes need to be studied. According to Figure 36, transit passenger distribution is high on Gazipur Chourasta, Hemayetpur, Tongi, Abdullahpur, Housebuilding, Airport, Mirpur-10, Shapla Chattar, Jatrabari and so on.

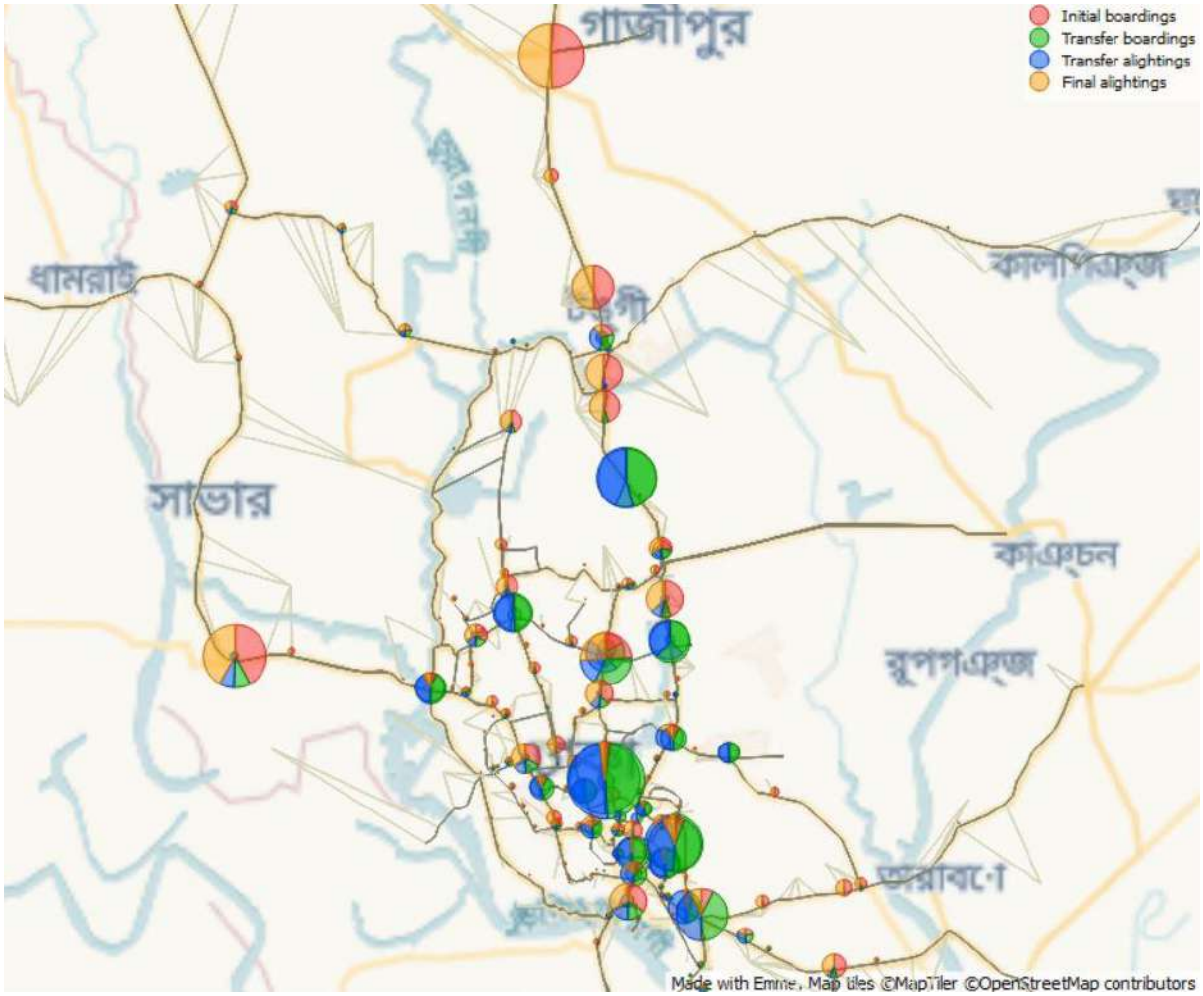


Figure 36: Distribution of Passengers in BRT, MRT and Existing Bus stops for Peak Period of Year 2035 (Scenario 7: Existing Bus Routes, BRT Line 3 and MRT Line 1,5 and 6 only)

7.8. Scenario 8: Rationalized Bus Routes with MRT Line 1,5 and 6 and BRT Line 3

This is the last scenario and, on this scenario, the rationalized bus routes along with BRT and MRT network are considered. In this case, the operational characteristics of rationalized bus routes and MRT, BRT system are kept similar to scenario 6 and 7.

Following this, the distribution of transit traffic on rationalized bus routes along with BRT and MRT system is discussed here. According to Figure 37, the transit traffic volume is high on Khilkhet to Abdullahpur corridor. Along with this, the volume is also high on Hemayetpur to Chittagong Road corridor. Apart from that, Banani to Zia Colony segment and extended till Keraniganj and Jamuna Future Park to Natun Bazar segment has high transit volume.

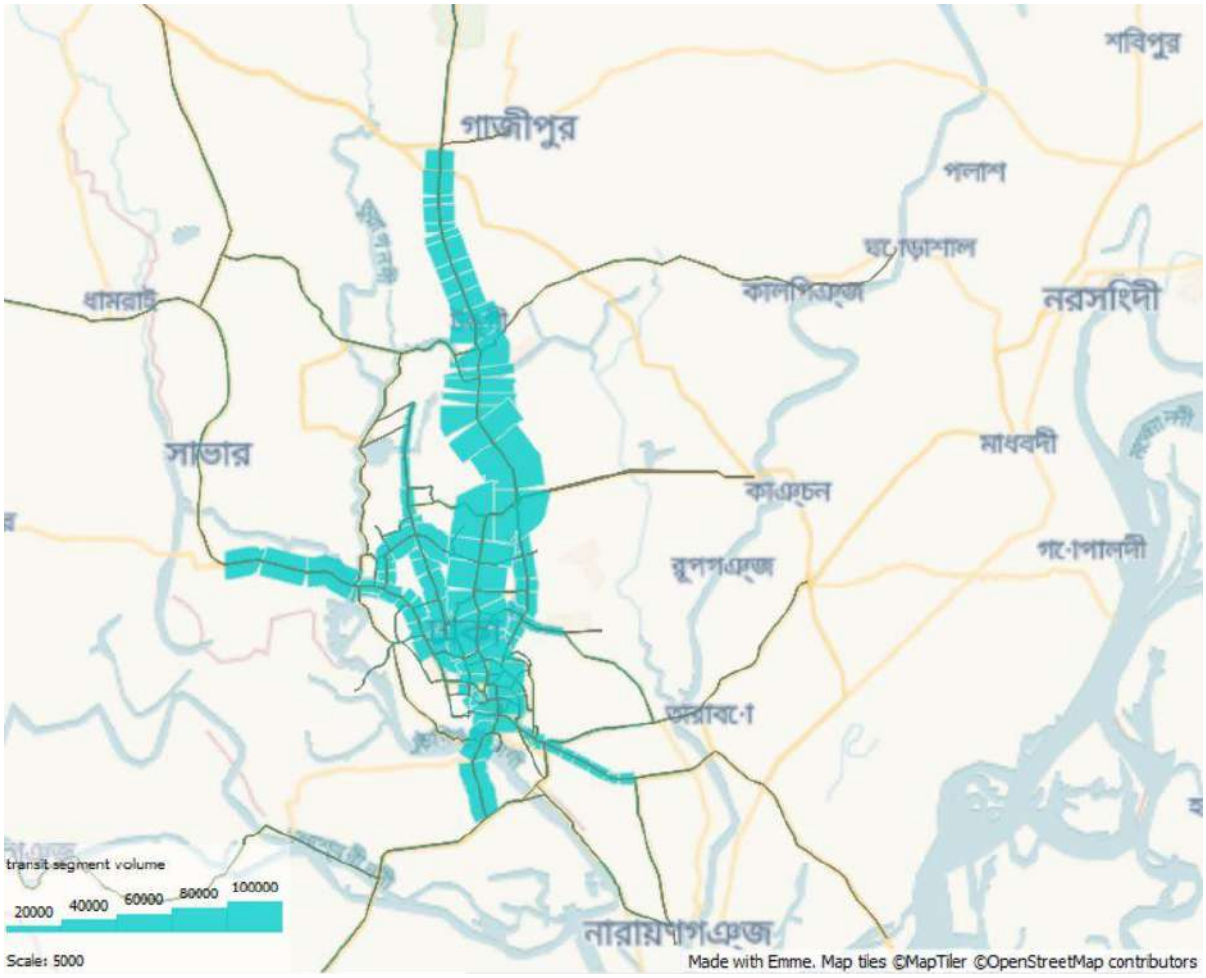


Figure 37:Segment wise transit volume for rationalized bus routes and MRT line 1,5, 6 and BRT line 3 in 2035 peak period (Scenario 8)

In this phase, a detailed analysis of the transit traffic volume on BRT Line 3 corridor is provided. According to the Table 96, high volume of transit traffic on BRT Line 3 could be found on Tongi to Airport segment in both northbound and southbound direction which is similar to scenario 7 and on this segment the volume of auxiliary transit is zero. However, the value of average load factors is more than 85. It means that the corridor always remains busy.

Although there are parallel bus routes on this corridor, the transit traffic volume remains high on Airport to Tongi segment.

From Airport towards south there are MRT lines, and the transit traffic remains high on those corridors.

Table 96:Distribution of transit volume on different segments of BRT Line 3 on 2035 peak period (Scenario 8)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Azampur	Housebuilding	0.7	B	1	20	1000	1300	127103	97.77	0
Jashimuddin	Azampur	0.79	B	1	20	1000	1300	127103	97.77	0
Airport	Jashimuddin	1.32	B	1	20	1000	1300	127103	97.77	0
Housebuilding	Azampur	0.7	B	1	20	1000	1300	122154	93.96	0
Azampur	Jashimuddin	0.79	B	1	20	1000	1300	122154	93.96	0
Jashimuddin	Airport	1.32	B	1	20	1000	1300	122154	93.96	0
Housebuilding	Abdullahpur	0.74	B	1	20	1000	1300	117688	90.53	0
Abdullahpur	Tongi	0.5	B	1	20	1000	1300	116695	89.77	0
Abdullahpur	Housebuilding	0.74	B	1	20	1000	1300	113878	87.6	0
Tongi	Abdullahpur	0.5	B	1	20	1000	1300	113396	87.23	0

Table 97:Distribution of transit volume on different segments of MRT Line 1,5,6 on 2035 peak period (Scenario 8)

From	To	Corresponding MRT Line	Length	Modes	No. lines	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Kawran Bazar	West Panthapath	5_S	1.63	M	1	1371	1714	62024	36.18	0
Hatirjheel Mor	Kawran Bazar	5_S	0.88	M	1	1371	1714	61156	35.67	0
West Panthapath	Kawran Bazar	5_S	1.63	M	1	1371	1714	57717	33.67	0
Kawran Bazar	Hatirjheel Mor	5_S	0.88	M	1	1371	1714	56980	33.24	0
West Panthapath	Asad Gate	5_S	1.13	M	1	1371	1714	55657	32.47	0
Gabtoli	Amin Bazar	5_N	0.25	M	1	1371	1714	52854	30.83	0
Amin Bazar	Gabtoli	5_N	0.25	M	1	1371	1714	52737	30.76	0
Asad Gate	West Panthapath	5_S	1.13	M	1	1371	1714	52284	30.5	0
Baliarpur	Bilamalia	5_N	2.32	M	1	1371	1714	50711	29.58	0
Bilamalia	Amin Bazar	5_N	2.69	M	1	1371	1714	50711	29.58	0

According to the Table 97, the highest volume of transit traffic is noticed on the MRT 5 north and south corridor. It is because these are the only lines which are aligned in an east-west direction in Dhaka. Although the bus routes are rationalized still there is only one east west oriented bus

route which is route-6, except that rest of the routes are north-south oriented However, on these segments the volume of auxiliary transit is zero. Along with this, the average load factor values on these segments are above 25. It means that these segments also remain overly crowded.

In the BRT system, the difference between, access fare for Bus service and BRT is zero and very less for segment fare, it means that, the transfer penalty values are very less, whereas it is high for MRT. In case of taking transfer from Bus to MRT one has to pay two times higher access fare considering bus and the segment fare is also high.

However, considering the modified travel demand matrix, both lists showing top 10 BRT and MRT stops, based upon transit traffic remained same as previous ones but the volume got increased and these are shown into Table 98 and Table 99.

Table 98: Distribution of transit traffic on BRT corridor considering modified travel demand matrix for scenario 8

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Azampur	House Building	0.7	B	1	20	1000	1300	137354	105.66	0
Jashimuddin	Azampur	0.79	B	1	20	1000	1300	137354	105.66	0
Airport	Jashimuddin	1.32	B	1	20	1000	1300	137354	105.66	0
House Building	Azampur	0.7	B	1	20	1000	1300	132352	101.81	0
Azampur	Jashimuddin	0.79	B	1	20	1000	1300	132352	101.81	0
Jashimuddin	Airport	1.32	B	1	20	1000	1300	132352	101.81	0
House Building	Abdullahpur	0.74	B	1	20	1000	1300	127212	97.85	0
Abdullahpur	Tongi	0.5	B	1	20	1000	1300	125680	96.68	0

Abdullahpur	House Building	0.74	B	1	20	1000	1300	123457	94.97	0
Tongi	Abdullahpur	0.5	B	1	20	1000	1300	122984	94.6	0

Table 99: Distribution of transit traffic on MRT corridor considering modified travel demand matrix for scenario 8

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Kawran Bazaar	West Panthapath	1.63	M	1	17.1	1371	1714	67823	39.56	0
Hatirjheel mor(kw.b)	Kawran Bazaar	0.88	M	1	17.1	1371	1714	67142	39.17	0
West Panthapath	Kawran Bazaar	1.63	M	1	17.1	1371	1714	62301	36.34	0
Kawran Bazaar	Hatirjheel mor(kw.b)	0.88	M	1	17.1	1371	1714	61378	35.8	0
West Panthapath	Asad Gate	1.13	M	1	17.1	1371	1714	61153	35.67	0
Amin Bazaar	Gabtoli	0.25	M	1	17.1	1371	1714	58740	34.27	0
Asad Gate	West Panthapath	1.13	M	1	17.1	1371	1714	56951	33.22	0
Gabtoli	Amin Bazaar	0.25	M	1	17.1	1371	1714	56917	33.2	0
Hemayetpur	Baliarpur	2.32	M	1	17.1	1371	1714	55074	32.13	0
Baliarpur	Bilamalia	2.69	M	1	17.1	1371	1714	55074	32.13	0

Table 100:Distribution of traffic volume on different segments of rationalized bus routes on 2035 peak period (Scenario 8)

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Dholpur	Jatrabari	0.53	cbPN	14	84	2940	4200	26740	6.37	18862
Janapath mor	Dholpur	0.16	cbPN	13	78	2730	3900	26119	6.7	18868
Jatrabari	Dholpur	0.53	cbPN	14	84	2940	4200	25250	6.01	19518
Dholpur	Janapath mor	0.16	cbPN	13	78	2730	3900	23930	6.14	21037

Jatrabari	Kazla	1.1	cbPN	8	48	1680	2400	22478	9.37	6456
Kazla	Shonir Akhra	0.65	cbPN	8	48	1680	2400	22478	9.37	3312
Saddam Market	Signboard	0.79	cbPN	10	60	2100	3000	22123	7.37	2226
Rayerbag	Matuail	1.04	cbPN	8	48	1680	2400	21021	8.76	3312
Matuail	Saddam Market	0.69	cbPN	8	48	1680	2400	21021	8.76	3312
Shonir Akhra	Rayerbag	0.91	cbPN	8	48	1680	2400	20835	8.68	3312

According to the Table 100, the highest value of transit traffic volume is found on Dholpur to Jatrabari segment, and on this segment the volume of auxiliary transit is about 19000. However, it is important to note that all the segments which have high transit traffic considering bus routes are out of the BRT and MRT corridors and all of them are concentrated on the south Dhaka. On each segment the number of overlapped bus routes ranges between 8-15, when the number of overlapping bus routes increases, the value of average load factor decreases. In this case, the list of top 10 segments ranked considering transit traffic got changed than previous one, while considering the modified travel demand matrix. In all the segments the transit traffic increased.

Table 101: Distribution of transit traffic on rationalized bus route network considering modified travel demand matrix for scenario 8

From	To	Length	Modes	No. lines	No.vehicles	Seated capacity	Total capacity	Volume	Avrg. Load	Aux. volume
Jatrabari Ideal	Jatrabari	0.53	cbPN	14	84	2940	4200	27906	6.64	15699
Atish Dipankar Road	Jatrabari Ideal	0.16	cbPN	13	78	2730	3900	27345	7.01	15699
Jatrabari	Jatrabari Ideal	0.53	cbPN	14	84	2940	4200	26377	6.28	21109
Jatrabari Ideal	Atish Dipankar Road	0.16	cbPN	13	78	2730	3900	23265	5.97	23933
Sign Board_NG	Saddam Market	0.79	cbPN	10	60	2100	3000	18654	6.22	5428
Swamibag	Rajdhani market	0.17	cbPN	9	54	1890	2700	17897	6.63	29309
Jatrabari Ideal	Saidabad	0.51	cbPN	9	54	1890	2700	17897	6.63	29729
Matuail	Rayerbag	1.04	cbPN	8	48	1680	2400	17878	7.45	6173
Saddam Market	Matuail	0.69	cbPN	8	48	1680	2400	17878	7.45	6173
Kazla	Jatrabari	1.1	cbPN	8	48	1680	2400	17770	7.4	12593

In this phase, it is necessary to analyze the distribution of passenger traffic on different MRT, BRT and bus stops.

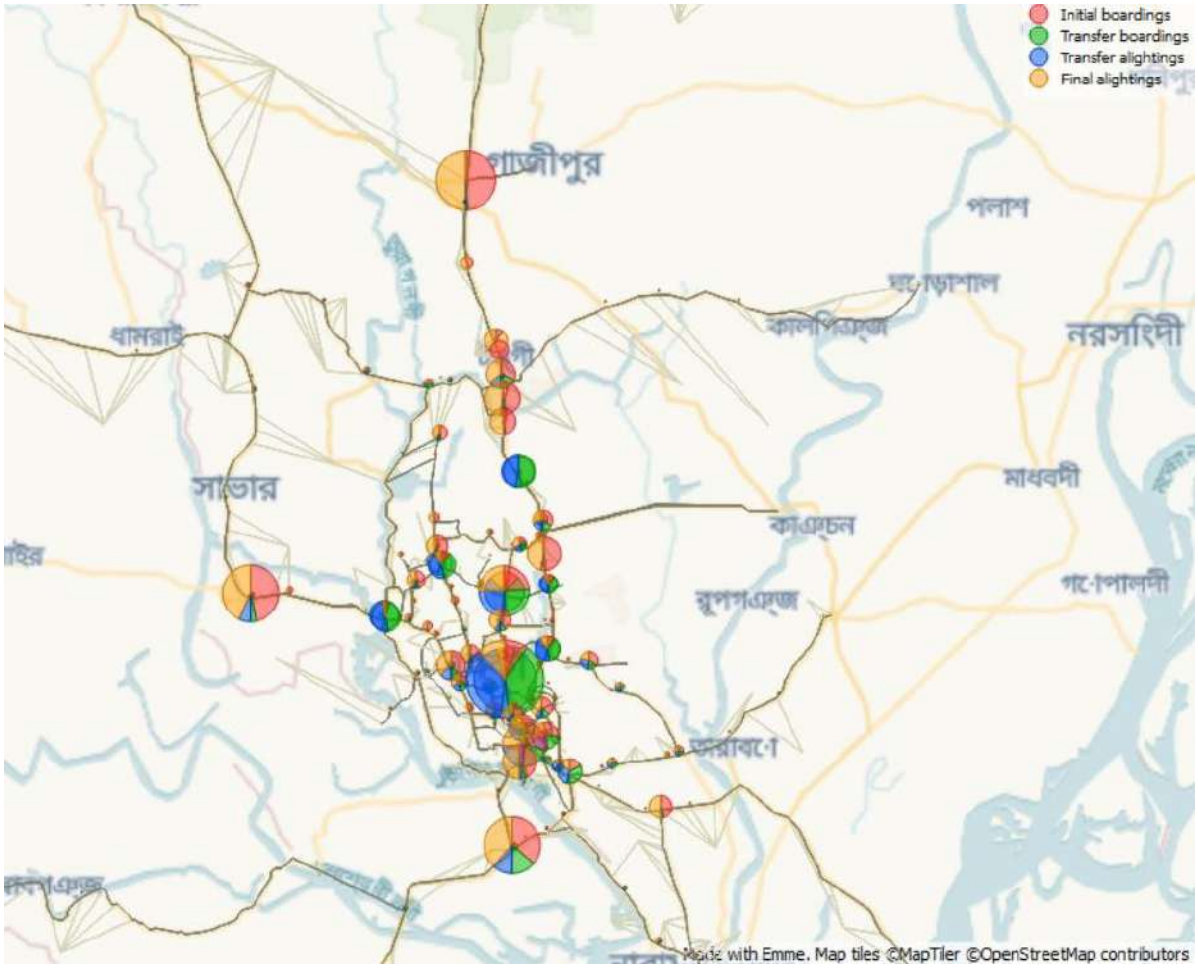


Figure 38:Distribution of passengers in BRT, MRT and rationalized bus stops for peak period of 2035 (Scenario 8)

According to the Figure 38, the transit passenger distribution is high on Gazipur Chousrasta, Hemayetpur, Abdullahpur, Airport, Keraniganj, Hatirjheel, Banani, Mirpur-10, Gabtoli and so on. In this case, all the rationalized bus routes, BRT and MRT system has been considered all together. According to the Table 102, the highest transit traffic could be found on to Hatirjheel BRT stop which is similar to the scenario 7 and in this case, the transfer traffic is higher than the initial boarding and alighting. In Gazipur Chourasta South and Keraniganj stops the value of through traffic is zero, as most people would get down and can take auxiliary transit for further travel. But in College Gate the alighting value is zero, whereas the boarding value is about 30,000 and the number of through passenger is more than 100000.

Table 102:Top 10 stops on BRT 3 corridor following total number of transit boarding passenger (Scenario 8)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel Mor	12237	49164	61401	124312	15275	50733	66008
Gp Chourasta South	48024	526	48550	-	48643	535	49179
Keraniganj	33581	12931	46512	-	35320	10776	46097
Banani	20157	21491	41647	166391	20937	20613	41550
Fulbaria	21246	15258	36504	125138	19274	15495	34769
College Gate	29339	-	29339	141349	-	-	-
Tongi	28750	577	29326	180982	27721	923	28645
Airport	179	28791	28970	194257	-	26029	26029
Naya Bazar	23941	2262	26204	91560	27113	948	28061
Mill gate	15343	9024	24367	156177	17138	6672	23810

However, in the Airport the final alighting passenger number is zero, but the transfer alighting passenger number is more than 25000. However, while the modified travel matrix is used, the list of top 10 BRT stops remained almost same, only one new stop named Kadamtali got included in the list.

Table 103: Distribution of passenger traffic on BRT corridor considering modified travel demand matrix for scenario 8

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel mor(kw.b)	13844	53198	67041	134468	16573	56028	72601
GP Chourasta South	52024	552	52576	-	52844	404	53248
Kadamtali	40304	10382	50686	-	42893	11793	54686
Banani	21822	23474	45297	179868	22731	22816	45547
Fulbaria	25147	14666	39813	140073	20575	15236	35811
Tongi	31037	792	31829	195858	29934	612	30545
Airport	184	31540	31724	209592	-	28390	28390
College Gate (T)	31682	-	31682	152655	-	4.00E-03	4.00E-03
Naya Bazaar	26024	2253	28278	104924	28364	1754	30118
Mill gate	19116	8263	27379	167959	20911	5557	26468

In this phase, the distribution of passengers in MRT Stops needs to be analyzed.

Table 104:Top 10 stops on MRT 1,5,6 corridor following total number of transit boarding passenger (Scenario 8)

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Gabtoli	5135	47745	52880	29112	4681	44501	49183
Hemayetpur	43166	3018	46184	-	40190	6163	46354
Banani	8062	24385	32447	26075	8069	25380	33449
Jamuna Future Park	29525	14	29539	40787	26085	1	26086
Asad Gate	18374	5113	23487	70012	17266	6180	23446
Airport	-	23461	23461	-	-	26365	26365
Shapla Chattar	11019	10129	21148	-	12694	11481	24174
Rampura Bridge	4576	16328	20904	45144	4073	14611	18685
Mirpur 10	4619	16266	20885	63306	3864	19555	23419
Mirpur 11	16508	1810	18318	42013	13947	1955	15902

According to the

Table *104*, the highest value of transit traffic could be found on the Gabtoli MRT stop. On this stop the number of transfer traffic is higher than initial and final boarding-alighting. Similar to the Banani BRT stop the MRT stop has high transit traffic, although here the transfer traffic is more than initial and final boarding-alighting. In this case, there is chance that, people can take transfer from MRT to BRT in Banani.

Considering the network, Banani, Airport, these are two points where BRT, MRT and bus routes all are available. Moreover, considering the modified travel demand matrix, the distribution of transit traffic on top 10 ranked MRT stops remained almost same, although two new stops got included, which are, Hatirjheel and Notun Bazaar.

Table 105: Distribution of passenger traffic on top 10 MRT stops considering modified travel demand matrix for scenario 8

Node	Boarding			Passing Through	Alighting		
	Initial	Transfer	Total		Final	Transfer	Total
Hatirjheel mor(kw.b)	5424	52465	57890	31385	4818	48187	53005
Hemayetpur	46539	3638	50177	-	44401	5487	49889
Banani	8604	26423	35027	28086	8683	27106	35789

JFP	31995	19	32014	44561	28770	1	28771
Gabtoli	1034	25176	26210	67855	950	23412	24363
Asad Gate	20223	5902	26126	76452	16814	8828	25642
Airport	-	25525	25525	-	-	28870	28870
Notun Bazar	1875	22373	24249	-	1657	25686	27343
Mirpur 10	3667	19218	22885	63417	3190	15369	18559
Shapla Chattar	12754	8899	21653	-	14715	10311	25026

Following this, the distribution of transit traffic at bus stops would be analyzed.

Table 106:Top 10 stops on rationalized bus routes following total number of transit boarding passenger (Scenario 8)

	Boarding			**Passing**	**Alighting**		
Node	**Initial**	**Transfer**	**Total**	**Through**	**Final**	**Transfer**	**Total**
Jatrabari	7228	14570	21798	35485	5443	13940	19382
Signboard	16970	679	17649	4799	19121	676	19796
Janapath mor	2318	9875	12193	37642	1950	6078	8028
Paltan	844	8763	9607	6895	1204	8939	10143
Shahbag	5588	3715	9304	9683	5880	5784	11665
Shapla Chattar	1354	7579	8933	16626	1983	9640	11623
Matuail Madrasa	3949	4816	8765	1583	3646	4514	8160
Dhour	4001	4522	8523	3327	2623	2966	5589
Saidabad	1987	6177	8164	36547	761	3013	3774
Staff Quarter	4461	2900	7361	1345	4497	2596	7094

According to the above table, most of the bus stops having high transit traffic are out of BRT and MRT corridors and all of them are in south Dhaka.

Considering the overall distribution, it seems that, in north Dhaka Airport to Abdullahpur corridor and Jamuna Future Park to Natun Bazar Corridor remains busy. However, unlike scenario 7, the list of top 10 bus stops remained same while considering the modified travel demand matrix, although 4 new stops named Atish Dipankar Road, Madrasa Bazaar, Asad Gate, Keraniganj got included.

Table 107: Distribution of passenger traffic on rationalized bus stops considering modified travel demand matrix for scenario 8

Node	**Boarding**		**Alighting**

	Initial	Transfer	Total	Passing Through	Final	Transfer	Total
Sign Board_NG	16544	576	17120	4672	12525	471	12995
Atish Dipankar Road	1417	13969	15386	33908	2923	6788	9711
Jatrabari	5606	5513	11120	41679	4965	7882	12847
Shahbag	6306	3713	10019	9596	6689	4995	11684
Paltan	954	9007	9961	6571	1027	10392	11419
Madrasa Bazaar	2331	7140	9470	1609	5111	4833	9944
Asad Gate	1192	7523	8714	8122	1335	4736	6072
Dhour	6088	2366	8454	3291	2597	3254	5851
Shapla Chattar	1404	6757	8161	16482	1609	7942	9551
Keraniganj	1038	7120	8158	-	929	4912	5841

7.9. Comparison among Scenarios

Table 108: Distribution of transit traffic across 8 different scenarios following two different travel demand matrices

Scenario	Components	2035 Peak Hour Transit Travel Demand Matrix		2035 Peak Hour Transit Travel Demand Matrix considering Traffic Growth Rate	
		Total Transit Trips	Average Load Factor	Total Transit Trips	Average Load Factor
1	Existing Bus Routes	26,86,994	5.09	29,87,402	5.78
2	Rationalized Bus Routes	8,40,769	5.61	8,66,718	5.4
3	Existing Bus Routes with BRT	16,99,655	3.01	17,74,978	9.22
4	Rationalized Bus Routes with BRT	12,04,935	5.18	12,86,583	9.44
5	Existing Bus Routes with MRT	26,62,636	2.86	28,42,945	6.42
6	Rationalized Bus Routes with MRT	15,25,070	4.83	16,51,714	5.97
7	Existing Bus Routes with BRT and MRT	22,63,608	2.12	24,24,232	9.73
8	Rationalized Bus Routes with BRT and MRT	16,19,473	4.80	17,05,569	8.71

According to the Table 108, it is seen that, two different travel demand matrices are used and the value of transit traffic got increased in transit scenarios where existing bus routes are incorporated, whereas it is comparatively low on rationalized scenarios. It is caused as the number of overlapped bus routes is high on existing scenarios. In scenario 1, 3,5, and 7 existing bus route network is incorporated and along with this gradually BRT, MRT systems are incorporated. As any new transit system got introduced the transit traffic volume got reduced eventually and it happened in rationalized scenarios as well. It should be noted that rationalized bus route (Scenario 2) generates less than one third of trips than existing bus route which generates highest number of trips. But it may be because it covers less area than the existing bus routes.

In the case of average load factors, it seems that, for both existing and rationalized network scenarios the value of average load factor gets reduced with the addition of each transit facility. However, it is true when 2035 peak hour transit travel demand matrix is used, but when the modified one is used, the load factor value increased. Considering all the scenarios, the least congested scenario (least value of load factor) would be Scenario 7: Existing Bus Routes with BRT and MRT when the 2035 peak hour transit travel demand matrix is used, but the case gets opposite and turns into the most congested one, when the modified matrix is used.

Chapter 8: Major Findings and Policy Implications

Due to limitations in the infrastructure and operational strategy, public buses—the only form of mass transit available in Dhaka—are perceived as being ineffective. This was followed by the introduction of numerous new initiatives, including the rationalization of bus routes and the BRT and MRT services. Existing bus routes and other interventions would have impacts by the opening of every new intervention because they are linked to one another as part of a network. This study made an effort to determine this aspect of it. The study's key findings and policy implications are presented in this chapter.

8.1. Major Findings

- Existing public bus route network has more overlapping percentage within intra-network and inter -network than rationalized bus route network. Moreover, the network length of rationalized bus route network is less than existing one. It seems that the rationalized network has less coverage than the existing one.
- The average length of a single transit line in case of rationalized network is higher than existing bus route network. Apart from this, considering the coverage within the city extent rationalized bus routes cover more areas than existing bus route network.
- Additionally, it appears that the accessibility scenario may be enhanced in the later instance because the average stop spacing in the existing network is higher than the one that has been rationalized. However, in the rationalized bus route network, there are very few bus routes available in the east-west direction of Dhaka, much like the old network. It appears that in this instance, the issue of providing connectivity to the east-west route is also disregarded.
- The number of vehicles deployed on an existing route is lower than the number of public buses deployed on an optimized route. The overall number of public buses operating in one corridor always remains relatively high, despite the high intra-overlapping ratio.
- In case of existing bus route network, the values of overlapping ratio with other transit systems such as BRT and MRT services are higher than rationalized network ones.

- The concentration of mixed and residential land use, along with industrial use around the BRT and MRT stops are higher than other categories of land uses. But in case of MRT 6 and MRT 1, the percentages of vacant lands are also high due to their alignment.
- The first scenario developed considering only existing bus routes (base scenario), and in this scenario the number of transit trips is the highest among all scenarios. Although when BRT Line 3 was included in the scenario the transit trip got reduced by 36.75 %. But while comparing BRT Line 3 and existing bus routes there is a significant difference between operational speed, although there is no transfer penalty and per km fare is lessened by BDT 0.45 in case of bus.
- In the scenario of existing bus routes with MRT line 1, 5 and 6; the trip number remains almost similar to the base one. Although the difference of operational speed, transfer penalty and per km fare is prominent in between MRT system and bus, still transit users prefer both MRT and bus in similar manner and it can be termed as best fit scenario, as the value of the load factor is about 2.12.
- With the existing bus route network when both BRT line 3 and MRT Line 1,5 and 6 are incorporated, the number of trips get lessened from base one by 15.76%. It seems that the existing bus route network with MRT system works as a better network while complementing each other.
- In the next scenario, the rationalized bus route network is considered. In comparison with existing bus route networks, the rationalized one gets 93% less trips, which happened due to the alignment plan of rationalized routes. In this rationalized network most of the bus routes have an average length of 29 km, whereas this value stands out to be 24.35 km for the existing network.
- While considering BRT network with rationalized bus routes it seems that, the transit trip number from rationalized base scenario increased by 43%, and with MRT it increased by 81%, and with both MRT and BRT the value increased by 93%. This means that, with the addition of each transit system intervention the rationalized network performs well but alone itself does not provide good service.
- According to the findings, it appears that although the current network has operational and functional limitations, it still serves the purpose better when considering fleet alignments and distribution. However, in the case of rationalization, it appeared during project review that no prior demand estimation was carried out. The route plans were made based on political and local ad hoc judgments without accurate demand calculations, therefore even if the number of routes decreased from the previous level,

there was no functional network structure formed. A well-structured demand analysis is required to understand the demand-supply gap and, using this information, the routes may have been reorganized.

- Along with this, a modified travel demand matrix has been used and it seems that, transit traffic in every corridor increased than before, although the distribution pattern remained similar.

8.2. Policy Implications

- While conducting this study, operational and network characteristics of bus routes, BRT and MRT are used for respective services, but it seemed that, these services do not consider each other during their planning phases. But these services need to be integrated to work as a connected network, in this case, it is required to have integrated operational planning while taking any initiative for development of transit services.
- It has been found out within this study that the rationalized network could not perform well as the planning was not done properly and there were lacking while considering the demand for transit. That is why it is recommended to carry out proper demand estimation study before preparing any route network plan.
- In case of setting up fare for any transit services, several factors are taken into consideration, and based on service provision quality the fare varies among different services, but there should be an integrated fare system and defined penalty fare for each service. Following this, it will be helpful while taking transfers from one service to another.
- Moreover, the fare integration system calls for a certain fixed setup, where one user can take rides of multiple transit services by using a single smart card, using which one user can pay for any transit service and take transfer to another easily. It is recommended that, while having service integration it is also required to work on a fare integration system as well.
- The operational integration among different transit services requires integration among services, following different aspects which are frequency, headway, speed, and operation hour etc. In this case, it is required to design operational parameters of one transit service considering these aspects of another service so that people travelling through different transit services can easily avail transfers from one mode to another.
- Although in case of BRT and MRT services before taking the initiative of development demand estimation within the corridor is done and it helped in fixing the operational

parameters of BRT and MRT. However, in both of the bus route networks both existing and rationalized, the demand estimates are not done perfectly. So, it is recommended to have a comprehensive demand estimation before network planning.

- However, while studying the network characteristics it has been found out that bus routes (both existing and rationalized) have crossings with both BRT and MRT corridors. Along with this, there are several places such as the Airport, Mirpur 10, Farmgate and so on, where bus stop, MRT and BRT stops are located. On these spaces, people will take transfer from one transit to another, and there should be ample amenities for supporting this activity. So, it is recommended to develop plans considering these spaces as transportation hubs.
- Apart from this, MRT and BRT services are getting developed within such area, where land use and structure development works are done long before and areas around certain transit stations are already developed. Along with this, there are also certain stations such as Uttara Centre, Uttara North and South where there was less development works (developed land use and structures). So, in these cases, areas within the accessible distance of the station should be developed following proper plans.
- The success of transit projects mostly depends on the ridership of the services, which can be achieved easily if the stations are well accessible. Access road connectivity along with availability of auxiliary transit modes should be good enough to serve this purpose. People coming from distant places can avail auxiliary modes, to reach transit stops and avail transit services to continue their journeys.
- Apart from this, mostly working people and students are the major users of transit services in this country, so the ridership remains high during starting and ending times of offices and educational institutes. So, considering this, the operation plan of transit services requires to be adjusted. So that it can serve the purpose fully.

Chapter 9: Conclusion

The effectiveness and efficiency of a city's transportation system has a significant impact on the quality of life for its residents. The crucial function of providing transportation for people from all social and economic backgrounds is carried out by public transportation. The public bus is a crucial component of the public transportation system that facilitates access to amenities, fosters social inclusion, and supports a city's performance. In Dhaka, the majority of people commute daily through public transportation because it is the only affordable option. Many people find the public bus service to be unsatisfactory due to a variety of issues, including lack of operational regulation, lack of responsibility in service delivery, lengthy wait times, rivalry among drivers for more passengers, lack of safety, poor driving, etc. Since the public transportation system does a terrible job of providing service, more and more people are becoming interested in driving, which poses a threat to the city's already serious traffic congestion and pollution issues. Considering all these issues, the government has planned to introduce initiatives such as BRT line 3 and MRT line 1, 5 and 6, along with this, the government has also tried to rationalize the exiting bus routes to make the entire transit network more functional and effective.

In this study, two transit networks comprised of a BRT, MRT system, an existing bus route network, and a rationalized network are compared. In total, eight scenarios are created taking this into account. In these cases, existing bus routes carry the greatest number of transit users compared to other networks; but, with the addition of MRT, the number of transit trips stays almost the same. However, the ridership value declines by a very small amount with the addition of BRT to this network, but the load factor value increases, which suggests that traffic congestion gets low, and people can move more effectively. However, based on the rationalized network, it appears that the bus route network has a relatively low ridership volume. The addition of MRT and BRT boosts ridership and reduces congestion, but the total network efficiency is lower than the present one. Thus, the network's rationalization would prevent it from achieving the hoped-for ridership attainment objective.

During project evaluation, it became apparent that no prior demand estimation has been done in the instance of rationalization. Even though there were fewer routes than before, there was no functioning network structure since the route planning was based on political and local ad hoc judgments rather than realistic demand predictions. To comprehend the demand-supply

gap, a well-structured demand analysis is necessary, and armed with this knowledge, the routes may have been rearranged. Otherwise, efforts made to meet people's needs for mobility would not be successful and would not be able to achieve their intended results.

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Annexure A: List of Existing Bus Routes

Greater Dhaka Sustainable Urban Transport Project (GDSUTP)

Package 3: Operational Design and Business Model (ODBM)

List of Official Bus & Mini Bus Routes within Dhaka City(Updated on 25-09-2014)

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
01	A-101	1	Kalsi Mirpur-12	Signboard	Shikar Paribahan/ Individual Operator	110	7	103	110	5	3/4	5Am-10Pm
02	A-102	1A	Pallabi (Mirpur-12)	Sadargat	Mirpur United Service	37	6	31	37	5	4/5	6Am-12Pm
					United Service	3	3	0	3	5	4/5	6Am-10Pm
03	A-103	1B	Pallabi (BDR Shopping Counter)	Jatrabari	Silk City Service	20	3	15	18	5	3/4	6Am-10Pm
04	A-104	1C	Pallabi (Mirpur-12)	Bangabandhu Avenue	Pallabi Super Local Service /Different operator	93	3	65	68	8	4	6Am-11Pm
05	A-105	1D	Pallabi(Duari para)	Dhakeshswari Mandir.	Saftey Enterprise	33	23	0	23	10	4	6Am-11Pm
06	A-106	1E	Pallabi (Mirpur -12)	Narayngang Link Road	Bikalpa Paribon.	48	10	37	47	15	2/3	7Am-9Pm
07	A-107	1F	Pallabi (Ceramic)	Jatrabari	Bikalpa City Super Service	26	25	0	25	5	3/4	6Am- 9 Pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
08	A-108	1G	Pallabi (Duaripara)	Kamalapur	Route Cancelled	20	0	0	0			
09	A-109	1H	Pallabi (Duaripara)	Demra Ghat	Best Transport	25	14	11	25	20	2/3	7Am-9Pm
					71 Paribahan Ltd.	20	0	0	0			
10	A-110	1I	Pallabi (Duaripara)	Gulistan	Ashirbad Paribahan pvt. Ltd	20	20	0	20	10	4/5	6Am-11Pm
11	A-111	1J	Pallabi (Cerimic	Notordam Collage.	Bikalpa Auto Service	36	10	26	36	15	4/5	6Am-11Pm
12	A-112	1K	Pallabi (Mirpur-12)	Zeropoint	Individual Operators	40	5	1	6	10	4/5	6Am- 11Pm
13	A-113	1L	Pallabi (BDR Shopping)	Jatrabari	Shikar Paribahan/ Individual Operators	40	11	26	37	5	5	6Am- 10Pm
14	A-114	1N	Mirpur(Chiria khana)	Saidabad	The New vision pvt./	29	20	0	20			Closed
					Ciriakhana Express/ Individual Operators	111	0	91	91			
15	A-115	1 O	Mirpur -1(Baishakhi Super Market)	Jatrabari	Trans Silva (BD) Ltd.	30	0	30	30	5	2/3	6Am- 11Pm
16	A-116	1P	Kamalapur	Pallabi (Mirpur-12)	Modomoti Foundation Ltd.	26	13	0	13	15	3/4	7Am-9Pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
17	A-117	1Q	Pallabi (Duaripara)	Postgola Bridge	Pubali Paribahon	18	18	0	18	15	2/3	7Am-9Pm
					Moon Transline Ltd.	22	0	0	0			
18	A-118	1R	Duaripara	Dhakeshari	Bihanga Paribahan	15	3	5	8	20	3/4	7Am-9Pm
19	A-119	1S	Duaripara	Victoria Park	Bihanga Paribahon	25	12	12	24	10	4/5	5Am- 11Pm
20	A-120	1T	Kulsi(Mirpur-11)	Motijheel (Shaplachattar)	Eratan Paribahan	30	10	0	10	10	3	6Am- 10Pm
21	A-121	1U	Pallabi	Motijheel	Al-Jajira Associates Ltd.	30	0	0	0			Closed
22	A-122	1V	Pallabi	Dhakarshari Mandir	Mirpur Super Link Ltd.	50	5	19	24	20	3/4	7Am-9Pm
23	A-123	1W	Mirpur-12	Motijheel	Hazi Transport	28	28	0	28	10	3/4	6Am-10Pm
24	A-124	1X	Mirpur-12 (Ceramic)	Signboard	Choice Transport Ltd	4	0	4	4	10	3/4	6Am-10Pm
25	A-125	1Y	Kulsi	Fulbaria Bus Stand	ETC Transport Transport	10	3	7	10			

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
26	A-126	2	Mirpur Chiriakhana Road	Kamalapur Pirjangi Mazar	Shakalpa Paribahan	30	25	0	25	10	3/4	6Am- 10Pm
27	A-127	2A	Mirpur Mazar Road	Azimpur	Metrolink	30	0	28	28	10	5/6	6Am- 10Pm
28	A-128	2B	Azimpur	Mirpur Mazar Road	Metrolink	15	0	7	7			6Am- 10Pm
29	A-129	2C	Mirpur-14	Khilgaon Taltala	Bahan Paribahan Ltd.	44	40	0	40	15	2/3	7Am-9Pm
30	A-130	2D	Mirpur(Diabari Bat Tala)	Jatrabari	Al-Jami(Pvt) Ltd.	20	15	0	15	15	3/4	6Am-9pm
31	A-131	2E	Mirpur Chiriakhana	Sadargat	Tanjin Paribahon	25	0	15	15	5	4/5	6Am- 7Pm
32	A-132	3	Abdullapur (House Building)	Fulbaria	Metro Classic Paribahan Ltd/. Individual Opearators	225	24	215	239	10	3/4	7 am - 9 pm
33	A-133	3A	Palashi	Uttara (Baniajuri)	Suchana Associates	100	43	0	43	10	3/4	7 am - 9 pm
34	A-134	3B	Tongi Bridge	Demra Crossing	Eleven Gold Transport	20	16	0	16	10	2/3	6 am - 8 pm
					Jatrabari Paribahan	10	4	6	10	10	2/3	6 am - 8 pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
					Individual Operator	170	0	134	134	10	2/3	6 am - 8 pm
35	A-135	3C	Azimpur	Kuril	Winner Transport.	30	19	0	19	20	6/7	7Am-9Pm
36	A-136	3D	Dhaor	Sayedabad	New Desh Bangla Transport Ltd	20	0	0	0			
37	A-137	4	Balugat	Sayedabad	Alike Transport	30	13	15	28	10	4/5	6Am-11Pm
38	A-138	4A	Uttara (Raniganj)	Sadar Ghat	Individual Operator	185	23	145	168	10	2/3	6 am - 9 pm
39	A-139	4B	Uttara	Kamalapur	Sino Dipan	28	21	0	21	5	3/4	6 am - 8 pm
40	A-140	4C	Uttara	Motijheel (A/C Bus Service)	Jaguar Transport	20	0	0	0			
41	A-141	5	Bonoshri	Motijheel Shapla Chattar	Alif Enterprise	25	0	0	0			
42	A-142	6	Pirjangi Mazar	Natun Bazar,	Gulshan Express/Motijheel Banani Transport Co. Ltd	46	26	20	46	5	4/5	6Am-10Pm
43	A-143	6A	Pirjangi Mazar	Natun Bazar,	Various Operator	36	33	3	36	5	5/6	6Am-10Pm
44	A-144	6C	Motijheel	Abdullahpur	Ababil	38	0	36	36	10	3	6 am - 9 pm
45	A-145	7	Gabtali	Vicktoria Park	Various Operator	115	4	85	89	10	3	5.30Am-10Pm
46	A-146	7A	EPZ	New Airport	Discovery Transport.	26	10	13	23	15	4/5	7 am - 9 pm
					Various	9	0	9	9			

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
					Operator							
47	A-147	7B	Gabtali	Azimpur		50	0	0	0			7 am - 9 pm
48	A-148	7C	Gabtali	Banashari	Midway Link PVT Ltd.	25	6	0	6	20	3/4	7 am - 9 pm
49	A-149	7D	Gabtali	Sayedabad	Ekusha Paribahan	50	44	0	44			Closed
50	A-150	7E	Savar	Dhaur	Various Operator	50	0	0	0			
51	A-151	7F	Gabtali	Abdullapur	Rupkhata Ltd.	30	8	0	8			
52	A-152	8	Vashan take	Katchpur Bridge	Various Operator	80	6	66	72	15	2/3	7 am - 9 pm
53	A-153	8A	Vashan take	Khilgaon Taltala	Myline Ltd.	49	48	0	48	15	3/4	7 am - 9 pm
54	A-154	8B	Mirpur(14)	Signboard	Shatabdi Paribahan Ltd.	37	29	0	29	10/15	5	6Am-10Pm
55	A-155	9	Nikunza	Kamlapur	Modumoti Ltd	20	19	0	19	15	3	7Am-7.30Pm
56	A-156	10A	Mohakhali	Motijheel Shaplachattar)	Dibanishi Paribahan	15	15	0	15	10	5/6	6Am-8.30Pm
57	A-157	11	Bonoshri	Mohammadpur	Taranga Plus	20	20	0	20	15	4/5	6.30Am-8.30Pm
58	A-158	12	Mohammad pur(Satmasjid)	Naraynganj Linkroad	ATCL	76	8	59	67	10	2/3	7Am-8Pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
59	A-159	12A	Mohammad pur (Bus Stand)	Naraynganj Linkroad	Various Operator	40	0	11	11	10	2/3	7Am-8Pm
60	A-160	12B	Mohammad pur(Japan garden City)	Postagola	Rang Dhanu Paribahan	22	21	0	21	15	3	7.30Am-8.30Pm
61	A-161	12C	Mohammad pur (Bus Stand)	Dhupkhola	Malancha Transport/	46	19	0	19	20	3	7.30Am-8.30Pm
					Various Operator		0	24	24			
62	A-162	12F	Mohammadpur (Sia Masjid)	Rayerbag	Rajdani Express	29	6	19	25	15	3/4	7Am-9Pm
63	A-163	12G	Mohammadpur (Taj Mahal Road)	Kamlapur	Megacity Service	30	30	0	30	10	5	6Am-11Pm
64	A-164	12H	Shaymoli	Kallaynpur	Metropolitan Bus Service.	20	20	0	20	5	3	6Am-10.30Pm
65	A-165	12I	Mohammadpur (Geneva Camp)	Uttara (Baliajuri)	Megacity Passenger Service Ltd.	27	20	0	20	20	4/5	7Am-9Pm
66	A-166	12J	Mohammadpur (Bus Stand)	Uttara House Building	Tarango Bus Co Ltd	20	19	0	19	20	4/5	7Am-9Pm
67	A-167	12K	Dhopkhola	Mirpur-14	Nisharga Paribahan	20	18	0	18	20	3/4	6.30Am-8.30Pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
68	A-168	13	Postagola	Azimpur		20	0	0	0			
69	A-169	13A	Postagola	Abdullahpur	Shakti Paribahan	25	0	0	0			
70	A-170	13B	Loharpul	Gulshan-2		30	0	0	0			
71	A-171	14	Khilgaon Taltala	Mohammadpur(adabar)	Midway Paribahan	30	25	0	25	20	4/5	7Am-9Pm
72	A-172	15	Signboard	Tongi Bridge	Jhalak paribahan	20	8	0	8	20	2/3	7Am-9Pm
73	A-173	16	Babubazar Bridge	Dhaor Bridge	Prochesta Paribahan	15	15	0	15	20	2/3	7Am-9Pm
					Mawa Paribahan	15	0	0	0			
74	A-174	17	Victoria park	Pragoti Shawrani	AB Brothers	20	14	0	14	15	2/3	7Am-9Pm
75	A-175	18A	Azimpur	Kuril	Diph Bangla Paribahan Ltd	20	0	0	0	20	4/5	7Am-9Pm
76	A-176	19	Mirpur -12	Dhakshari Mondir	Druti Service Ltd.	50	0	11	11	10	2/3	6 am - 8 pm
77	A-177	19A	Gabtali	Tongi Bridge	Belal Enterprise Ltd.	30	0	2	2	10	4	6 am - 8.30 pm
78	A-178	19B	Pallabi (Mirpur Section 12)	Abdullapur	Newdesh Bangla	20	20	0	20	15 m	4	6 am - 8 pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
					Kanak	20	15	0	15	20	4	6 am - 8 pm
79	A-179	19D	North Kulsi	Chandra	Titas Paribahan Ltd.	20	8	0	8	20	3/4	7 am -9 pm
80	A-180	19E	Pallabi(Mirpur-12)	Dhakeshari Mondir	Bikalpa City Super Service.	33	33	0	33	15	3/4	7 am -9 pm
81	A-181	19F	Saver	Badda	Baishakhi Paribahan Ltd.	20	19	0	19	20	2/3	6.30Am-8.30Pm
82	A-182	19G	Mohammadpur-12 Bus stand	Nandan Park	Alif Enterprise	20	17	0	17	20	2/3	6Am-8Pm
83	A-183	19H	Vashan Teke	Chandra	Shah Ali Paribahan Ltd.	20	0	0	0			
84	A-184	19I	Agargaon	Abdullapur	Jabala Nur Paribhan Ltd.	20	13	0	13			Closed
85	A-185	20	Duaripara	Babubazar Bridge	Jannat Paribahan	47	0	7	7			
86	A-186	20A	Ati Bazar (Keraniganj)	Sayedabad	M.Sinha International	20	0	0	0			
87	A-187	21	Mohd.Pur (Asad Avenue)	Naraynganj	Raj City/Metropolitan Bus-45/Lockwood-20	65	65	0	65	20	2/3	6Am-8Pm
88	A-188	21A	Hemayetpur	Dhalahsawri	Individual Operators	102	0	102	102	10	2/3	6Am-8.30Pm
89	A-189	21B	Hemayetpur	Link Road	Individual Operators	40	8	29	37	10	2/3	6Am-9Pm
90	A-190	22	Saver(EPZ)	Link Road	Individual Operators	124	16	106	122	10	2/3	6Am-9Pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
91	A-191	22A	Savar(EPZ)	Chittagong Road Road	Borak Development Ltd.	40	38	0	38	15	2/3	6Am-9Pm
92	A-192	22B	EPZ	Link Road	Labbaik Travels Pvt Ltd.	26	22	0	22	20	2/3	6Am-9Pm
93	A-193	23	Saver(EPZ)	Motijheel	Hanif Metro Service	21	20	0	20	10	3	6Am-9Pm
94	A-194	23A	Saver	Keranigonj	Hanif Metro Service	34	0	27	27	20	2/3	6Am-9Pm
95	A-195	23B	Keranigonj	Nandanpark (Chandra)	Central LineTransport Ltd.	30	24	0	24	20	2	6Am-8Pm
96	A-196	23C	Nandan Park	Manikmia Ave	Moshin Express	20	16	0	16	20	3/4	6Am-8Pm
97	A-197	24	Chandra	Motijheel	Hanif Metro service	55	51	0	51	10	3	6Am-9Pm
98	A-198	25	Dhamrai	Gulishtan (Gola p Shah Mazar)	Sino Dipan Transport Transport	20	19	0	19			Closed
99	A-199	25A	Dhamrai (Islampur)	Motijheel	Greenway City Service	30	26	0	26			Closed
100	A-200	25B	Dhamrai	Motijheel	Trans Millenium	25	25	0	25	20	3	6Am-8Pm
101	A-201	25C	Dhamrai(Dhulivita)	Motijheel	Great Wall Paribahan	25	25	0	25			Closed
102	A-202	25D	Savar	Banashri	Alif Enterprise	50	28	0	28	15	3/4	6Am-8Pm
103	A-203	26	Tongi (Board Bazar)	Postagola	Blue Bird Export Import Co. Ltd	50	30	0	30	10	3	6 am - 8 pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
104	A-204	26A	Gazipur (Board Bazar)	Kamalapur	Metro Classic	20	0	0	0			
105	A-205	26B	South Banashri	Vulta	Rim Zhim Paribahan (Pvt) Ltd.	20	0	0	0			
106	A-206	27	Tongi (Cherag Ali)	Sadar Ghat	Sky Line/ Individual Operator	35	0	30	30	10	2	5am - 11pm
107	A-207	27A	Tongi (Cherag Ali)	Dhakeshwari	Dul Dul/V.Opt	30	6	24	30	10	3	6 am - 8 pm
					VIP Automobile Ltd.	50	0	0	0			
108	A-208	27B	Gabtali	Gazipur National University	Dul Dul Paribahan Ltd.	38	29	0	29	10	3	6 am - 8 pm
109	A-209	27C	Tongi (Cherag Ali)	Motijheel	Individual Operator	30	0	17	17	5	3	6 am 10 pm
110	A-210	27D	Tongi (Cherag Ali)	Azimpur	Anik Paribahan	28	26	0	26	10	4	6 am - 8 pm
111	A-211	28B	Konabari	Kamalapur	Nagrik Paribahan	20	16	0	16	10	3	6 am - 8 pm
112	A-212	28C	Gazipur	Chiriakhana	Bengal Motors	30	22	0	22	15	3	7am - 10 pm
113	A-213	29	Fantassy Kingdom	Azimpur	Falgun,8	40	40	0	40	15	3	6 am - 8 pm
114	A-214	29A	Nandanpark	Kamalapur	Manjil Pvt. Ltd.	23	23	0	23	10	3	6.30 am -10 pm
115	A-215	29B	Kamalapur	Nandan Park	Rajdhani Super Service Ltd.	30	0	0	0			
116	A-216	30	Kaliakoir	Kamalapur	Manjil	20	14	0	14			Closed
					Belal Enterprise Ltd	20	19	0	19			

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
117	A-217	30A	Chandra	Loharphul	Rahbar/ Individual. Operators	100	7	78	85	10	2	6 am - 8 pm
118	A-218	30B	Kaliakoir	Motijheel		0	0	0	0			
119	A-219	31	Fulbaria	Kapasia	Provati Bansree Paribahan Ltd.	75	19	30	49	10	2	5 am- 11 pm
120	A-220	31A	Fulbaria	Shreepur (Barmi)	Provati Bansree Paribahan Ltd.	125	66	34	100	10	2	5 am- 11 pm
121	A-221	31B	Fulbaria	Kaliakoir	Provati Bansree Paribahan Ltd.	56	7	49	56	10	2	5 am- 11 pm
122	A-222	31C	Fulbaria	Gazipur	Gazipur paribahan/ Individual. Operator	244	14	212	226	10	2	5 am- 11 pm
123	A-223	31D	Sayedabad	Kaliganj	Individual. Operator	70	0	33	33	10	2	5 am- 11 pm
124	A-224	31E	Fulbaria	Manikganj	Individual. Operator	80	0	58	58	10	3	7Am-11Pm
125	A-225	32	Sayedabad	Gazipur	Balaka Links/ Balaka Service/ Individual. Operator	103	0	91	91	5	3	5Am -11 pm
126	A-226	32A	Sayedabad	Gazipur (Tok)	Dhaka Paribahan	50	0	50	50	20	2	7 am - 10 pm
127	A-227	32B	Sayedabad	Narayngonj	Setu Paribahan	70	34	20	54	10	3	7 am - 11 pm
128	A-228	32C	Sayedabad	Narayngonj	BorakParibahan	45	13	27	40	5	5	6Am-11Pm
129	A-229	32D	Sayedabad	Narayngonj	Individual. Operator	20	0	9	9	2	6	5.30Am-11.30Pm
130	A-230	32E	Adamjee	Sayedabad	Komal Mini Bus/Individual Operator.	87	0	10	10	15	4	7 am - 10 pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
131	A-231	31F	Motijheel(Ideal School)	Narayngonj		20	0	0	0			
132	A-232	33	Narayngonj	Sadargat	Jamjam Paribahan	30	1	9	10	4	4/5	7.30Am-9.30Pm
133	A-233	33A	Sayedabad	Konabari	Individual. Operators	21	17	2	19	5	3	6Am-10Pm
134	A-234	33B	Madangonj	Gulishtan	Shraban Transport	22	0	17	17	20	2/3	5Am-11Pm
135	A-235	33C	Sayedabad	Narayngonj	Individual. Operator	34	1	25	26	10	3	6Am-10Pm
136	A-236	33D	Sayedabad	Narayngonj	Utsab Paribahan,	40	29	0	29	10	3	6Am-10Pm
137	A-237	33E	Sayedabad	Narayngonj	Hemel Paribahan	20	0	20	20	10	3	6Am-10Pm
138	A-238	33F	Motijheel	Narayngonj	Ashian AC Bus Services	24	24	0	24	15	3	7Am-10Pm
139	A-239	33G	Narayngonj	Sayedabad	Rofrof Paribahan	50	6	0	6			
140	A-240	34	Kachpur Bridge	Tongi	Anabil Super/ Individual. Operator	60	12	46	58	10	2/3	6 am - 8 pm
141	A-241	34A	Motijheel	Gazipur	Dhaka Paribahan	23	20	0	20			Closed
142	A-242	34C	Dhupkhola	Zirani	Panjeri Paribahan	53	18	20	38	10	3/4	5.30Am -8pm
143	A-243	34D	Dhaleshwar	Tongi (Bastuhara)	Green/Turag Salsabeel/Anabeel	210	23	174	197	10	2/3	6 am - 8 pm
144	A-244	34E	Dhaleshwar	Cheragali		0	0	0	0			
145	A-245	34F	Madanpur	Abdullapur	Himalay Paribahan	47	10	30	40	15	3	6 am - 9 pm
146	A-246	35	Motijheel	Nandan Park	Manjil Paribahan	40	14	17	31	5	2/3	7 am - 9 pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
147	A-247	35A	Motijheel	Chandra	Ababil Paribahan	29	0	23	23			Closed
148	A-248	35C	Jatrabari	Mouchak (Gazipur)	Velcity Co. Ltd.	30	15	0	15	10	2	6 am - 9 pm
149	A-249	35C	Fulbaria	Khashieakhali Baribadh	N.Mallick Paribahan	10	10	0	10	30	3/4	6.30Am-7.30Pm
150	A-250	35E	Gazipur	Postgola	New Desh Bangla Transport Ltd.	20	0	0	0			
151	A-251	36	Kanchpur Bridge	Board Bazar	Tasiko Paribahan Ltd.	30	29	0	29	10	2/3	5.am - 7 pm
152	A-252	36A	Vulta (Tarabo)	Gulishtan	Meghla Transport	43	12	30	42	20	3/4	5.30Am-11Pm
153	A-253	36B	Mohd.Pur (Bus Stand)	Vulta (gaosia)	Meshkat Transport Co. Ltd./Various Operator	76	1	72	73	30	2/3	7Am-10Pm
154	A-254	36C	Demraghat	Konabari	Salsabil	35	33	0	33	15	3/4	6 am - 11 pm
155	A-255	36D	Sayedabad	Sonargaon (Meghnaghat)	Doul Ltd.	20	15	0	15			
156	A-256	36E	Chankharpul	Sonargaon (Baradi)	Shadesh Paribahan Co. Ltd.	25	16	0	16	30	2/3	7Am-9Pm
157	A-257	37A	Kanchpur Bridge	Board Bazar	Trans Silva (BD) Ltd	35	25	0	25	15	2/3	6 am - 7 pm
158	A-258	38	Chankharpul	Ghorashal Ferryghat	Kaliganj Transport	20	0	16	16	10	2/3	5.am - 8 pm
159	A-259	38A	Palashi	Meghnaghat	Borak Transport	50	15	35	50	20	2/3	7Am-9Pm

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours
160	A-260	38B	Fulbaria	Dhamrai	Dhamrai Link Ltd.	103	1	87	88	10	4/5	5Am-11Pm
					Grameen Sheba	37	3	9	12			
161	A-261	38C	Fulbaria	Zirani	Individual. Operator	50	0	10	10			Closed
162	A-262	38D	Meghnaghat	Kamalapur	Brodway Transport Ltd.	20	0	0	0			
163	A-263	39	Pallabi	Keranigonj	Mirpur Paribahain Service.	31	1	29	30	20	2/3	7Am-9Pm
164	A-264	39A	Mirpur Chiriakhana	Keranigonj	Dishari Paribahan	41	5	35	40	20	2/3	7Am-9Pm
165	A-265	40A	Jagganath University	Chandra	Glory Exclusive	30	16	0	16	10	2/3	6.30Am-8.30Pm
166	A-266	40B	Jagganath University	Chandra	Azmeri Transport	30	15	0	15	10	2/3	6.30Am-8.30Pm
167	A-267	-	Motijheel	House Building (AC Bus)	Uro Transport Ltd.	40	0	0	0			
168	A-268	-	Chiriakhana	Khilgaon Comunity Center	Himachal Enterprice Ltd.	30	17	0	17			
169	A-269	-	Gabtali Bus Terminal	Kamarpara	Kanak Paribahan	20	0	0	0			
					Pallabi Super Service	30	0	0	0			
					Jawad transport & Builders	15	0	0	0			
170	A-270	-	Mirpur -02	Kamarpara	Projapati Paribahan	70	50	0	0			

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours	
171	A-271	-	Gabtali	Gazipur	Basumoti	70	40	0	0	0			Newer
172	A-272	-	Mirpur-1	Kuril Bishwa Rd.	Jabala Nur Paribahan Ltd.	20	0	0	0	0			Newer
						30	0	0	0	0			Newer
173	A-273	-	Gabtali	Rampura	Rabrab Paribahan	40	0	0	0	0			Newer
						40	0	0	0	0			Newer
174	A-274	-	Savar	Abdullahpur	New Desh Bangla Transport Ltd.	10	0	0	0	0			Newer
175	A-275	-	Mirpur-1	Meradia Bazar	Galaxy Line	20	0	0	0	0			Newer
						20	0	0	0	0			Newer
176	A-276	-	Mirpur-12	Abdullahpur	Trust Transport Setvices	10	0	0	0	0			Newer
177	A-277	-	Zia Colony	Abdullahpur	Trust Transport Setvices	10	0	0	0	0			Newer
178	A-278	-	Mirpur-10	Kakoli	Trust Transport Setvices	10	0	0	0	0			Newer
179	A-279	-	Mirpur-12	Mohakhali DOHS	Trust Transport Setvices	10	0	0	0	0			Newer
180	A-280	-	Balughat	Motijheel	Trust Transport Setvices	10	0	0	0	0			Newer
181	A-281	-	Mirpur-12	Natun Bazar	Behanga Paribahan Ltd.	50	0	0	0	0			Newer
182	A-282	-	Mirpur-12	Kuril Bishwa Rd.	Everest Paribahan Ltd.	20	0	0	0	0			Newer
						20	0	0	0	0			Newer

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours	
183	A-283	-	Japan Garden City	Dhaor	Activ Paribahan Ltd.	40	30						Newer
184	A-284	-	Mirpur Rupnagar	Shanirakhra	Mirpur Mission Paribahan (Pvt.) Ltd.	30	30						Newer
185	A-285	-	Duaripara	Chunkutia (Karanigonj)	Everest Paribahan Ltd.	50	40						Newer
186	A-286	-	Atibazar	Khilgaon	New Estama Paribahan Pvt. Ltd.	30	25						Newer
187	A-287	-	Mirpur-14	Zirani Bazar	Nur a Modina Paribahan Ltd.	30	30						Newer
188	A-288	-	Mirpur-12	Narayngonj	Himachal Enterprice Ltd.	40	30						Newer
189	A-289	-	Mirpur-12	Babubazar	Prathoy Transport Co. Ltd.	30	25						Newer
190	A-290	-	Mirpur-1	Badda Natunbazar	Nobokoli Paribahan Ltd.		11						Newer
191	A-291	-	Ansar Camp.	Badda Natunbazar	Akik Paribahan Ltd.	40	30						Newer
192	A-292	-	Mohammadpur Shia Mosjid	Dhaor	M/s. Alif Enterprise	40	30						Newer
193	A-293	-	Mohammadpur Shia Mosjid	Dhaor	Rupkhata Ltd.	30	20						Newer

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours	
194	A-294	-	Japan Garden City	Dhaor	M/s. Bhuiya Enterprise.	35	25						Newer
195	A-295	-	Mirpur-12	Mawa	Shawdhin Paribahan Ltd.	40	30						Newer
196	A-296	-	Agargaon	Nandanpark	Sharaboni Paribahan	50	30						Newer
197	A-297	-	Savar	Banashri	Agrodut Paribahan Ltd.	30	30						Newer
198	A-298	-	Mirpur Kalshi	Keranigonj	ETC Transport Co. Ltd.	30	30						Newer
199	A-299	-	Ati Bazar (Keraniganj)	Dhaor	Ark Transport Co. Ltd.	40	30						Newer
200	A-300	-	Gabtali	Kuril Flyover	Jabala Tur Ltd.	40	30						Newer
201	A-301	-	Bosila	Dhaor	Tetulia Paribahan Ltd.	50	50						Newer
202	A-302	-	Banashari Meradia	Savar	Roich Paribahan Ltd.	25	25						Newer
203	A-303	-	Rampura	Gabtali	Tasin Enterprise	25	25						Newer
204	A-304	-	Agargaon BNP Bazar	Dhaor	Avijat Transport Ltd.	40	40						Newer

Sl. No.	Route No. (New)	Route No. (Old)	From	To	Operators	Maximum Allowed	Bus	Mini Bus	Total	Frequency (minutes)	No. of Trips	Operating Hours	
205	A-305	-	Manikdi ECB Chattar Mirpur	Kalampur	Al- Kamal Paribahan Ltd.	40	40						Newer
206	A-306	-	Chiriakhana	Motijheel	Basumati Transport Ltd.	40	35						Newer
207	A-307	-	Mirpur-14	EPZ	Etihas Paribahan Ltd.	30	30						Newer
208	A-308	-	School & College	Office	Traust Transport Ltd.	40	40						Newer
209	A-309	-	Sadar Ghat	EPZ	Savar Paribahan Ltd.	30	25						Newer

Annexure B: List of Rationalized Bus Routes

Cluster	Clustered Route. Under Company	No. of Proposed Buses						Remarks
		Bus (50 Seat)	A/C Bus (50 Seat)	Reconstructed Bus		Articulated Bus	Total	
				36/40 Seat	50 Seat			
Pink-1	1A	275	100	62	21	0	458	PINK : Company-1,2 & 3
Pink-2	1B	100	50	83	27	0	260	
Pink-3	1C and 1D	132	75	165	53	0	425	
Total		**507**	**225**	**310**	**101**	**0**	**1143**	
Blue-1	2A and 2B	65	40	102	34	0	241	Blue, Company-1 & 2
Blue-2	3A and 3B	60	30	102	34	0	226	
Total		**125**	**70**	**204**	**68**	**0**	**467**	
Maroon-1	4A, 4B & 4C	32	55	296	101	0	484	Maroon: 1 & 2
Maroon-2	5 and 6	115	31	88	31	0	265	
Total		**147**	**86**	**384**	**132**	**0**	**749**	
Orange-1	7 (7a,7B&7C)	130	70	122	42	0	364	Orange; 1, 2 and 3
Orange-2	8 and 9A	75	40	138	46	0	299	
Orange-3	9B and 10	68	30	107	36	0	241	
Total		**273**	**140**	**367**	**124**	**0**	**904**	
Green-1	11A	150	60	115	40	0	365	Green: 1,2,3 & 4
Green-2	11B & 11C	110	65	102	33	0	310	
Green-3	12A & 12B	70	60	160	55	0	345	
Green-4	13,14A &14B	100	45	120	44	0	309	
Total		**430**	**230**	**497**	**172**	**0**	**1329**	
Violet-1	15A and 15B	230	80	51	17	0	378	Violet:- 1, 2 & 3
Violet-2	16A and 16C	150	70	136	46	0	402	
Violet-3	16B and 16D	120	45	94	31	0	290	
Total		**500**	**195**	**281**	**94**	**0**	**1070**	
North-1	17 and 18	124	52	185	62	0	423	North;- 1 & 2
North-2	19	100	40	150	50	0	340	
Total		**195**	**92**	**392**	**131**	**0**	**810**	
North-West:-1	20 and 22	75	40	192	64	0	371	North-West; 1 & 2
North-West:-2	21	135	75	198	66	0	474	
Total		**210**	**115**	**390**	**130**	**0**	**845**	
South-1	23 and 24	0	5	44	16	0	65	South; 1
Total		**0**	**5**	**44**	**16**	**0**	**65**	
G. Total		**2416**	**1158**	**2812**	**949**		**7335**	

Annexure C: Peak Hour OD of 2035

O/D	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
1001	0	41	86	0	3	45	16	19	3	23	6	5	29	63	361	171	1271	350	942	668
1002	20	0	413	0	404	596	88	371	0	9	194	34	378	347	8	192	235	23	187	78
1003	75	305	0	71	76	411	177	163	14	35	41	167	221	184	6	121	0	0	183	30
1004	31	4	174	0	103	46	714	2	0	0	168	1	14	58	34	24	0	0	91	8
1005	123	613	183	58	0	490	112	137	3	25	33	5	128	14	30	93	0	3	120	20
1006	36	491	440	156	490	0	1505	123	19	108	152	5	544	39	656	329	0	7	411	19
1007	60	93	126	456	220	1435	0	299	40	146	1238	154	796	175	2	153	184	42	273	38
1008	222	453	396	41	178	198	319	0	318	349	631	724	232	445	41	377	0	7	504	113
1009	2	0	21	0	27	8	47	132	0	264	49	256	81	0	36	6	0	16	23	20
1010	32	10	50	0	12	416	291	431	339	0	64	62	83	141	2	47	97	1	53	92
1011	2	0	21	0	27	8	47	132	0	264	0	256	81	0	36	6	0	16	23	20
1012	5	6	49	5	6	1	342	617	27	23	207	0	23	117	0	19	0	3	59	50
1013	59	119	264	0	41	149	691	493	60	122	71	80	0	274	0	95	521	64	99	279
1014	16	466	185	66	16	70	415	269	212	173	187	10	339	0	36	225	80	11	97	74
1015	207	1	93	0	66	626	18	22	18	1	55	0	1	106	0	1875	1292	179	305	253
1016	103	189	69	42	12	268	167	272	3	25	48	6	149	263	1307	0	66	215	378	36
1017	1012	3	0	0	13	0	181	18	0	420	72	0	432	1	1103	95	0	3413	2466	513
1018	572	0	66	0	147	13	29	36	0	13	0	14	33	59	797	164	2561	0	333	701
1019	1066	354	340	142	61	234	62	480	54	85	147	199	161	193	305	452	1097	202	0	761
1020	383	88	266	0	43	35	686	26	5	2	67	144	203	112	120	199	117	372	1184	0
1021	144	17	1	84	0	0	8	27	3	7	2	0	3	0	15	16	415	6	389	211
1022	38	42	12	0	7	4	89	4	0	6	4	9	2	28	7	42	194	27	152	219
1023	18	0	44	0	5	0	0	40	0	0	0	8	32	0	28	6	174	22	65	72
1024	21	1	15	0	0	8	2	13	6	7	16	0	34	54	7	49	141	2	75	50
1025	23	6	3	0	0	39	12	62	11	0	34	0	0	0	68	4	4	27	114	158
1026	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1027	6	0	0	0	91	79	0	11	16	25	6	0	25	31	7	0	0	0	17	0
1028	0	0	0	0	0	127	0	0	0	0	0	0	0	4	0	0	0	3	0	0
1029	7	2	3	0	4	0	0	2	0	0	0	0	10	7	0	0	0	0	208	12
1030	12	157	0	0	0	0	0	0	0	251	0	18	0	0	0	0	0	4	41	0
1031	56	156	274	0	341	527	153	6	0	34	3	0	5	3	372	43	40	17	249	10
1032	195	401	24	0	27	5	76	37	1	36	43	45	41	7	37	63	0	86	400	3
1033	69	295	233	0	75	160	8	178	33	51	1	36	163	91	11	84	139	34	523	41
1034	6	0	0	0	2	0	117	1	27	0	0	0	1	0	34	0	145	6	110	4
1035	15	0	0	110	2	12	0	44	21	7	28	0	6	11	0	2	0	373	142	2
1036	190	409	40	0	27	31	142	65	25	10	24	128	132	49	85	29	557	45	283	199
1037	385	24	6	0	177	279	160	8	2	9	174	114	53	118	633	88	469	111	425	45
1038	45	2	14	0	18	0	12	0	10	5	2	0	15	1	75	25	468	2	131	134
1039	294	336	99	0	111	165	7	159	13	53	49	39	218	65	666	156	218	121	434	292
1040	330	55	11	146	45	436	223	383	12	49	160	32	151	734	33	72	933	73	680	236
1041	121	222	107	0	48	116	80	97	20	63	130	33	104	218	12	40	36	0	397	12
1042	91	14	152	0	6	795	23	12	1	1	112	0	0	45	9	1	18	5	33	2
1043	11	9	13	0	0	5	139	151	11	11	58	15	94	5	0	3	0	15	262	12
1044	47	178	39	0	4	120	325	141	40	56	112	26	33	21	71	22	0	0	406	0
1045	192	136	68	0	20	138	12	45	46	30	11	33	18	61	122	21	203	36	211	0
1046	14	12	27	0	1	54	0	25	161	11	0	15	93	42	0	11	82	0	597	4
1047	57	0	8	14	11	1	84	5	1	0	270	3	6	0	4	0	94	14	190	535
1048	0	12	9	0	7	1	1	180	6	10	76	0	4	32	4	10	0	0	94	158
1049	480	299	557	295	97	259	144	109	60	95	132	72	337	136	177	53	264	82	792	385

O/D	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
1050	94	29	27	0	1	23	13	32	76	18	27	24	39	50	46	4	0	1	70	79
1051	12	71	134	144	59	116	0	75	23	3	12	13	44	55	25	5	0	153	220	64
1052	117	393	95	0	87	179	336	44	23	46	156	40	100	60	88	35	498	97	368	44
1053	87	206	98	0	10	41	126	10	25	18	21	17	11	26	41	11	406	28	327	59
1054	53	19	30	0	7	156	22	136	13	31	50	89	94	70	48	31	0	16	310	170
1055	8	0	0	0	0	0	0	0	0	23	0	0	19	0	0	0	0	11	11	58
1056	345	157	48	0	118	85	307	72	7	35	182	90	54	157	235	44	466	111	477	14
1057	330	136	224	0	99	156	40	81	20	59	173	85	82	102	606	188	46	75	512	9
1058	131	0	7	0	3	0	0	0	2	0	17	0	14	573	0	0	139	431	83	0
1059	82	59	1	0	2	0	24	4	3	9	64	47	6	82	30	0	4	85	0	1
1060	90	35	0	0	0	26	0	1	4	0	0	0	23	0	25	18	0	0	11	5
1061	0	0	0	0	0	0	0	0	0	9	55	85	0	0	1	2	0	0	0	0
1062	149	0	0	110	1	0	20	196	0	73	158	24	102	1	0	36	0	0	88	1
1063	2	0	0	0	0	0	0	49	4	1	18	1	0	0	4	6	0	0	12	0
1064	1	7	2	0	26	17	41	58	13	3	0	106	42	11	20	15	0	0	35	12
1065	5	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	38	0	0
1066	7	0	1	0	0	1	2	0	33	8	14	0	6	3	14	0	213	4	27	2
1067	0	39	1	0	0	0	0	4	8	9	5	84	0	38	11	0	0	0	98	0
1068	18	40	0	102	17	0	1	45	1	0	6	166	8	47	8	1	0	4	3	3
1069	1	0	0	0	0	0	0	24	0	0	55	0	0	0	0	0	0	28	18	0
1070	34	0	3	0	0	0	0	4	11	16	0	0	15	0	28	32	0	0	1	14
1071	3	413	12	0	8	0	0	57	11	32	2	0	0	91	35	0	245	7	100	2
1072	7	2	85	0	63	1	0	33	1	7	0	19	24	2	27	29	0	4	57	5
1073	33	72	0	0	35	1	0	4	2	30	1	0	24	100	47	0	0	0	106	0
1074	11	51	207	0	0	8	120	18	0	4	2	9	3	31	13	2	66	0	109	1
1075	0	0	0	0	56	10	0	13	0	0	2	0	0	28	0	2	0	0	112	1
1076	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47	0	8	0
1077	0	24	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	13	0
1078	26	1	1	0	0	0	0	0	9	3	0	0	0	0	12	0	0	0	0	0
1079	8	136	22	0	60	89	0	30	5	11	6	8	35	32	4	4	0	0	36	4
1080	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
1081	1	0	49	0	0	0	0	1	9	0	0	0	3	0	1	0	87	1	16	0
1082	82	0	0	0	0	0	0	30	16	17	0	0	0	0	0	0	0	0	24	0
1083	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115	0
1084	16	8	1	0	1	8	0	55	8	1	1	28	9	24	14	2	0	0	58	0
1085	3	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	7	16	10	6
1086	32	0	0	0	0	3	20	2	4	0	1	5	65	38	0	0	68	0	35	2
1087	37	0	44	0	0	0	0	0	1	0	0	0	8	0	0	66	0	0	97	1
1088	0	0	1	0	0	0	0	43	11	277	0	0	0	0	0	0	0	90	0	0
1089	1	0	0	0	0	0	0	0	0	0	0	0	0	8	19	16	0	3	10	0
1090	0	70	0	0	1	0	0	5	0	0	0	0	2	0	11	1	0	0	4	0
1091	437	34	12	4	17	27	119	58	49	47	30	41	18	16	37	27	115	204	356	312
1092	380	37	8	6	10	17	118	35	22	41	17	24	21	8	30	16	118	212	316	342
1093	217	23	6	5	6	11	74	16	13	23	11	12	15	6	24	9	65	141	222	239
1094	150	14	5	2	16	5	41	33	20	30	3	3	7	7	7	11	72	70	96	128
1095	242	26	7	5	5	16	73	25	13	19	16	15	11	4	25	10	62	141	232	216
1096	1816	196	22	10	85	35	200	220	143	175	28	50	41	58	79	67	805	454	1118	895
1097	190	2	11	1	18	18	50	26	16	16	17	17	13	8	19	23	56	126	168	131
1098	1574	198	26	35	104	35	232	215	180	206	27	65	60	74	112	94	739	963	1706	1282

O/D	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
1099	296	22	9	13	21	12	54	51	39	48	8	19	18	20	24	21	106	108	171	151
1100	816	115	10	1	1	22	68	33	11	12	18	39	6	3	38	7	224	427	874	546
1101	146	18	7	1	19	8	43	38	34	36	7	13	12	11	15	18	83	66	95	114
1102	1629	194	74	54	267	87	386	392	306	327	90	165	115	163	240	199	1029	694	1072	1029
1103	290	32	43	21	110	32	68	83	102	76	41	73	56	54	106	84	160	145	210	183
1104	362	23	18	9	47	25	128	74	59	67	33	51	29	31	59	45	62	151	274	282
1105	184	6	8	4	16	13	91	31	25	33	16	20	16	14	28	18	37	78	119	146
1106	226	22	27	15	60	31	98	79	79	67	34	62	36	47	81	54	76	84	134	126
1107	258	22	10	13	21	15	88	51	31	47	12	19	21	13	32	18	55	110	203	212
1108	13	0	1	0	1	2	4	1	2	1	3	3	1	1	3	1	3	9	11	8
1109	108	6	12	0	40	12	37	32	35	27	20	29	10	21	32	32	56	62	63	73
1110	71	2	5	2	9	7	34	13	13	13	8	10	8	8	14	9	21	35	42	49
1111	91	2	9	2	18	8	47	19	19	20	10	13	11	12	20	12	20	31	49	58
1112	76	2	14	2	35	13	43	21	33	20	22	30	14	22	38	26	29	36	33	23
1113	6	0	1	0	3	1	2	2	2	2	2	3	2	2	4	2	2	4	3	1
1114	98	2	7	3	16	7	36	17	16	23	8	11	11	10	17	12	34	52	65	72
1115	72	2	11	1	23	11	48	24	31	21	16	22	13	20	31	20	23	27	25	21
1116	15	2	0	0	0	1	3	1	0	1	1	2	1	0	1	1	5	16	31	20
1117	10	0	0	0	0	0	3	0	0	1	1	1	2	0	3	1	10	6	4	3
1118	86	2	16	0	39	13	34	20	25	17	19	26	12	20	41	23	36	30	41	19
1119	100	0	3	1	8	4	29	13	8	12	6	7	4	4	9	5	8	23	43	54
1120	35	1	5	0	5	5	9	2	4	3	4	4	5	4	5	3	6	23	24	15
1121	90	0	4	1	11	5	29	16	12	14	7	9	5	7	13	8	8	17	29	44
1122	1553	107	99	50	245	91	394	310	285	197	104	202	115	160	250	176	732	354	556	447
1123	93	2	5	1	8	7	25	11	9	12	5	6	7	7	9	6	13	28	37	47
1124	988	58	30	22	42	36	275	176	29	109	25	35	43	30	53	44	181	201	465	564
1125	460	41	12	6	5	25	93	60	15	33	9	20	16	11	26	10	162	206	419	335
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1134	790	62	67	50	153	80	321	261	289	254	86	178	114	126	173	148	217	277	473	420
1135	167	12	8	3	25	13	63	43	40	47	24	39	16	20	34	26	52	97	142	162
1136	74	5	10	2	5	9	44	17	20	23	4	5	13	10	6	8	17	37	49	59
1137	151	13	8	7	12	9	89	41	31	46	8	11	20	8	12	22	38	71	138	161
1138	263	24	16	5	27	19	118	59	50	55	21	26	21	20	35	24	76	126	222	243
1139	252	7	16	4	33	24	114	62	50	59	32	41	23	27	43	32	49	92	147	190
1140	287	39	11	5	12	12	101	38	45	46	15	17	17	15	37	14	100	182	326	269
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1002	5	24	2	10	4	0	1	0	2	74	95	197	215	0	0	325	38	2	177	68
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1006	0	8	0	6	78	0	169	0	0	0	397	66	220	0	26	46	37	0	149	471
1007	0	38	0	1	40	133	0	0	0	0	218	0	16	0	253	36	422	4	142	264
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1046	0	8	276	7	0	0	0	0	0	0	0	8	54	0	7	25	11	29	69	86
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1052	43	78	11	84	33	0	26	69	58	16	29	36	26	7	35	84	15	66	104	239
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1100	42	181	12	51	9	14	14	0	0	12	286	306	38	40	103	438	86	113	122	182
1101	16	39	10	6	2	7	7	2	2	9	51	59	20	12	7	111	27	29	25	38
1102	212	370	104	62	17	101	66	36	20	32	384	416	176	64	98	842	257	197	303	189
1103	57	143	36	30	6	60	100	22	13	34	112	184	41	42	24	223	96	79	66	55
1104	51	109	23	34	7	46	32	16	8	15	251	176	30	32	45	223	54	107	117	72
1105	22	51	11	11	4	18	14	7	3	8	105	72	16	22	11	97	35	51	52	40
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O/D	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060
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1002	199	91	31	372	113	5	0	7	246	8	44	313	166	3	0	216	89	631	102	34
1003	179	54	4	6	36	12	5	3	355	21	38	32	79	1	0	179	105	7	3	0
1004	4	0	0	0	0	0	6	0	688	0	150	4	0	0	0	5	6	0	0	0
1005	32	0	6	0	29	7	159	1	236	0	31	218	3	5	0	49	95	1	0	0
1006	276	130	0	75	170	152	0	31	566	0	300	42	35	207	0	113	142	0	0	44
1007	90	43	19	97	38	4	83	1	358	199	0	137	0	78	1360	190	186	11	61	0
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1012	104	0	2	26	29	20	3	0	108	29	32	15	2	72	0	47	74	0	42	0
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1014	163	0	30	14	52	16	0	24	116	75	33	29	78	73	0	128	112	281	49	0
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1019	179	16	323	303	310	273	198	442	773	140	179	170	726	268	230	379	531	8	0	34
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1027	6	0	0	20	11	0	2	0	283	0	6	15	12	15	10	105	0	0	12	2
1028	0	0	0	0	0	0	0	82	169	0	0	304	27	0	34	0	0	0	0	0
1029	45	0	0	0	2	0	0	0	17	45	14	48	27	241	0	48	24	13	19	0
1030	117	0	0	0	9	0	0	25	57	0	0	12	2	0	193	83	72	0	0	0
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1037	65	24	421	0	76	24	9	35	71	45	101	58	155	52	2	95	77	101	0	0
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1053	45	35	307	1	31	48	0	21	203	41	118	19	0	35	0	138	79	16	16	0
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1089	2	0	0	0	1	1	0	0	14	0	25	20	0	2	0	27	10	4	1	0
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O/D	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060
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1100	12	6	88	15	24	27	201	27	56	19	8	307	326	232	78	258	219	10	271	2
1101	6	7	29	9	7	25	27	9	36	6	4	22	89	22	9	29	3	19	7	3
1102	93	36	175	62	70	273	207	47	257	34	16	386	590	274	63	263	115	152	210	26
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1104	18	28	71	59	13	65	122	41	48	14	6	235	211	100	40	114	57	42	105	22
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1133	60	23	124	34	51	173	86	28	225	26	19	149	333	147	24	134	20	110	89	24
1134	74	29	179	43	59	200	102	30	206	31	21	197	312	143	42	147	27	124	96	31
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1136	5	11	14	18	6	17	29	9	19	2	2	31	36	16	10	18	4	5	13	2
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1139	20	21	58	42	12	69	90	27	40	7	2	116	73	40	27	45	8	22	35	7
1140	6	7	64	11	5	16	72	24	88	20	11	98	408	138	33	150	56	10	103	5
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O/D	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080
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1002	0	0	0	2	0	0	62	1113	0	0	3	5	40	130	0	0	57	0	39	0
1003	0	0	0	1	0	1	3	34	0	8	19	7	1	555	0	0	0	6	2	0
1004	0	92	0	0	0	0	0	0	0	0	0	130	0	0	0	0	0	0	0	0
1005	0	2	0	13	2	0	4	8	0	93	2	7	1	0	0	0	0	0	27	0
1006	0	0	28	63	0	1	0	0	0	0	0	12	53	24	20	0	0	0	10	0
1007	0	14	0	0	9	132	2	30	0	0	0	0	0	1	2	0	0	1	0	0
1008	12	126	14	44	0	5	45	63	0	1	78	17	14	64	22	0	26	0	25	0
1009	0	0	4	6	0	52	17	1	0	6	27	19	1	0	0	0	0	0	8	0
1010	4	49	22	4	0	0	0	0	0	78	45	6	8	0	0	0	0	6	96	0
1011	0	0	4	6	0	52	17	1	0	6	27	19	1	0	0	0	0	0	8	0
1012	167	5	2	195	0	0	0	0	0	0	2	25	17	6	0	0	0	1	13	0
1013	0	100	0	112	0	4	0	1	0	17	0	73	21	3	2	0	0	0	23	0
1014	0	0	0	7	0	11	37	110	0	17	311	0	1	53	14	0	0	0	28	0
1015	61	3	4	38	0	5	11	6	0	4	0	14	23	11	0	0	5	14	4	0
1016	2	76	0	7	0	3	2	0	0	43	0	20	0	3	1	0	0	1	1	0
1017	0	0	0	40	0	117	0	0	0	0	258	0	0	0	8	0	1	0	0	4
1018	0	0	0	0	157	3	0	14	0	0	2	12	0	0	0	0	0	0	0	0
1019	0	16	3	21	2	25	37	155	26	1	17	15	120	28	12	12	41	24	16	0
1020	0	3	0	1	0	1	102	0	0	0	14	24	37	5	0	0	1	1	2	0
1021	0	2	543	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	8	0
1022	61	1	0	6	0	13	8	18	0	14	0	20	16	15	0	1	0	0	3	0
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1024	6	35	0	71	0	5	0	0	0	3	0	2	0	0	1	0	0	6	192	0
1025	0	94	0	17	0	1	36	8	0	9	0	0	24	184	0	0	0	2	14	0
1026	0	0	5	0	3	0	0	0	127	0	0	0	0	0	0	0	0	0	0	0
1027	1	2	0	19	0	9	1	0	0	16	1	4	0	3	0	0	0	126	6	0
1028	0	0	0	0	0	0	0	2	0	0	0	0	0	0	22	0	35	1	2	0
1029	0	0	0	6	1	0	20	2	0	2	10	7	6	20	18	0	0	6	50	0
1030	0	0	0	1	0	0	0	39	0	6	14	8	15	1	4	0	0	1	0	0
1031	0	12	18	178	0	1	0	5	0	5	161	1	4	75	99	0	1	61	15	0
1032	11	35	4	1	0	1	2	82	0	1	4	4	19	10	2	5	3	1	5	0
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1037	10	33	8	6	0	200	0	1	1	2	0	26	20	1	48	0	0	25	0	0
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1041	36	121	32	16	0	2	67	0	0	4	12	8	6	0	0	0	21	9	5	0
1042	8	6	12	0	0	0	4	18	0	98	0	0	28	4	0	0	3	0	3	0
1043	2	7	23	0	0	8	11	0	17	0	2	26	3	0	162	1	0	0	690	0
1044	0	1	30	3	0	8	0	0	0	1	30	0	3	1	0	0	0	311	1	0
1045	0	15	24	6	0	0	9	0	0	119	7	0	10	5	0	0	0	0	34	0
1046	42	2	0	169	0	44	0	184	0	0	8	16	3	0	0	0	0	0	0	0
1047	7	94	8	14	157	15	0	28	4	6	4	859	13	43	1	0	0	0	11	0
1048	40	64	8	6	95	20	33	7	1	5	38	151	12	10	0	0	5	7	107	42
1049	70	141	22	41	47	23	45	38	0	3	13	5	145	32	0	0	29	8	1	0

O/D	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080
1050	10	18	13	15	0	1	11	2	2	3	0	2	1	0	0	0	10	0	22	1
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1052	22	54	72	80	27	53	44	441	134	5	68	67	203	65	1	0	9	6	20	0
1053	0	104	1	3	2	9	2	0	5	8	16	12	11	4	3	2	2	2	5	9
1054	199	28	4	34	0	52	3	4	16	77	5	24	0	9	2	0	20	2	29	0
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1057	110	57	25	5	2	0	1	212	6	30	63	22	44	8	0	84	4	25	7	0
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1059	32	239	89	0	0	5	49	19	17	1	0	5	7	4	22	199	4	5	6	0
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1061	0	25	2	31	71	15	52	9	0	0	0	4	3	8	0	0	0	22	0	0
1062	26	0	14	9	36	7	31	10	7	0	6	0	3	9	0	0	0	1	8	3
1063	10	24	0	50	1	20	15	131	6	8	21	16	0	9	0	0	1	15	1	86
1064	22	8	21	0	62	21	160	9	4	11	47	5	10	6	0	0	0	5	9	0
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1067	25	11	15	62	11	22	0	9	19	1	7	6	19	0	0	0	4	1	42	0
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1073	0	0	1	20	1	4	16	1	21	80	4	8	0	13	1	0	2	40	40	0
1074	0	1	5	6	22	20	1	66	64	12	17	2	28	0	13	1	35	17	3	39
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1082	0	0	0	0	0	2	40	0	0	0	18	6	0	25	18	0	4	63	33	0
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O/D	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080
1099	2	3	38	3	6	14	2	30	20	0	17	7	13	7	17	43	24	4	19	2
1100	5	5	64	3	6	41	1	127	17	0	61	32	23	6	5	73	16	1	8	7
1101	2	2	23	1	2	12	1	25	7	0	17	7	8	4	6	27	10	3	7	1
1102	21	18	200	1	17	41	1	131	46	1	94	50	39	31	75	159	87	30	56	4
1103	6	1	62	4	16	17	2	60	44	1	61	13	14	6	71	133	25	19	89	4
1104	17	23	95	1	17	43	1	117	15	0	71	37	44	27	46	82	40	6	27	2
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1113	0	0	1	0	1	1	0	1	1	0	1	1	2	0	0	2	0	0	2	0
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1115	2	0	16	1	2	2	0	12	12	0	12	2	1	2	9	12	3	2	10	0
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1119	3	5	14	0	4	6	0	16	2	0	6	5	6	5	6	9	5	1	4	1
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1121	3	5	15	0	3	6	0	12	1	0	7	5	7	5	7	6	5	1	4	0
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1127	12	7	85	1	11	13	0	34	24	0	36	14	13	12	49	52	31	18	49	1
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1140	3	4	114	4	8	36	1	125	40	0	91	29	25	13	27	93	57	5	21	7
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O/D	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100
1001	0	38	0	29	39	33	20	0	0	4	404	323	167	83	229	1093	284	1236	380	702
1002	0	2	0	14	0	5	0	0	2	41	21	14	7	1	12	46	4	70	12	12
1003	0	0	0	79	1	1	8	0	1	1	66	69	42	7	64	152	5	208	44	155
1004	0	0	0	0	0	0	0	0	0	0	6	10	6	4	5	6	11	11	5	6
1005	0	0	0	69	0	0	0	0	0	0	4	10	9	9	1	72	1	84	16	2
1006	0	0	0	16	0	4	0	0	0	0	13	11	6	2	8	26	10	24	5	10
1007	1	0	0	1	11	0	0	0	0	3	72	89	51	31	45	94	79	115	50	61
1008	3	16	0	0	7	0	1	75	2	15	35	31	18	8	16	45	30	89	26	17
1009	0	0	0	2	33	1	0	24	0	0	37	40	22	13	18	125	27	173	40	25
1010	0	10	0	0	0	0	0	138	0	0	26	27	14	17	9	85	15	134	31	17
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1012	0	0	0	4	13	0	0	0	0	0	35	21	14	7	16	116	17	124	22	50
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1016	0	0	0	2	0	0	134	0	2	6	59	45	26	14	27	159	40	249	44	56
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1018	0	0	0	0	1	0	0	32	3	18	254	150	87	45	111	263	142	854	128	303
1019	10	17	86	144	106	108	39	0	44	35	486	313	158	91	170	949	206	1877	311	747
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1023	71	9	0	30	0	2	0	0	7	0	37	30	21	12	20	95	25	99	24	37
1024	129	16	0	2	4	2	0	0	18	5	32	23	12	9	10	91	8	104	19	42
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1031	140	26	0	10	40	25	23	0	1	98	222	192	96	50	93	350	110	386	107	275
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1043	2	0	0	12	0	23	0	176	0	0	56	54	32	8	40	110	41	88	24	44
1044	0	0	0	4	0	1	40	0	0	0	15	25	13	9	8	10	18	30	14	9
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1048	2	0	0	584	0	4	2	0	0	2	24	29	16	7	13	21	13	25	10	19
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O/D	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100
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1095	0	0	16	76	12	13	7	1	0	5	32	46	24	13	0	86	32	90	20	26
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1097	1	0	20	36	13	5	7	1	1	10	71	95	52	29	40	112	0	145	59	46
1098	2	0	34	165	62	80	22	1	1	49	136	125	68	45	63	692	127	0	196	234

O/D	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100
1099	1	1	10	20	19	18	6	0	3	17	48	55	31	21	23	131	45	229	0	70
1100	0	0	15	105	33	16	7	0	1	5	30	33	23	8	17	182	37	248	29	0
1101	0	0	8	29	5	13	3	1	1	12	48	49	25	10	25	78	43	102	29	32
1102	10	1	49	122	45	47	17	24	14	76	484	330	184	66	291	970	415	1768	286	646
1103	7	1	43	40	33	21	13	17	13	57	524	492	249	132	232	427	292	447	153	285
1104	5	1	41	94	33	41	22	12	6	23	268	210	103	40	127	202	165	221	59	131
1105	2	0	18	44	20	16	11	4	3	8	89	63	31	11	53	106	59	105	25	62
1106	6	1	31	43	30	37	6	16	15	38	380	285	151	56	173	327	180	286	83	183
1107	1	0	15	68	36	23	15	3	3	10	118	92	45	14	38	125	39	114	29	63
1108	0	0	2	5	2	0	1	1	0	1	6	3	3	2	4	6	4	6	2	5
1109	3	0	18	13	8	8	3	8	3	18	161	114	64	28	76	100	94	113	34	78
1110	1	0	8	14	6	4	4	2	1	8	51	41	25	9	25	52	31	51	18	28
1111	2	0	9	12	8	11	5	4	2	11	83	80	42	19	45	72	56	80	28	50
1112	3	1	12	6	9	8	1	9	4	16	167	144	81	32	89	123	99	119	44	91
1113	0	0	1	1	1	1	1	1	1	1	12	14	8	5	7	9	11	11	7	7
1114	1	0	7	13	17	8	6	3	2	9	89	78	38	13	38	79	57	75	28	33
1115	2	0	10	0	4	8	2	6	3	12	102	64	35	11	58	108	66	98	27	78
1116	0	0	1	4	1	0	0	0	0	0	1	2	2	1	1	3	3	3	1	0
1117	0	0	0	3	1	0	1	0	0	1	5	9	5	1	5	13	17	15	8	3
1118	2	0	11	8	7	6	4	6	4	10	128	123	62	0	77	115	143	138	56	98
1119	1	0	5	10	5	4	4	1	0	2	23	20	11	5	14	22	26	37	10	23
1120	0	0	2	7	3	1	1	0	0	5	15	24	13	6	8	20	20	29	15	13
1121	1	0	5	7	5	6	4	3	1	3	41	29	16	6	24	36	33	50	12	35
1122	13	2	68	71	28	0	12	33	15	73	640	484	264	116	389	1060	597	1771	325	1004
1123	1	0	4	7	4	4	3	1	1	5	22	20	11	3	13	33	21	42	14	22
1124	2	0	32	104	33	30	30	4	3	20	130	99	56	20	81	229	161	461	64	161
1125	0	0	9	57	18	11	9	0	6	8	57	50	29	4	39	173	73	265	42	51
1126	1	0	14	30	12	10	10	3	1	9	59	56	32	12	38	98	62	139	33	72
1127	9	1	33	28	21	34	7	23	12	42	384	251	146	43	245	532	278	752	153	639
1128	2	0	7	12	6	8	1	4	2	11	58	37	24	7	35	75	43	90	30	60
1129	5	0	30	52	25	22	13	14	7	16	187	106	71	17	118	211	143	278	50	216
1130	4	0	19	23	10	13	5	11	4	16	157	88	53	12	96	184	133	243	43	193
1131	0	0	8	12	7	8	5	1	1	10	38	44	23	12	19	74	41	86	34	41
1132	0	0	3	6	2	1	3	0	1	2	10	9	6	5	7	14	7	19	10	12
1133	6	1	36	60	22	39	11	14	11	4	321	247	132	60	185	481	230	534	143	372
1134	8	2	51	79	31	37	14	21	13	50	408	319	180	81	245	614	336	751	195	606
1135	2	0	11	43	12	17	5	5	1	8	75	52	32	7	50	110	50	91	26	58
1136	0	0	6	11	4	4	4	0	0	9	17	24	14	4	10	44	15	45	20	14
1137	0	0	10	24	9	6	8	0	0	8	36	36	19	10	19	66	37	83	25	34
1138	2	0	18	88	17	37	11	5	3	21	100	84	48	20	68	155	63	159	38	69
1139	3	0	20	41	18	17	12	8	4	15	117	80	52	16	76	136	84	140	38	89
1140	1	0	17	109	13	47	9	1	1	17	67	103	47	33	38	150	46	148	42	59
1141	2	0	10	22	9	8	5	4	2	9	76	54	30	9	46	76	53	79	21	46

O/D	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120
1001	156	1523	346	301	163	286	261	20	70	84	89	108	29	96	113	5	90	67	82	57
1002	12	109	25	7	8	21	10	0	4	2	2	4	0	3	6	0	1	4	1	3
1003	33	250	68	58	20	41	30	2	12	7	10	17	4	8	23	1	7	8	5	3
1004	4	60	22	22	15	20	14	0	14	6	9	10	1	8	10	2	3	12	6	0
1005	13	236	71	37	33	69	22	0	44	12	20	26	4	16	28	1	5	37	14	5
1006	6	74	26	15	13	25	10	2	16	6	7	10	1	5	10	2	2	14	4	2
1007	37	310	0	126	76	99	92	7	40	34	44	50	14	46	50	2	31	32	34	15
1008	21	229	52	43	33	57	38	2	17	12	16	19	4	17	23	1	9	12	12	7
1009	38	286	80	51	31	77	30	0	29	11	16	18	4	17	24	0	7	18	9	3
1010	30	281	73	51	33	77	37	1	27	12	20	21	5	22	25	1	11	19	12	2
1011	38	286	80	51	31	77	30	0	29	11	16	18	4	17	24	0	7	18	9	3
1012	10	221	98	34	31	60	24	2	35	14	16	24	1	12	24	1	1	26	8	4
1013	14	144	36	14	13	39	10	2	15	6	8	9	3	8	12	1	4	11	5	4
1014	10	156	50	14	15	45	13	0	19	4	8	7	1	5	11	2	4	14	1	0
1015	13	80	24	34	18	24	22	5	13	12	11	17	4	10	14	2	7	16	7	7
1016	27	322	103	58	34	86	32	2	37	14	17	23	3	15	30	2	6	28	9	5
1017	68	649	116	93	66	109	93	12	27	40	35	40	10	49	38	7	36	30	24	25
1018	66	697	139	112	52	114	106	12	24	38	27	41	7	39	51	4	18	34	16	18
1019	114	1428	329	197	99	179	190	14	15	48	42	54	21	63	91	3	49	34	30	39
1020	99	940	259	246	105	174	195	12	18	50	60	65	25	74	72	2	61	22	41	22
1021	17	227	93	37	27	65	35	3	26	13	14	19	4	11	23	1	6	14	7	6
1022	76	622	221	85	66	217	52	5	74	24	17	31	3	31	31	3	6	24	6	12
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1024	9	93	64	25	17	40	19	1	19	6	8	9	2	4	10	1	4	9	2	2
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1027	11	82	33	24	19	45	18	2	20	9	10	13	1	9	9	0	2	9	4	2
1028	0	23	13	7	7	12	4	0	8	2	4	5	0	3	5	0	0	4	2	0
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1030	7	22	27	21	4	9	10	2	3	3	2	2	2	0	4	1	3	4	0	2
1031	41	238	181	207	73	65	149	10	4	33	34	45	18	36	30	0	36	13	20	12
1032	55	351	142	153	59	101	96	4	14	16	15	44	5	20	16	1	10	7	5	11
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1035	8	35	24	10	9	9	8	2	6	4	2	5	7	6	3	1	6	11	5	8
1036	98	765	307	221	103	215	185	14	30	47	34	64	15	36	36	1	27	19	13	31
1037	28	236	81	40	32	72	49	7	18	24	14	22	2	16	16	3	7	16	4	15
1038	31	237	87	95	54	79	56	3	38	20	24	32	5	25	26	1	15	18	16	4
1039	14	233	195	41	35	49	39	6	38	20	13	17	5	10	20	1	7	31	6	8
1040	48	490	146	123	51	110	96	3	12	18	36	26	14	36	32	2	34	10	18	4
1041	7	131	48	16	23	44	21	0	19	7	9	13	1	6	14	1	1	14	4	7
1042	10	47	15	23	12	17	17	1	5	5	5	8	3	7	5	0	6	5	5	4
1043	26	260	113	74	59	99	39	2	60	21	26	38	1	19	38	2	3	34	12	5
1044	9	53	9	32	16	18	22	1	2	6	10	9	4	13	8	1	9	3	7	1
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1046	22	221	107	69	59	97	46	3	55	23	31	36	6	29	34	2	12	27	18	5
1047	26	143	65	74	37	71	55	4	4	17	19	18	9	48	13	3	23	9	12	8
1048	7	42	11	38	17	17	21	1	6	6	9	12	2	10	8	0	6	4	7	1
1049	34	365	129	87	54	85	89	1	0	14	23	21	9	27	26	0	22	2	14	10

O/D	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120
1050	9	67	38	12	16	32	6	0	19	4	5	7	1	4	6	0	1	6	3	1
1051	3	7	5	2	2	5	1	1	2	1	1	1	1	1	1	0	1	0	1	0
1052	31	194	275	142	62	67	102	4	6	26	40	44	16	48	26	1	36	11	25	8
1053	85	594	181	212	72	157	124	5	24	25	38	56	13	42	37	1	28	16	18	6
1054	12	161	44	34	28	39	34	2	9	9	10	15	2	11	12	0	4	6	5	6
1055	7	85	42	25	19	19	20	4	10	10	6	11	1	8	9	0	2	10	4	4
1056	29	212	171	118	44	56	87	4	5	14	22	22	18	24	21	1	30	13	14	10
1057	9	85	20	17	10	25	15	0	5	3	5	4	2	8	3	0	4	1	3	1
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1059	4	149	122	30	36	28	44	2	14	13	7	12	2	8	10	0	5	12	4	9
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1068	20	197	153	120	48	50	103	9	4	22	22	29	17	24	21	1	25	10	14	13
1069	6	58	39	11	17	38	10	1	21	7	6	9	1	4	7	0	1	6	3	3
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1076	19	57	53	69	19	34	40	7	11	16	14	20	13	18	13	1	16	15	10	12
1077	5	53	26	25	11	24	16	0	7	4	7	9	1	8	6	0	3	3	3	0
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1079	10	104	65	17	20	60	18	0	28	8	8	13	4	8	11	0	3	15	5	7
1080	2	2	2	4	1	3	2	1	2	2	1	2	2	2	1	0	1	3	1	2
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1083	10	71	69	51	22	44	27	5	19	14	16	18	8	13	17	1	10	12	7	4
1084	52	175	100	103	34	89	80	14	13	30	19	37	19	33	0	2	18	25	15	24
1085	33	114	136	37	28	104	28	3	50	14	14	16	6	12	12	1	9	6	5	3
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1092	45	298	516	164	105	226	72	5	189	53	56	72	9	46	68	11	16	114	21	8
1093	25	201	309	94	62	152	45	2	116	31	35	46	7	25	43	4	9	61	13	5
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1096	79	1238	541	178	154	348	124	3	186	55	77	95	12	63	134	8	24	142	37	18
1097	47	453	224	153	122	172	88	5	105	48	68	72	12	75	84	12	46	111	47	13
1098	93	1778	500	196	144	283	135	3	161	56	78	88	15	64	115	8	45	145	49	19

O/D	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120
1099	28	276	119	65	40	67	46	7	39	22	27	29	14	29	34	7	25	44	23	15
1100	28	693	264	96	100	184	62	0	123	35	50	66	1	34	79	4	5	99	31	9
1101	0	133	114	48	33	69	32	3	37	16	16	18	6	18	18	4	10	24	7	6
1102	137	0	487	282	137	229	237	30	103	104	66	99	22	60	101	7	60	126	52	91
1103	132	455	0	634	258	321	391	19	35	115	141	155	64	161	49	7	99	34	69	47
1104	58	182	670	0	114	147	129	24	163	86	57	85	16	67	43	16	31	113	23	24
1105	23	114	309	74	0	97	44	8	99	36	21	30	6	15	26	5	8	59	7	10
1106	71	223	295	207	124	0	165	26	50	68	49	77	23	51	41	5	29	43	21	38
1107	18	209	420	77	83	105	0	4	101	42	28	38	4	19	34	5	6	66	10	12
1108	1	31	18	16	13	24	8	0	16	5	7	10	0	4	8	2	0	11	2	1
1109	36	120	110	126	68	89	93	9	0	32	46	52	9	44	30	4	19	30	17	13
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1111	20	82	129	94	38	51	62	7	40	29	0	24	12	28	24	3	18	31	15	11
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1113	5	10	11	20	9	11	13	5	6	8	9	9	0	8	6	2	5	5	4	5
1114	21	59	123	79	34	40	38	4	35	20	17	23	8	0	22	4	14	36	12	8
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1116	2	30	24	11	10	15	4	0	12	3	5	7	0	4	8	0	0	8	3	0
1117	5	12	11	9	4	4	1	1	6	2	2	2	2	2	5	4	0	12	3	3
1118	31	137	31	136	58	52	86	9	19	35	39	47	13	53	40	7	43	0	38	18
1119	6	67	79	30	16	21	19	2	27	12	10	14	2	11	13	3	8	36	0	4
1120	8	101	40	40	25	38	25	1	29	11	19	20	6	19	24	5	14	34	17	0
1121	8	18	70	27	8	7	18	5	20	15	7	11	4	8	8	2	8	25	7	7
1122	165	1825	389	446	186	263	374	52	45	154	122	144	59	131	132	12	158	85	117	141
1123	7	43	54	20	9	14	11	2	20	9	6	9	4	7	8	1	6	25	8	9
1124	46	882	645	102	96	157	114	6	164	68	44	50	7	39	63	14	28	179	24	36
1125	25	517	238	60	54	91	43	2	77	25	21	27	3	13	42	4	3	74	15	21
1126	21	255	231	75	40	70	46	4	68	26	22	27	6	17	35	5	14	70	16	13
1127	86	469	161	183	48	61	81	28	27	71	27	56	16	31	30	4	36	61	29	62
1128	16	140	48	43	23	40	27	6	31	19	14	24	5	13	19	4	6	35	12	12
1129	36	474	347	141	76	138	81	15	144	69	44	75	2	29	66	5	2	134	28	29
1130	33	164	128	58	26	44	52	12	36	37	13	26	2	14	15	4	8	48	7	28
1131	26	110	82	40	24	36	27	3	22	13	13	13	8	16	15	3	12	21	9	8
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1133	107	665	277	234	101	158	190	20	49	68	58	70	28	57	69	5	61	60	42	50
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O/D	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140
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1012	8	185	12	59	80	14	118	28	70	52	40	4	174	103	37	27	35	50	56	46
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O/D	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140
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1062	1	2	1	10	4	4	4	0	4	2	1	0	0	2	2	1	3	3	3	0
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1065	1	7	4	2	1	4	2	3	2	1	4	3	5	8	2	6	1	5	2	2
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O/D	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140
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1103	86	438	74	566	244	241	232	55	244	120	87	36	177	396	115	65	137	187	158	193
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1126	16	516	34	209	131	0	167	39	166	93	30	10	306	323	40	27	45	59	64	82
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1131	8	117	16	69	41	29	49	19	42	27	0	5	120	102	20	27	42	35	32	39
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1135	8	194	14	56	68	26	115	38	89	59	15	8	226	201	0	20	28	56	69	54
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1137	9	223	17	100	68	31	86	24	74	43	34	8	253	192	26	25	0	46	54	57
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1139	17	355	23	124	98	58	138	51	104	70	34	15	263	281	68	40	47	93	0	110
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O/D	1141
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1095	68
1096	95
1097	65
1098	93

O/D	1141
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1123	8
1124	56
1125	33
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1127	26
1128	18
1129	65
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1131	17
1132	8
1133	51
1134	100
1135	26
1136	13
1137	20
1138	46
1139	46
1140	53
1141	0

Annexure D: Codes and Parameters of Scenarios

Codes and Parameters for Scenario 1: Existing Bus Route


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        "effective_headways": "hdw",
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        "perception_factor": 1
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            "penalty": 0,
            "perception_factor": 1
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        "on_lines": null,
        "on_segments": null
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    "boarding_cost": {
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        "on_lines": {
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            "perception_factor": 0.34
        },
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            "perception_factor": 0.34
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    "aux_transit_time": {
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    "aux_transit_cost": null,
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        "fixed_proportions_on_connectors": null
    },
    "flow_distribution_at_regular_nodes_with_aux_transit_choices": {
        "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
    },
    "flow_distribution_between_lines": {
        "consider_total_impedance": false
    },
    "connector_to_connector_path_prohibition": null,
    "circular_lines": {
        "stay": false
    },
    "od_results": {
        "total_impedance": "mf4"
    },
    "journey_levels": [],
    "performance_settings": {
        "number_of_processors": "max"
    }
}
```

Codes and Parameters for Scenario 2: Rationalized Bus Route


```
{
    "type": "EXTENDED_TRANSIT_ASSIGNMENT",
    "modes": [
        "B",
        "M",
        "b",
        "N",
        "P"
    ],
    "demand": "mf2",
    "waiting_time": {
        "headway_fraction": 0.5,
        "effective_headways": "hdw",
        "spread_factor": 1,
        "perception_factor": 1
    },
    "boarding_time": {
        "global": {
            "penalty": 0,
            "perception_factor": 1
        },
        "at_nodes": null,
        "on_lines": null,
        "on_segments": null
    },
    "boarding_cost": {
        "global": null,
        "at_nodes": null,
        "on_lines": {
            "penalty": "@access_fare",
            "perception_factor": 0.34
        },
```

```
    "on_segments": {
        "penalty": "@per_km_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf1"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Codes and Parameters for Scenario 3: Existing Bus Route with BRT


```
{
   "type": "EXTENDED_TRANSIT_ASSIGNMENT",
   "modes": [
      "B",
      "M",
      "b",
      "N",
      "P"
   ],
   "demand": "mf2",
   "waiting_time": {
      "headway_fraction": 0.5,
      "effective_headways": "hdw",
      "spread_factor": 1,
      "perception_factor": 1
   },
   "boarding_time": {
      "global": {
         "penalty": 0,
         "perception_factor": 1
      },
      "at_nodes": null,
      "on_lines": null,
      "on_segments": null
   },
   "boarding_cost": {
      "global": null,
      "at_nodes": null,
      "on_lines": {
         "penalty": "@access_fare",
         "perception_factor": 0.34
      },
```

```
    "on_segments": {
        "penalty": "@segment_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf5"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Codes and Parameters for Scenario 4: Rationalized Bus Route with BRT


```
{
    "type": "EXTENDED_TRANSIT_ASSIGNMENT",
    "modes": [
        "B",
        "M",
        "b",
        "N",
        "P"
    ],
    "demand": "mf2",
    "waiting_time": {
        "headway_fraction": 0.5,
        "effective_headways": "hdw",
        "spread_factor": 1,
        "perception_factor": 1
    },
    "boarding_time": {
        "global": {
            "penalty": 0,
            "perception_factor": 1
        },
        "at_nodes": null,
        "on_lines": null,
        "on_segments": null
    },
    "boarding_cost": {
        "global": null,
        "at_nodes": null,
        "on_lines": {
            "penalty": "@access_fare",
            "perception_factor": 0.34
        },
```

```
    "on_segments": {
        "penalty": "@segment_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf3"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Codes and Parameters for Scenario 5: Existing Bus Route with MRT


```
{
    "type": "EXTENDED_TRANSIT_ASSIGNMENT",
    "modes": [
        "B",
        "M",
        "b",
        "N",
        "P"
    ],
    "demand": "mf2",
    "waiting_time": {
        "headway_fraction": 0.5,
        "effective_headways": "hdw",
        "spread_factor": 1,
        "perception_factor": 1
    },
    "boarding_time": {
        "global": {
            "penalty": 0,
            "perception_factor": 1
        },
        "at_nodes": null,
        "on_lines": null,
        "on_segments": null
    },
    "boarding_cost": {
        "global": null,
        "at_nodes": null,
        "on_lines": {
            "penalty": "@transit_access_fare",
            "perception_factor": 0.34
        },
```

```
    "on_segments": {
        "penalty": "@segment_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf6"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Codes and Parameters for Scenario 6: Rationalized Bus Route with MRT


```
{
    "type": "EXTENDED_TRANSIT_ASSIGNMENT",
    "modes": [
        "B",
        "M",
        "b",
        "N",
        "P"
    ],
    "demand": "mf2",
    "waiting_time": {
        "headway_fraction": 0.5,
        "effective_headways": "hdw",
        "spread_factor": 1,
        "perception_factor": 1
    },
    "boarding_time": {
        "global": {
            "penalty": 0,
            "perception_factor": 1
        },
        "at_nodes": null,
        "on_lines": null,
        "on_segments": null
    },
    "boarding_cost": {
        "global": null,
        "at_nodes": null,
        "on_lines": {
            "penalty": "@access_fare",
            "perception_factor": 0.34
        },
```

```
    "on_segments": {
        "penalty": "@segment_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf8"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Codes and Parameters for Scenario 7: Existing Bus Route with MRT and BRT


```
{
    "type": "EXTENDED_TRANSIT_ASSIGNMENT",
    "modes": [
        "B",
        "M",
        "b",
        "N",
        "P"
    ],
    "demand": "mf2",
    "waiting_time": {
        "headway_fraction": 0.5,
        "effective_headways": "hdw",
        "spread_factor": 1,
        "perception_factor": 1
    },
    "boarding_time": {
        "global": {
            "penalty": 0,
            "perception_factor": 1
        },
        "at_nodes": null,
        "on_lines": null,
        "on_segments": null
    },
    "boarding_cost": {
        "global": null,
        "at_nodes": null,
        "on_lines": {
            "penalty": "@access_fare",
            "perception_factor": 0.34
        },
```

```
    "on_segments": {
        "penalty": "@segment_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf7"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Codes and Parameters for Scenario 8: Rationalized Bus Route with MRT


```
{
    "type": "EXTENDED_TRANSIT_ASSIGNMENT",
    "modes": [
        "B",
        "M",
        "b",
        "N",
        "P"
    ],
    "demand": "mf2",
    "waiting_time": {
        "headway_fraction": 0.5,
        "effective_headways": "hdw",
        "spread_factor": 1,
        "perception_factor": 1
    },
    "boarding_time": {
        "global": {
            "penalty": 0,
            "perception_factor": 1
        },
        "at_nodes": null,
        "on_lines": null,
        "on_segments": null
    },
    "boarding_cost": {
        "global": null,
        "at_nodes": null,
        "on_lines": {
            "penalty": "@access_fare",
            "perception_factor": 0.34
        },
```

```
    "on_segments": {
        "penalty": "@segment_fare",
        "perception_factor": 0.34
    }
},
"in_vehicle_time": {
    "perception_factor": 1
},
"in_vehicle_cost": null,
"aux_transit_time": {
    "perception_factor": 1
},
"aux_transit_cost": null,
"flow_distribution_at_origins": {
    "choices_at_origins": "OPTIMAL_STRATEGY",
    "fixed_proportions_on_connectors": null
},
"flow_distribution_at_regular_nodes_with_aux_transit_choices": {
    "choices_at_regular_nodes": "OPTIMAL_STRATEGY"
},
"flow_distribution_between_lines": {
    "consider_total_impedance": false
},
"connector_to_connector_path_prohibition": null,
"circular_lines": {
    "stay": false
},
"od_results": {
    "total_impedance": "mf9"
},
"journey_levels": [],
"performance_settings": {
    "number_of_processors": "max"
}
```

}

Annexure E: Scenario wise Line Summary

Scenario 1: Existing Bus Route																	
Line	Descriptio	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
101	101	b	1	9437	9436.17	10	48.09	94361.7	9110	68122.7	4946129	4.72	11.07	1416.7	3322.4	0	0
101_R	101_R	b	1	360	359.89	10	48.09	3598.85	7291	37463.2	79992.4	2.6	5.87	779.1	1759.5	0	0
102	102	b	1	989	988.8	10	34.84	9888	5425	38597.2	288511.9	3.69	7.16	1107.8	2149.4	0	0
102_R	102_R	b	1	292	291.66	10	34.84	2916.59	4783	29469.6	64405.9	2.82	5.53	845.8	1657.6	0	0
103	103	b	1	1940	1939.75	10	36.86	19397.47	7567	48396.4	694216.4	4.38	8.71	1312.9	2612.8	0	0
103_R	103_R	b	1	968	967.61	10	36.86	9676.11	7356	46039.6	251820	4.16	6.58	1248.9	1974.5	0	0
104	104	b	1	26705	26704.02	10	37.67	267040.2	11301	83601.3	18103240	7.4	14.37	2219.6	4311.1	0	0
104_R	104_R	b	1	260	259.53	10	37.67	2595.32	6824	29640.8	56883.8	2.62	5.31	786.9	1592.1	0	0
105	105	b	1	1362	1361.22	10	30.82	13612.2	5017	39834.6	418228.6	4.31	6.82	1292.6	2047	0	0
105_R	105_R	b	1	10242	10241.72	10	30.82	102417.2	7091	46554.8	6148653	5.04	13.55	1510.7	4064.6	0	0
106	106	b	1	3644	3643.63	10	42.15	36436.27	8111	43838.8	1850647	3.47	11.32	1040	3396.1	0	0
106_R	106_R	b	1	2370	2369.52	10	42.15	23695.17	7479	43159.1	997924.4	3.41	9.4	1023.9	2821.2	0	0
107	107	b	1	332	331.54	10	48.63	3315.37	6826	40264.9	61957.4	2.76	4.64	827.9	1391.7	0	0
107_R	107_R	b	1	3546	3545.16	10	48.63	35451.6	10104	58297.9	1599843	4	10.51	1198.7	3151.7	0	0
109	109	b	1	10753	10752.25	10	32.93	107522.5	8353	70899.5	5382400	7.18	12.52	2153.2	3755.6	0	0
109_R	109_R	b	1	86	85.47	10	32.93	854.72	4821	22340	11841.1	2.26	3.33	678.5	1000.5	0	0
110	110	b	1	71	70.93	10	35.89	709.34	4587	22391.9	9436.7	2.08	3.62	623.9	1087	0	0
110_R	110_R	b	1	43188	43187.54	10	35.89	431875.4	14564	86110	33365730	8	17.47	2399.4	5241.2	0	0
111	111	b	1	436	435.17	10	33.98	4351.74	6145	31198.5	103043.9	3.06	5.51	918.1	1651.6	0	0
111_R	111_R	b	1	4035	4034.41	10	33.98	40344.06	7799	43563.7	1903755	4.27	10.21	1282	3063.7	0	0
112	112	b	1	133	132.12	10	32.76	1321.17	4733	26183.4	20227.1	2.66	3.96	799.2	1186.8	0	0
112_R	112_R	b	1	299	298.54	10	32.76	2985.37	6819	29492.2	63495.3	3	5.21	900.2	1562.6	0	0
113	113	b	1	1299	1298.59	10	39.03	12985.92	10345	39766.3	508496.5	3.4	9.26	1018.9	2778.2	0	0
113_R	112_R	b	1	2030	2029.84	10	39.03	20298.41	7800	41400.8	812331	3.54	9.33	1060.8	2797.8	0	0
114	114	b	1	42700	42699.38	10	35.95	426993.8	10373	66036.9	37925112	6.12	18.76	1837	5628.4	0	0
114_R	114_R	b	1	3003	3002.5	10	35.95	30024.96	7571	36144.9	1570907	3.35	10.89	1005.5	3268.3	0	0
115	115	b	1	2222	2221.44	10	34.49	22214.41	7782	46893.1	825868.6	4.53	9.1	1359.6	2729.6	0	0
115_R	114_R	b	1	2991	2990.98	10	34.49	29909.8	9598	40938.1	1339731	3.96	9.93	1187	2979.3	0	0
116	116	b	1	1945	1944.26	10	32.35	19442.64	7310	40299.3	697217.8	4.15	8.02	1245.5	2404.9	0	0
116_R	116_R	b	1	1225	1224.76	10	32.35	12247.61	5291	33426.3	416942.5	3.44	7.7	1033.1	2310.1	0	0
117	117	b	1	508	507.79	10	37.68	5077.9	7399	31862.5	136511.4	2.82	6.21	845.7	1862.4	0	0
117_R	117_R	b	1	198	197.54	10	37.68	1975.38	8119	29084	35979.4	2.57	4.42	772	1327.3	0	0
118	118	b	1	95	94.46	10	27.86	944.57	4404	18622.1	15254.8	2.23	4.43	668.4	1329.8	0	0
118_R	118_R	b	1	551	550.59	10	27.86	5505.92	5653	27352.7	150400.8	3.27	6.39	981.8	1916.9	0	0
119	119	b	1	989	988.8	10	34.84	9888	5425	38597.2	288511.9	3.69	7.16	1107.8	2149.4	0	0
119_R	119_R	b	1	292	291.66	10	34.84	2916.59	4783	29469.6	64405.9	2.82	5.53	845.8	1657.6	0	0
120	120	b	1	383	382.32	10	37.01	3823.18	5289	35857.1	79434.9	3.23	5.17	968.9	1552.1	0	0
120_R	120_R	b	1	118	117.29	10	37.01	1172.9	5601	27497.8	16716	2.48	3.5	743	1049.4	0	0
122	122	b	1	1362	1361.22	10	30.82	13612.2	5017	39834.6	418228.6	4.31	6.82	1292.6	2047	0	0
122_R	122_R	b	1	10242	10241.72	10	30.82	102417.2	7091	46554.8	6148653	5.04	13.55	1510.7	4064.6	0	0
123	123	b	1	4905	4904.08	10	31.03	49040.8	6615	47739.7	2381598	5.13	11.2	1538.7	3361.5	0	0
123_R	123_R	b	1	532	531.88	10	31.03	5318.82	5878	34789.3	123350.9	3.74	5.43	1121.3	1629.8	0	0
124	124	b	1	26616	26615.44	10	41.97	266154.4	9889	66217	20602867	5.26	16.46	1577.7	4937.8	0	0
124_R	124_R	b	1	1232	1231.19	10	41.97	12311.88	9365	40832.2	487051.3	3.24	9.44	972.9	2830.6	0	0
125	125	b	1	714	713.73	10	28.82	7137.27	6523	29091.7	218633.8	3.36	7.12	1009.3	2137.4	0	0
125_R	125_R	b	1	1474	1473.07	10	28.82	14730.69	4095	41138.9	477113.8	4.76	8.19	1427.3	2456	0	0
126	126	b	1	7611	7610.94	10	31.73	76109.39	7717	58510.9	3845204	6.15	11.96	1844.1	3587	0	0
126_R	126_R	b	1	40	40	10	31.73	399.99	2145	18540	4060.8	1.95	2.63	584.3	787.8	0	0

Line	Descriptio	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
127	127	b	1	9142	9141.89	10	22.31	91418.93	5944	46791.9	5099215	6.99	12.97	2097	3892.4	0	0
127_R	127_R	b	1	3723	3722.8	10	22.31	37227.99	7992	42224.7	1505647	6.31	8.83	1892.3	2647.8	0	0
129	129	b	1	31522	31521.26	10	47.16	315212.6	11829	88849.9	22088843	6.28	15.69	1884.2	4708.4	0	0
129_R	129_R	b	1	3343	3342.57	10	47.16	33425.72	12405	63640	1259624	4.5	9.46	1349.6	2836.8	0	0
130	130	b	1	1603	1602.62	10	43.61	16026.25	10411	52579.5	525196.8	4.02	8.3	1205.5	2490.3	0	0
130_R	130_R	b	1	742	741.11	10	43.61	7411.14	10175	44424.4	192550.7	3.4	6.29	1018.6	1886.7	0	0
131	131	b	1	1347	1346.34	10	35.41	13463.36	6116	29260.7	602620.1	2.75	9.79	826.3	2935.9	0	0
131_R	131_R	b	1	756	755.1	10	35.41	7550.98	7034	36361.1	229794.4	3.42	7.5	1026.8	2249.1	0	0
132	132	b	1	541	540.4	10	46.9	5404.04	9621	38039.4	165087.3	2.7	8.13	811.1	2437.5	0	0
132_R	132_R	b	1.00E+00	1.00E+06	1009913	10	46.9	10099126	21424	1.87E+05	1.70E+09	13.28	35.73	3982.6	10717.8	0	0
133	133	b	1	171767	171766.5	10	42.52	1717665	18866	1.14E+05	2.60E+08	8.92	32.62	2676.1	9787.1	0	0
133_R	133_R	b	1	124647	124647	10	42.52	1246470	17544	1.01E+05	1.50E+08	7.92	25.52	2374.8	7655.5	0	0
134	134	b	1	942575	942574.8	10	62.86	9425748	17217	1.50E+05	1.80E+09	7.94	38.4	2382.2	11521.5	0	0
134_R	134_R	b	1	2610	2609.62	10	62.86	26096.24	8107	74052.3	917108.6	3.93	8.91	1178.1	2672.3	0	0
135	135	b	1	689	688.49	10	33.42	6884.86	7338	31824.1	196447.8	3.17	6.59	952.4	1977.5	0	0
135_R	135_R	b	1	46826	46825.47	10	33.42	468254.7	13605	52051.2	48410000	5.19	21.64	1557.7	6491.4	0	0
137	137	b	1	4482	4481.56	10	34.85	44815.61	8731	55757.9	1845012	5.33	9.54	1600	2863.4	0	0
137_R	137_R	b	1	21430	21429.02	10	34.85	214290.2	11590	55261.5	16829046	5.29	16.11	1585.8	4831.5	0	0
138	138	b	1	5437	5436.07	10	47.89	54360.65	12447	65375.9	3267169	4.55	14.46	1365.2	4339	0	0
138_R	138_R	b	1	44702	44701.74	10	47.89	447017.4	10523	82225	36221296	5.72	18.66	1717.1	5599	0	0
139	139	b	1	131307	131306.2	10	45.6	1313062	19224	1.67E+05	1.20E+08	12.22	21.22	3667.3	6367.1	0	0
139_R	139_R	b	1	8251	8250.65	10	45.6	82506.54	7452	85907.9	3554904	6.28	11.03	1884	3310.3	0	0
142	142	b	1	17002	17001.69	10	31.05	170016.9	9342	57094.9	11316519	6.13	14.04	1839	4211.5	0	0
142_R	142_R	b	1	520	519.02	10	31.05	5190.23	6051	30542.7	134909.8	3.28	6.11	983.8	1831.8	0	0
143	143	b	1	78464	78463.74	10	31.92	784637.4	8919	79328.5	75969829	8.28	20.26	2485	6077.9	0	0
143_R	143_R	b	1	10441	10440.22	10	31.92	104402.2	9809	54706.3	6787633	5.71	14.63	1713.7	4388.9	0	0
144	144	b	1	3558	3557.54	10	42.9	35575.41	11732	59577.3	1513456	4.63	10.04	1388.7	3012	0	0
144_R	144_R	b	1	134248	134247	10	42.9	1342470	12602	9.02E+04	1.50E+08	7.01	26.27	2102.2	7881.6	0	0
145	145	b	1	726	725.82	10	29.67	7258.18	9797	26006.9	252370.4	2.92	8.16	876.5	2449.4	0	0
145_R	145_R	b	1	20503	20502.34	10	29.67	205023.4	11253	63760.6	13639016	7.16	14.64	2148.8	4391.2	0	0
146	146	b	1	27294	27293.51	10	54.21	272935.1	13121	89136.7	18739716	5.48	14.73	1644.3	4418.1	0	0
146_R	146_R	b	1	24062	24061.6	10	54.21	240616	12396	83211.2	16433185	5.12	14.45	1535	4335.2	0	0
148	148	b	1	2215	2214.48	10	32.23	22144.79	5900	29893.5	1160829	3.09	11.12	927.4	3337.5	0	0
148_R	148_R	b	1	108	107.54	10	32.23	1075.38	1732	25053	15072.1	2.59	3.29	777.3	985.7	0	0
151	151	b	1	31051	31050.79	10	45.89	310507.9	18013	105867.6	20617409	7.69	14.72	2307	4415.1	0	0
151_R	151_R	b	1	194298	194297.8	10	45.89	1942978	16839	1.54E+05	2.10E+08	11.19	25.92	3355.6	7775	0	0
152	152	b	1	2273	2272.16	10	57.21	22721.65	9028	65298.6	757192.4	3.8	7.95	1141.4	2386.3	0	0
152_R	152_R	b	1	934	933.23	10	57.21	9332.29	7143	51263.6	278528.1	2.99	7.64	896.1	2292.3	0	0
153	153	b	1	2205	2204.39	10	46.95	22043.94	9508	52418.8	830427.4	3.72	8.65	1116.5	2594.8	0	0
153_R	153_R	b	1	3400	3400	10	46.95	33999.98	12019	60879.8	1356876	4.32	9.46	1296.8	2838.6	0	0
154	154	b	1	615	614.53	10	43.24	6145.3	8913	42919.2	146069.7	3.31	5.51	992.7	1653.7	0	0
154_R	154_R	b	1	737	736.45	10	43.24	7364.48	8679	37259	215898.6	2.87	6.92	861.7	2076.3	0	0
155	155	b	1	37386	37385.51	10	39.14	373855.1	13670	83019.3	29361962	7.07	17.17	2121.3	5151	0	0
155_R	155_R	b	1	34397	34396.41	10	39.14	343964.1	11336	79581.1	28208953	6.78	18.18	2033.4	5455	0	0
156	156	b	1	2084	2083.77	10	25.02	20837.72	9121	39319.3	726701.2	5.24	7.83	1571.3	2350.4	0	0
156_R	156_R	b	1	4070	4069.07	10	25.02	40690.75	7030	33976.7	2309774	4.53	13.26	1357.8	3976.9	0	0
157	157	b	1	311	310.76	10	27.33	3107.63	4048	20766.2	95079.7	2.53	6.72	759.8	2016.3	0	0
157_R	157_R	b	1	198	197.8	10	27.33	1978.04	3722	22255.5	41440.1	2.71	4.98	814.2	1493.2	0	0
158	158	b	1	348	347.63	10	43.17	3476.26	6060	37336.5	65993	2.88	4.21	864.9	1263.9	0	0

Line	Descriptio	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
158_R	158_R	b	1	523	522.52	10	43.17	5225.15	6496	31180.3	173119.1	2.41	7.83	722.3	2349.5	0	0
159	159	b	1	452	451.71	10	38.64	4517.08	6511	38376.6	97694.9	3.31	5.39	993.2	1616.2	0	0
159_R	159_R	b	1	1329	1328.54	10	38.64	13285.43	8759	49031.4	415474.5	4.23	8.02	1268.9	2405.4	0	0
160	160	b	1	2916	2915.39	10	33.25	29153.89	9947	40469.3	1399626	4.06	10.64	1217	3192	0	0
160_R	158_R	b	1	308	307.21	10	33.25	3072.05	6906	30193.8	66232.5	3.03	5.47	908	1641.9	0	0
161	161	b	1	77	76.64	10	20.63	766.37	3781	15043.3	12464.8	2.43	4.02	729.2	1204.9	0	0
161_R	161_R	b	1	454	453.57	10	20.63	4535.7	5930	19872	141658.7	3.21	6.99	963.2	2097.7	0	0
162	162	b	1	787	786.27	10	32.61	7862.73	7039	37045.5	218118.5	3.79	6.45	1136	1934.1	0	0
162_R	162_R	b	1	31718	31717.73	10	32.61	317177.3	10006	91698.9	20888722	9.37	14.62	2811.8	4385	0	0
163	163	b	1	104	103.82	10	22.61	1038.2	4223	17410.1	17452.8	2.57	3.74	770.1	1122	0	0
163_R	163_R	b	1	1697	1696.9	10	22.61	16969.01	4406	24360.7	727125.9	3.59	9.05	1077.6	2714.1	0	0
164	164	b	1	3311	3310.5	10	20.53	33105.04	4053	36297.3	1411997	5.89	10.08	1767.6	3023	0	0
164_R	164_R	b	1	12783	12782.16	10	20.53	127821.6	6478	55017.9	7158541	8.93	12.55	2679.2	3765.2	0	0
165	165	b	1	22905	22904.43	10	37.76	229044.3	5084	73966.5	14907965	6.53	13.65	1958.8	4096	0	0
165_R	165_R	b	1	69310	69309.12	10	37.76	693091.2	8228	91770.9	61668701	8.1	18.25	2430.4	5474.9	0	0
166	166	b	1	22905	22904.43	10	37.76	229044.3	5084	73966.5	14907965	6.53	13.65	1958.8	4096	0	0
166_R	166_R	b	1	69310	69309.12	10	37.76	693091.2	8228	91770.9	61668701	8.1	18.25	2430.4	5474.9	0	0
167	167	b	1	216	215.28	10	36.47	2152.81	4700	29663.1	41479.3	2.71	5.17	813.3	1551.2	0	0
167_R	167_R	b	1	11578	11577.02	10	36.47	115770.2	9169	73325.1	6546733	6.7	13.85	2010.4	4155.9	0	0
171	171	b	1	99	98.72	10	24.89	987.17	2729	19742	14906	2.64	3.6	793.2	1081.2	0	0
171_R	171_R	b	1	107	106.01	10	24.89	1060.13	2634	19848	16647	2.66	3.85	797.5	1154.2	0	0
172	172	b	1	38564	38563.78	10	51.84	385637.8	15679	91859.2	34261742	5.91	21.34	1771.9	6402.7	0	0
172_R	172_R	b	1	14976	14975.36	10	51.84	149753.6	11054	85906.1	9870906	5.52	14.99	1657.1	4495.8	0	0
173	173	b	1	19059	19058.07	10	55.54	190580.7	12787	107098.1	12278421	6.43	16.15	1928.2	4843.8	0	0
173_R	173_R	b	1	18382	18381.72	10	55.54	183817.2	11622	101068.2	11579300	6.07	16	1819.7	4799.3	0	0
174	174	b	1	3672	3671.87	10	29.82	36718.73	9309	46250.3	1511372	5.17	9.05	1550.7	2714.5	0	0
174_R	174_R	b	1	46	45.66	10	29.82	456.61	2183	18807	4918	2.1	2.43	630.6	730.5	0	0
175	175	b	1	10966	10965.85	10	29.99	109658.5	9726	35533.6	8554141	3.95	16.15	1185	4844.9	0	0
175_R	175_R	b	1	145293	145292.2	10	29.99	1452922	14549	6.02E+04	2.00E+08	6.7	27.85	2008.7	8354.5	0	0
176	176	b	1	16419	16418.58	10	40.9	164185.8	11250	82320.7	9574631	6.71	13.88	2012.8	4164.6	0	0
176_R	175_R	b	1	2791	2790.67	10	40.9	27906.72	8180	37147	1429565	3.03	10.73	908.3	3219.7	0	0
177	177	b	1	2738	2737.2	10	33.77	27372.03	4838	52599.4	954143	5.19	8.79	1557.7	2635.6	0	0
177_R	177_R	b	1	5980	5979.11	10	33.77	59791.12	2810	65291.6	2492509	6.45	8.75	1933.5	2624.5	0	0
178	178	b	1	23922	23921.38	10	48.63	239213.8	9700	78765.5	16388711	5.4	14.45	1619.7	4335.2	0	0
178_R	178_R	b	1	26356	26355.29	10	48.63	263552.9	8957	81578.9	18252456	5.59	14.73	1677.5	4418.1	0	0
179	179	b	1	1482	1481.07	10	97.97	14810.74	5914	90957	391574	3.09	7.79	928.4	2336.1	0	0
179_R	179_R	b	1	1552	1551.62	10	97.97	15516.22	6454	94750.5	372191.3	3.22	5.84	967.2	1753	0	0
180	180	b	1	511	510.44	10	29.51	5104.44	5336	27947.8	136162.1	3.16	6.37	946.9	1911.3	0	0
180_R	180_R	b	1	247	246.74	10	29.51	2467.42	5802	24505.9	51378.6	2.77	4.73	830.3	1417.8	0	0
181	181	b	1	3779	3778.26	10	80.68	37782.62	4574	113423.4	1158424	4.69	6.98	1405.9	2094.8	0	0
181_R	181_R	b	1	2142	2141.28	10	80.68	21412.76	3896	96313.2	582382.5	3.98	6.17	1193.8	1851.5	0	0
182	182	b	1	5484	5483.89	10	85.51	54838.94	7193	106059	1961243	4.13	7.88	1240.3	2364.5	0	0
182_R	182_R	b	1	2899	2898.35	10	85.51	28983.51	5632	91886.8	921544.1	3.58	7.68	1074.5	2302.8	0	0
184	184	b	1	221987	221986	10	35.35	2219860	13559	1.25E+05	2.80E+08	11.75	25.68	3524	7703	0	0
184_R	184_R	b	1	5642	5641.06	10	35.35	56410.58	5018	52859.6	2730050	4.98	11.24	1495.5	3372.9	0	0
187	187	b	1	57	56.21	10	26	562.05	3216	17773.4	6969.6	2.28	2.94	683.5	881.2	0	0
187_R	187_R	b	1	93	92.2	10	26	921.95	4327	18845.5	15031.5	2.42	4.49	724.7	1346.8	0	0
188	188	b	1	9856	9855.01	10	45.55	98550.07	16788	94032.6	4386375	6.88	10.38	2064.4	3112.5	0	0
188_R	188_R	b	1	7905	7904.06	10	45.55	79040.61	11181	72509.7	3827346	5.31	10.42	1591.9	3125	0	0

Line	Descriptio	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
189	189	b	1	4819	4818.11	10	34.81	48181.09	10706	44880.2	2444869	4.3	10.86	1289.1	3256.9	0	0
189_R	189_R	b	1	699	698.36	10	34.81	6983.57	8047	35859.4	198555.1	3.43	6.59	1030	1976.8	0	0
190	190	b	1	1083	1082.23	10	45.72	10822.29	6638	53205.7	288046.7	3.88	6.6	1163.8	1980.8	0	0
190_R	190_R	b	1	148912	148911	10	45.72	1489110	15205	1.45E+05	1.50E+08	10.58	23.15	3173.5	6945.3	0	0
191	191	b	1	791	790.96	10	52.82	7909.64	7159	48397.3	202526.9	3.05	6.64	916.3	1991.6	0	0
191_R	191_R	b	1	9530	9529.99	10	52.82	95299.95	12009	65511	6091220	4.13	14.58	1240.4	4372.8	0	0
192	192	b	1	5407	5406.77	10	106.44	54067.66	8267	142329.1	1773134	4.46	8.08	1337.1	2424	0	0
192_R	192_R	b	1	4169	4168.92	10	106.44	41689.16	7554	133949.9	1286079	4.19	7.62	1258.4	2284.9	0	0
193	193	b	1	3685	3685	10	30.79	36849.97	9416	41260.2	1745317	4.47	10.79	1340.1	3237.4	0	0
193_R	193_R	b	1	2603	2602.15	10	30.79	26021.46	9800	44779.9	1042241	4.85	8.74	1454.4	2623.3	0	0
194	194	b	1	817	816.78	10	27.4	8167.83	3501	38008.5	204137.7	4.62	5.78	1387.3	1732.7	0	0
194_R	194_R	b	1	872	871.95	10	27.4	8719.5	4215	38030.4	222955.2	4.63	5.78	1388.1	1733.6	0	0
195	195	b	1	817	816.78	10	27.4	8167.83	3501	38008.5	204137.7	4.62	5.78	1387.3	1732.7	0	0
195_R	195_R	b	1	872	871.95	10	27.4	8719.5	4215	38030.4	222955.2	4.63	5.78	1388.1	1733.6	0	0
197	197	b	1	2199	2198.09	10	32.27	21980.9	9305	45707.3	823071.8	4.72	10.57	1416.2	3169.5	0	0
197_R	197_R	b	1	2762	2761.43	10	32.27	27614.32	7278	43833	1133679	4.53	8.85	1358.2	2653.9	0	0
200	200	b	1	28381	28380.93	10	27.93	283809.3	9180	66932.5	20229734	7.99	15.16	2396.1	4549.4	0	0
200_R	200_R	b	1	1241	1240.12	10	27.93	12401.23	6396	30102.5	464756.4	3.59	8.28	1077.6	2483.3	0	0
202	202	b	1	659	658.61	10	95.08	6586.11	7930	88040.1	116257.6	3.09	4.27	926	1281.6	0	0
202_R	202_R	b	1	749	748.18	10	95.08	7481.76	7234	85321.2	155099.5	2.99	6.12	897.4	1834.5	0	0
203	203	b	1	67362	67361.26	10	68.81	673612.6	9905	149743.9	57509904	7.25	18.12	2176.1	5436	0	0
203_R	203_R	b	1	9291	9290.49	10	68.81	92904.92	9188	119994.8	3859940	5.81	9.64	1743.8	2892.4	0	0
206	206	b	1	659225	659224.6	10	54.38	6592246	28317	1.86E+05	1.00E+09	11.4	35.04	3421.5	10511.3	0	0
206_R	206_R	b	1	2962	2961.66	10	54.38	29616.64	12505	59736.4	1268100	3.66	10.36	1098.5	3108.5	0	0
207	207	b	1.00E+00	2.00E+06	2022575	10	51.68	20225751	19922	1.97E+05	4.10E+09	12.71	42.34	3814.3	12703.4	0	0
207_R	207_R	b	1	121166	121165.9	10	51.68	1211659	19237	1.56E+05	1.20E+08	10.05	23.04	3016.1	6912.6	0	0
208	208	b	1	81436	81435.19	10	61.13	814351.9	30298	151626.6	67471115	8.27	20.89	2480.5	6265.5	0	0
208_R	208_R	b	1	30273	30272.42	10	61.13	302724.2	16865	77757.7	25491401	4.24	18.18	1272	5454.2	0	0
209	209	b	1	12486	12485.12	10	49.89	124851.2	17009	102980.8	5772196	6.88	11.04	2064.3	3312.8	0	0
209_R	209_R	b	1	37445	37444.98	10	49.89	374449.8	14429	108128.7	26376582	7.23	15.39	2167.5	4616.6	0	0
210	210	b	1	106857	106856.2	10	46.96	1068562	19844	8.58E+04	1.20E+08	6.09	24.75	1827.7	7425.5	0	0
210_R	210_R	b	1	63342	63341.55	10	46.96	633415.5	16944	114590.4	49781531	8.13	17.32	2440.1	5197.2	0	0
211	211	b	1	174892	174891.7	10	81.87	1748917	19746	2.20E+05	1.60E+08	8.94	20.26	2681.9	6076.6	0	0
211_R	211_R	b	1	567029	567028	10	81.87	5670280	39505	3.39E+05	6.40E+08	13.79	24.91	4138.1	7472.7	0	0
212	212	b	1	142569	142568.1	10	78.82	1425681	13453	1.51E+05	1.60E+08	6.38	25.45	1913.4	7634	0	0
212_R	212_R	b	1	372066	372065.4	10	78.82	3720654	29420	1.87E+05	4.90E+08	7.93	31.34	2377.8	9401.8	0	0
213	213	b	1	1134	1133.8	10	86.68	11337.97	8609	77072.1	294683	2.96	6.28	889.1	1884.1	0	0
213_R	213_R	b	1	11448	11447.57	10	86.68	114475.7	14007	108689.5	5975166	4.18	12.3	1253.9	3688.8	0	0
214	214	b	1	6441	6440.03	10	105.41	64400.3	9692	103378	3702330	3.27	13.66	980.7	4097.2	0	0
214_R	214_R	b	1	28739	28739	10	105.41	287390	18752	127299.6	20906846	4.03	16.08	1207.7	4823.7	0	0
216	216	b	1	222104	222103.2	10	123.79	2221032	28817	2.29E+05	2.40E+08	6.17	23.32	1851.7	6995.7	0	0
216_R	216_R	b	1	77065	77064.25	10	123.79	770642.5	16048	157602.6	82287861	4.24	23.17	1273.1	6950.1	0	0
217	217	b	1	1582	1581.58	10	113.68	15815.8	5936	103693.1	378596.7	3.04	5.96	912.1	1788	0	0
217_R	217_R	b	1	2528	2527.98	10	113.68	25279.84	6019	117151.9	673312.1	3.44	7.08	1030.5	2122.7	0	0
219	219	b	1	838659	838658.2	10	136.24	8386582	14454	5.10E+05	9.20E+08	12.48	23.55	3744	7063.7	0	0
219_R	219_R	b	1	918636	918635.7	10	136.24	9186357	9667	5.04E+05	1.00E+09	12.32	24	3695.8	7199.4	0	0
220	220	b	1	52178	52177.34	10	131.61	521773.4	9270	256998.9	28351666	6.51	12.15	1952.7	3643.8	0	0
220_R	220_R	b	1	65138	65137.38	10	131.61	651373.8	14430	281166.7	36366742	7.12	12.43	2136.4	3727.9	0	0
221	221	b	1	329688	329687.6	10	97.13	3296876	25106	3.14E+05	3.50E+08	10.77	25.88	3231.9	7764.2	0	0

Line	Descriptio	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
221_R	221_R	b	1	61446	61445.51	10	97.13	614455.1	16948	237300.8	37560337	8.14	15.59	2443	4675.7	0	0
222	222	b	1	44909	44908.74	10	83.44	449087.4	18550	176028.4	31260140	7.03	16.81	2109.8	5042.9	0	0
222_R	222_R	b	1	32611	32610.21	10	83.44	326102.1	19218	170230.9	20508911	6.8	15.7	2040.3	4711.1	0	0
223	223	b	1	66255	66254.86	10	86.62	662548.6	16202	108287.6	69404695	4.17	25.42	1250.2	7626.4	0	0
223_R	223_R	b	1	334522	334521.7	10	86.62	3345217	18655	1.47E+05	5.00E+08	5.65	32.1	1693.6	9629.2	0	0
224	224	b	1	12061	12060.04	10	41.53	120600.4	11497	73242.2	6697072	5.88	11.8	1763.8	3540.4	0	0
224_R	224_R	b	1	8816	8815.66	10	41.53	88156.59	8070	67906.1	4479720	5.45	10.64	1635.3	3191.8	0	0
225	225	b	1	31998	31997.8	10	76.08	319978	18694	131806.4	24453200	5.78	18.42	1732.5	5524.8	0	0
225_R	225_R	b	1	2079	2078.22	10	76.08	20782.17	12447	84773.5	679837.4	3.71	8.08	1114.3	2422.7	0	0
226	226	b	1	427773	427772.1	10	71.52	4277721	18665	1.97E+05	5.70E+08	9.16	28.4	2749	8519.2	0	0
226_R	226_R	b	1	196818	196817.1	10	71.52	1968171	22020	1.73E+05	2.20E+08	8.06	24.08	2419.4	7224.9	0	0
227	227	b	1	1432	1431.97	10	33.15	14319.67	2603	45332.8	409560.7	4.56	6.08	1367.4	1824.8	0	0
227_R	227_R	b	1	1105	1104.82	10	33.15	11048.24	2115	42409.2	298866.3	4.26	5.76	1279.2	1729.5	0	0
228	228	b	1	476	475.94	10	29.63	4759.41	3410	29176.2	123863.6	3.28	5.7	984.8	1711.4	0	0
228_R	228_R	b	1	2553	2552.29	10	29.63	25522.88	5110	34166	1098307	3.84	8.83	1153.2	2649.6	0	0
229	229	b	1	58	57.09	10	30.5	570.89	2472	19122.5	6878.3	2.09	3.27	627.1	981.9	0	0
229_R	229_R	b	1	253	252.26	10	30.5	2522.65	2534	27744.9	49797.4	3.03	4.64	909.8	1391.7	0	0
230	230	b	1	826	825.24	10	15.25	8252.42	3358	20226.9	273530.4	4.42	6.85	1326.2	2055.9	0	0
230_R	230_R	b	1	388	387.34	10	15.25	3873.35	3430	17894.5	101428.6	3.91	5.52	1173.3	1655.3	0	0
232	232	b	1	78	77.1	10	29.35	771	2129	19853.6	10810.3	2.25	3.57	676.4	1070.7	0	0
232_R	232_R	b	1	245	244.57	10	29.35	2445.71	2470	26621.1	48530.6	3.02	4.64	906.9	1391.5	0	0
233	233	b	1	19584	19583.52	10	65.34	195835.2	7410	115281.3	11330417	5.88	12.51	1764.3	3753.9	0	0
233_R	233_R	b	1	18317	18316.56	10	65.34	183165.6	7132	93107.8	11653080	4.75	13.64	1424.9	4091.2	0	0
234	234	b	1	378	377.69	10	38.82	3776.92	3898	31277.2	79373.7	2.69	4.8	805.7	1440	0	0
234_R	234_R	b	1	458	457.55	10	38.82	4575.53	4467	28752.1	119943.6	2.47	6.12	740.6	1836	0	0
235	235	b	1	1431	1430.96	10	31.09	14309.63	2187	44874.9	409516.2	4.81	6.08	1443.5	1824.8	0	0
235_R	235_R	b	1	1088	1087.57	10	31.09	10875.71	2147	41122.8	294333.5	4.41	5.75	1322.8	1725.4	0	0
236	236	b	1	5332	5331.72	10	19.93	53317.21	3628	37837.5	2510847	6.33	11.04	1898.9	3312.4	0	0
236_R	236_R	b	1	797	796.68	10	19.93	7966.79	3226	19723.7	290633.8	3.3	9.05	989.9	2713.9	0	0
237	237	b	1	1431	1430.56	10	30.01	14305.59	2187	44874.9	409516.2	4.98	6.08	1495.2	1824.8	0	0
237_R	237_R	b	1	1088	1087.17	10	30.01	10871.68	2147	41122.8	294333.5	4.57	5.75	1370.2	1725.4	0	0
238	238	b	1	1466	1465.83	10	34.23	14658.27	3063	48540.3	418975.2	4.73	6.1	1418.2	1829.1	0	0
238_R	238_R	b	1	1241	1240.98	10	34.23	12409.84	3239	46904.7	339370.8	4.57	5.87	1370.4	1761.2	0	0
240	240	b	1	21088	21087.21	10	79.94	210872.1	19581	136826.8	12909703	5.71	15.04	1711.7	4513.1	0	0
240_R	240_R	b	1	64879	64878.9	10	79.94	648789	19491	111315.1	68467287	4.64	23.84	1392.5	7152.5	0	0
241	241	b	1	916011	916010.7	10	77.1	9160107	26000	1.74E+05	1.90E+09	7.53	42.66	2258.2	12799.1	0	0
241_R	241_R	b	1	353478	353477.6	10	77.1	3534776	35471	2.48E+05	4.00E+08	10.74	25.58	3220.6	7675.2	0	0
242	242	b	1	292283	292283	10	104.72	2922830	27587	2.78E+05	3.20E+08	8.85	25.12	2655.5	7535.7	0	0
242_R	242_R	b	1	340274	340273.4	10	104.72	3402734	20013	2.78E+05	4.00E+08	8.86	26.29	2659.4	7886.8	0	0
243	243	b	1	141985	141984.2	10	68.19	1419842	14233	1.59E+05	1.30E+08	7.78	20.03	2333.8	6008.2	0	0
243_R	243_R	b	1	708	707.09	10	68.19	7070.89	8722	53906.5	216361.2	2.64	7.56	790.5	2267.5	0	0
245	245	b	1	533825	533824.4	10	44.88	5338244	18995	1.89E+05	7.50E+08	14.06	29.49	4219.2	8845.6	0	0
245_R	245_R	b	1	3187	3186.97	10	44.88	31869.7	5940	46325.7	1534175	3.44	9.99	1032.1	2995.8	0	0
246	246	b	1	6682	6681.1	10	112.34	66811	11018	112748.7	3752738	3.35	13.66	1003.7	4097.2	0	0
246_R	246_R	b	1	31707	31706.03	10	112.34	317060.3	14908	126970.7	27948362	3.77	20.57	1130.3	6172.1	0	0
248	248	b	1	15861	15860.55	10	73.31	158605.5	19423	137917.6	8066659	6.27	12.84	1881.4	3853.4	0	0
248_R	248_R	b	1	60556	60555.39	10	73.31	605553.9	18872	141402.6	51125359	6.43	18.52	1928.9	5556.9	0	0
249	249	b	1	4999	4998.18	10	63.17	49981.84	7713	81882.8	2390267	4.32	12.32	1296.2	3695.7	0	0
249_R	249_R	b	1	3167	3166.15	10	63.17	31661.52	6763	81186.3	1065808	4.28	7.76	1285.1	2327.8	0	0

Line	Descriptio	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
251	251	b	1	6043	6042.91	10	88.75	60429.06	15358	102998.1	2823626	3.87	11.02	1160.5	3306.4	0	0
251_R	251_R	b	1	28264	28263.35	10	88.75	282633.5	21470	122215.5	20123992	4.59	15.45	1377	4634.6	0	0
252	252	b	1	22795	22794.71	10	39.5	227947.1	10052	67370.5	15276054	5.69	15.51	1705.8	4651.6	0	0
252_R	252_R	b	1	5603	5602.26	10	39.5	56022.64	8018	54505.1	2501411	4.6	9.94	1380	2982.8	0	0
253	253	b	1	8344	8343.61	10	61.96	83436.14	8487	97257.1	3728326	5.23	10.46	1569.6	3136.9	0	0
253_R	253_R	b	1	4381	4380.82	10	61.96	43808.22	5285	81305.2	1664200	4.37	8.66	1312.2	2597.7	0	0
254	254	b	1	16526	16525.61	10	86.52	165256.1	11319	163188.3	7411254	6.29	10.15	1886.1	3044.3	0	0
254_R	254_R	b	1	8801	8800.56	10	86.52	88005.56	10540	143608.8	3361949	5.53	8.76	1659.8	2627.6	0	0
256	256	b	1	456	455.27	10	36.81	4552.74	3543	27349.6	132615.9	2.48	6.32	743	1897.2	0	0
256_R	256_R	b	1	704	703.51	10	36.81	7035.09	4492	29601.7	236160.4	2.68	7.72	804.2	2316.9	0	0
257	257	b	1	141364	141363.6	10	85.45	1413636	18499	2.08E+05	1.50E+08	8.12	23.04	2434.6	6913.2	0	0
257_R	257_R	b	1	90058	90057.06	10	85.45	900570.6	12133	172628.8	82809577	6.73	19.65	2020.2	5896.5	0	0
258	258	b	1	125663	125662.6	10	90.06	1256626	25636	1.63E+05	1.30E+08	6.05	24.45	1813.9	7335.1	0	0
258_R	258_R	b	1	217900	217899.7	10	90.06	2178997	22044	1.50E+05	3.00E+08	5.54	31.97	1662.9	9589.6	0	0
259	259	b	1	353	352.43	10	35.3	3524.26	3843	30200.5	72694.8	2.85	4.68	855.6	1403.4	0	0
259_R	259_R	b	1	457	456.2	10	35.3	4562.03	4481	28672	119921.8	2.71	6.12	812.3	1836	0	0
260	260	b	1	2645	2644.47	10	79.44	26444.68	3981	103013.2	735302	4.32	6.42	1296.8	1926.9	0	0
260_R	260_R	b	1	23954	23953.99	10	79.44	239539.9	8231	144275.4	14471435	6.05	13.33	1816.2	3999.8	0	0
263	263	b	1	41203	41202.06	10	36.39	412020.6	9298	64469.6	36319262	5.91	18.51	1771.7	5551.9	0	0
263_R	263_R	b	1	49838	49837.3	10	36.39	498373	11830	87562.6	43107407	8.02	19.14	2406.4	5741.1	0	0
264	264	b	1	7186	7185.08	10	34.64	71850.84	9130	45605.7	4023922	4.39	12.38	1316.7	3712.7	0	0
264_R	264_R	b	1	190	189.99	10	34.64	1899.9	4831	25090.1	39922	2.41	5.25	724.4	1574.3	0	0
265	265	b	1	16964	16963.67	10	71.09	169636.7	18249	113221.2	11365453	5.31	14.96	1592.7	4486.9	0	0
265_R	265_R	b	1	47995	47994.8	10	71.09	479948	21055	130848.6	39026686	6.14	18.49	1840.7	5547.7	0	0
266	266	b	1	16878	16877.55	10	74.92	168775.5	15696	118920.9	11319828	5.29	14.96	1587.3	4486.9	0	0
266_R	266_R	b	1	44952	44951.82	10	74.92	449518.2	0	0	0	0	0	0	0	0	0

Scenario 2: Rationalized Bus Route																
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost
10	10	b	1	1055	1054.57	10	17.33	10545.72	7701	24563.4	375596.5	4.72	7.95	1417.1	2383.6	0
10_R	10_R	b	1	2006	2005.5	10	17.33	20055	7476	29988.9	891510.1	5.77	10.01	1730.1	3003.4	0
11A	11A	b	1	2261	2260.1	10	20.27	22600.99	11014	30331.1	1104037	4.99	11.5	1496.4	3449	0
11A_R	11A_R	b	1	92	91.5	10	20.27	914.99	5332	16689.5	16500.8	2.74	4.53	823.4	1359.6	0
11B	11B	b	1	865	864.38	10	32.53	8643.84	6169	29173.3	337075.3	2.99	9.05	896.8	2714.4	0
11B_R	11B_R	b	1	258	257.16	10	32.53	2571.58	5380	25149.6	70776.9	2.58	6.45	773.1	1934.4	0
11C	11C	b	1	24959	24958.41	10	39.81	249584.1	15824	68954.2	18815283	5.77	17.93	1732.2	5380.4	0
11C_R	11C_R	b	1	7890	7889.33	10	39.81	78893.32	10340	47145.5	5126232	3.95	14.98	1184.3	4493.3	0
12A	12A	b	1	53829	53828.93	10	27.4	538289.3	10288	68802.2	52603193	8.37	21.78	2510.8	6532.8	0
12A_R	12A_R	b	1	86733	86732.23	10	27.4	867322.3	14650	7.82E+04	1.00E+08	9.52	25.02	2855	7505.2	0
12B	12B	b	1	57212	57211.45	10	30.09	572114.5	39228	100011.8	50018317	11.08	21.18	3323.7	6352.7	0
12B_R	12B_R	b	1	70416	70415.17	10	30.09	704151.7	33468	104872.1	71634770	11.62	25.43	3485.3	7628.2	0
13	13	b	1	2897	2896.51	10	29.07	28965.14	9611	37552.3	1454810	4.31	11.57	1292	3471.6	0
13_R	13_R	b	1	2822	2821.97	10	29.07	28219.67	10287	36757	1400579	4.22	11.49	1264.6	3447	0
14A	14A	b	1	1053	1052.04	10	25.89	10520.37	8769	28611.3	440699.9	3.68	10.01	1105	3002.5	0
14A_R	14A_R	b	1	148	147.12	10	25.89	1471.15	5947	21851.8	29628.8	2.81	5.31	843.9	1593.1	0
14B	14B	b	1	85	84.42	10	26.32	844.22	4678	18405.4	14027.6	2.33	4.08	699.4	1224.6	0
14B_R	14B_R	b	1	989	988.4	10	26.32	9883.98	9360	25578.1	447621.5	3.24	10.26	971.9	3076.7	0
15A	15A	b	1	959	958.83	10	32.99	9588.27	5015	39887	312450.2	4.03	7.87	1209.2	2361.4	0
15A_R	15A_R	b	1	8844	8843.93	10	32.99	88439.26	7002	52188.4	5897523	5.27	14.81	1582.1	4441.9	0
15B	15B	b	1	438	437.5	10	30.51	4375.03	6147	33024.5	115528.2	3.61	6.47	1082.4	1940.1	0
15B_R	15B_R	b	1	450	449.83	10	30.51	4498.34	6437	35200.9	113691.3	3.85	6.32	1153.7	1896.8	0
16A	16A	b	1	827	826.26	10	28.11	8262.64	7352	31788.6	278841.4	3.77	7.84	1130.8	2352.9	0
16A_R	16A_R	b	1	917	916.09	10	28.11	9160.94	6812	31552.1	308448.8	3.74	7.85	1122.4	2356.1	0
16B	16B	b	1	20909	20908.92	10	23.3	209089.2	13530	59499.8	15642069	8.51	17.21	2553.6	5162.1	0
16B_R	16B_R	b	1	5620	5619.54	10	23.3	56195.42	8286	35076.5	3916768	5.02	14.71	1505.4	4414.3	0
16C	16C	b	1	73876	73875.25	10	18.3	738752.5	9715	60953.6	82705983	11.1	24.55	3331.2	7364.5	0
16C_R	16C_R	b	1	44990	44989.56	10	18.3	449895.6	9754	55236.8	44790919	10.06	20.85	3018.7	6254.7	0
16D	16D	b	1	13364	13363.16	10	40.09	133631.6	23679	84550.4	7613333	7.03	14.22	2109.2	4265.5	0
16D_R	16D_R	b	1	33371	33370.99	10	40.09	333709.9	26970	96839.5	27390593	8.05	22.19	2415.8	6657.4	0
17	17	b	1	30696	30695.37	10	74.25	306953.7	9473	108378.4	22211296	4.87	18.72	1459.6	5616	0
17_R	17_R	b	1	35083	35082.96	10	74.25	350829.6	9664	111073.1	26343138	4.99	19.89	1495.9	5965.7	0
18	18	b	1	27496	27495.56	10	26.27	274955.6	8968	26910.8	35636655	3.41	26.01	1024.3	7803.6	0
18_R	18_R	b	1	8909	8908.75	10	26.27	89087.53	7490	21929.6	8705987	2.78	19.62	834.7	5886.8	0
19	19	b	1	817	816.24	10	35.22	8162.41	2806	34956	247992.1	3.31	6.73	992.5	2017.6	0
19_R	19_R	b	1	1843	1842.13	10	35.22	18421.32	3098	40988.4	686833.8	3.88	8.36	1163.8	2506.9	0
1A	1A	b	1	43160	43159.89	10	19.33	431598.9	14558	54203.7	42232340	9.35	20.57	2804.4	6171.8	0
1A_R	1A_R	b	1	346924	346923.7	10	19.33	3469237	18487	8.51E+04	5.80E+08	14.68	33.61	4405.3	10082	0
1B	1B	b	1	478	477.23	10	36.55	4772.29	7795	36756.5	138098	3.35	7.93	1005.5	2380.1	0
1B_R	1B_R	b	1	2374	2373.12	10	36.55	23731.22	10382	43826.2	1110218	4	10.89	1198.9	3267.4	0
1C	1C	b	1	4627	4626.89	10	25.75	46268.88	5042	57312.5	2003423	7.42	10.05	2225.8	3014.9	0
1C_R	1C_R	b	1	4223	4222.85	10	25.75	42228.52	8113	56552.8	1810493	7.32	11.2	2196.3	3359.8	0
1D	1D	b	1	3534	3533.73	10	39.25	35337.29	9779	50159.2	2033187	4.26	12.82	1277.9	3846.5	0
1D_R	1D_R	b	1	2665	2664.41	10	39.25	26644.06	8538	44876.9	1546773	3.81	12.37	1143.3	3712.5	0
20	20	b	1	44	43.46	10	22.77	434.62	1829	15121.7	6057	2.21	3.41	664	1021.6	0
20_R	20_R	b	1	14008	14007.9	10	22.77	140079	9827	40812.1	11619732	5.97	17.38	1792.1	5215	0
21	21	b	1	266	265.05	10	30.84	2650.51	2937	28177.1	56295.9	3.05	4.87	913.6	1459.6	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost
21_R	21_R	b	1	238	237.83	10	30.84	2378.3	2975	26683.3	50859.6	2.88	5.08	865.1	1524.6	0
22	22	b	1	249	248.81	10	71.35	2488.07	2686	45566.9	47504.6	2.13	4.84	638.6	1450.8	0
22_R	22_R	b	1	239	238.36	10	71.35	2383.64	2870	46941.8	42636.9	2.19	4.66	657.9	1399.1	0
23	23	b	1	71	70.51	10	55.38	705.09	1676	35386.3	7954.1	2.13	2.51	639	752.9	0
23_R	23_R	b	1	62	61.5	10	55.38	615	1611	34502.2	6494.1	2.08	2.27	623	682.2	0
24	24	b	1	303	302.86	10	28.92	3028.6	2319	27463.1	69935.3	3.16	5.04	949.5	1510.8	0
24_R	24_R	b	1	315	314.44	10	28.92	3144.39	2333	27947.9	72161	3.22	5	966.2	1499.5	0
2A	2A	b	1	43470	43469.65	10	24.57	434696.5	15378	60539.9	42307720	8.21	20.62	2463.6	6186.4	0
2A_R	2A_R	b	1	141	140.9	10	24.57	1409.02	6603	20122.1	30017.3	2.73	5.38	818.8	1615.4	0
2B	2B	b	1	14520	14519.96	10	22.51	145199.6	11813	31413.6	13282411	4.65	18.95	1395.3	5686.3	0
2B_R	2B_R	b	1	676	675.86	10	22.51	6758.56	6614	21860.4	324355.4	3.24	11.2	971	3359.8	0
3A	3A	b	1	16250	16249.01	10	29.28	162490.1	16580	71161	11525769	8.1	15.79	2430.7	4735.9	0
3A_R	3A_R	b	1	19659	19658	10	29.28	196580	14408	67362.8	15037103	7.67	16.67	2301	5002	0
3B	3B	b	1	14272	14271.92	10	28.53	142719.2	11844	67643.4	9965231	7.9	15.41	2370.7	4622.8	0
3B_R	3B_R	b	1	19158	19157.03	10	28.53	191570.3	11048	64867.3	14756574	7.58	16.67	2273.4	5002	0
4A	4A	b	1	5436	5435.42	10	31.28	54354.17	10729	52940.4	2771162	5.64	13.39	1692.2	4016.8	0
4A_R	4A_R	b	1	31415	31414.73	10	31.28	314147.3	15078	75344.3	26479241	8.03	17.87	2408.3	5360.5	0
4B	4B	b	1	46306	46305.84	10	29.06	463058.4	15887	89244.3	39119899	10.24	18.19	3071.4	5456.9	0
4B_R	4B_R	b	1	25698	25697.98	10	29.06	256979.8	16414	76724.5	18688570	8.8	17.33	2640.5	5198.2	0
4C	4C	b	1	1356	1355.08	10	36.46	13550.8	3457	45625.2	467386.8	4.17	7.62	1251.3	2287.2	0
4C_R	4C_R	b	1	1129	1128.36	10	36.46	11283.65	3354	42811.3	378411.4	3.91	7.38	1174.1	2215.2	0
5	5	b	1	9629	9628.2	10	22.86	96282.03	11483	50869.9	6462890	7.42	16.58	2225.2	4973	0
5_R	5_R	b	1	20837	20836.46	10	22.86	208364.6	11393	60557.1	14929604	8.83	16.23	2649	4868.8	0
6	6	b	1	3433	3432.63	10	36.42	34326.31	12027	54501.6	1718536	4.99	12.4	1496.6	3721	0
6_R	6_R	b	1	23530	23529.39	10	36.42	235293.9	12283	71177.4	19262805	6.52	19.61	1954.5	5883.1	0
7A	7A	b	1	19028	19027.7	10	20.56	190277	11727	53066.4	13777596	8.6	16.07	2581.1	4820.2	0
7A_R	7A_R	b	1	38447	38446.36	10	20.56	384463.6	15345	52475.9	36786806	8.51	20.97	2552.4	6290.3	0
7B	7B	b	1	1648	1647.76	10	18	16477.58	7230	21661.9	846102.5	4.01	11.29	1203.4	3387.6	0
7B_R	7B_R	b	1	63849	63848.4	10	18	638484	13216	43523.9	86689818	8.06	31.71	2417.8	9512.3	0
8	8	b	1	11190	11189.4	10	30.69	111894	17597	62742.2	7817562	6.81	15.66	2044.4	4699.4	0
8_R	8_R	b	1	42188	42187.82	10	30.69	421878.2	17770	69020.9	44089703	7.5	21.96	2248.9	6587.7	0
9A	9A	b	1	986	986	10	32.91	9859.96	11157	39698.4	316353.1	4.02	7.51	1206.2	2252.7	0
9A_R	9A_R	b	1	2232	2231.33	10	32.91	22313.27	12355	42339.4	957016.2	4.29	9.85	1286.5	2954.5	0
9B	9B	b	1	7108	7107.2	10	22.4	71071.98	9405	35333.7	4891100	5.26	14.32	1577.4	4296.4	0
9B_R	9B_R	b	1	35753	35752.85	10	22.4	357528.5	17126	60394.3	33932042	8.99	22.56	2696.2	6768.4	0

Scenario 2: I	
Line	consum
10	0
10_R	0
11A	0
11A_R	0
11B	0
11B_R	0
11C	0
11C_R	0
12A	0
12A_R	0
12B	0
12B_R	0
13	0
13_R	0
14A	0
14A_R	0
14B	0
14B_R	0
15A	0
15A_R	0
15B	0
15B_R	0
16A	0
16A_R	0
16B	0
16B_R	0
16C	0
16C_R	0
16D	0
16D_R	0
17	0
17_R	0
18	0
18_R	0
19	0
19_R	0
1A	0
1A_R	0
1B	0
1B_R	0
1C	0
1C_R	0
1D	0
1D_R	0
20	0
20_R	0
21	0

Line	consum
21_R	0
22	0
22_R	0
23	0
23_R	0
24	0
24_R	0
2A	0
2A_R	0
2B	0
2B_R	0
3A	0
3A_R	0
3B	0
3B_R	0
4A	0
4A_R	0
4B	0
4B_R	0
4C	0
4C_R	0
5	0
5_R	0
6	0
6_R	0
7A	0
7A_R	0
7B	0
7B_R	0
8	0
8_R	0
9A	0
9A_R	0
9B	0
9B_R	0

Scenario 3: Existing Bus Route with BRT																	
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
101	101	b	1	6244	6243.94	10	22.37	62439.42	7859	34041.2	3628737	5.07	12.41	1522	3721.7	0	0
101_R	101_R	b	1	152	151.75	10	22.37	1517.49	4470	16983	31807.2	2.53	4.97	759.3	1492	0	0
102	102	b	1	373	372.68	10	16.21	3726.77	2924	16977.9	99224.6	3.49	5.86	1047.7	1757.9	0	0
102_R	102_R	b	1	67	66.97	10	16.21	669.71	2219	12001.4	10710.6	2.47	3.74	740.6	1121	0	0
103	103	b	1	263	262.73	10	17.15	2627.35	4113	15203.7	76865.2	2.96	6.88	886.7	2064.6	0	0
103_R	103_R	b	1	348	347.84	10	17.15	3478.43	4191	17834.3	89449	3.47	5.82	1040.2	1747.1	0	0
104	104	b	1	1646	1645.9	10	17.52	16458.98	4606	22723.6	678716.8	4.32	8.9	1297.1	2670.3	0	0
104_R	104_R	b	1	32	31.08	10	17.52	310.82	2867	10589	3707.9	2.01	2.91	604.4	873	0	0
105	105	b	1	176	175.88	10	14.33	1758.81	2910	11955.3	43272.5	2.78	5.41	834.1	1623.2	0	0
105_R	105_R	b	1	15	14.22	10	14.33	142.22	2872	7420.4	1314.3	1.73	2.16	517.7	647.9	0	0
106	106	b	1	154	153.01	10	19.61	1530.1	6090	16554.3	32911.2	2.81	5.4	844.4	1619.2	0	0
106_R	106_R	b	1	458	457.31	10	19.61	4573.12	5576	20720.3	137020.1	3.52	7.32	1056.8	2195.6	0	0
107	107	b	1	271	270.73	10	22.62	2707.3	6578	18431.9	69412.7	2.72	6.19	814.9	1856.3	0	0
107_R	107_R	b	1	115	114.16	10	22.62	1141.58	6165	16144.3	23373.1	2.38	5.65	713.7	1694	0	0
109	109	b	1	61	60.36	10	15.31	603.65	4092	9099.9	13068.8	1.98	5.12	594.2	1535.4	0	0
109_R	109_R	b	1	29	28.6	10	15.31	285.99	3611	9582.8	3473.9	2.09	3.08	625.7	923.4	0	0
110	110	b	1	103	102.85	10	16.69	1028.51	4696	13512.3	19019.2	2.7	4.3	809.5	1288.7	0	0
110_R	110_R	b	1	58	57.08	10	16.69	570.8	3922	12121.5	8482.4	2.42	3.49	726.2	1046.5	0	0
111	111	b	1	817	816.61	10	15.8	8166.14	4595	19892.9	287264.5	4.2	7.95	1258.7	2384.5	0	0
111_R	111_R	b	1	94	93	10	15.8	930.04	2914	10724.2	20189.4	2.26	4.93	678.5	1478.1	0	0
112	112	b	1	76	75.28	10	15.24	752.81	4854	10710.4	15324.9	2.34	4.88	702.9	1465.3	0	0
112_R	112_R	b	1	201	200.5	10	15.24	2004.95	2973	12400.7	55656.7	2.71	6.12	813.8	1834.8	0	0
113	113	b	1	1008	1007.8	10	18.15	10078.02	6729	15898.7	464326.7	2.92	9.58	875.8	2873.4	0	0
113_R	112_R	b	1	21	20.78	10	18.15	207.78	3435	9526.3	2146.1	1.75	2.77	524.8	831.6	0	0
114	114	b	1	226	225.88	10	16.72	2258.85	4715	14830.9	59723.3	2.96	6.15	887	1846	0	0
114_R	114_R	b	1	276	275.2	10	16.72	2751.97	6041	15597.4	71944.5	3.11	6	932.9	1800.6	0	0
115	115	b	1	3733	3732.33	10	16.04	37323.33	5218	26471.1	2074189	5.5	12.12	1650.1	3635.5	0	0
115_R	114_R	b	1	308	307.41	10	16.04	3074.11	4929	15819.7	85242.8	3.29	6.63	986.2	1987.9	0	0
116	116	b	1	463	462.76	10	15.05	4627.58	4296	18939.7	124734.6	4.2	6.03	1258.6	1809.9	0	0
116_R	116_R	b	1	54	53.71	10	15.05	537.08	3305	10429.6	8530	2.31	3.84	693.1	1153.1	0	0
117	117	b	1	618	617.86	10	17.52	6178.62	6208	17701.3	217653.4	3.37	8.46	1010.1	2539	0	0
117_R	117_R	b	1	121	120.94	10	17.52	1209.36	4215	13129.2	24636.8	2.5	4.82	749.2	1445.3	0	0
118	118	b	1	26	25.75	10	12.96	257.53	1911	7515.3	3331.8	1.93	3.11	580	933.5	0	0
118_R	118_R	b	1	23	22.52	10	12.96	225.23	3044	7485.3	2765	1.93	3.08	577.7	923.3	0	0
119	119	b	1	373	372.68	10	16.21	3726.77	2924	16977.9	99224.6	3.49	5.86	1047.7	1757.9	0	0
119_R	119_R	b	1	67	66.97	10	16.21	669.71	2219	12001.4	10710.6	2.47	3.74	740.6	1121	0	0
120	120	b	1	98	97.58	10	17.21	975.76	4024	13420.9	18103.9	2.6	4.35	779.7	1305.9	0	0
120_R	120_R	b	1	1813	1812.77	10	17.21	18127.66	6870	23237	812114.4	4.5	10.27	1349.9	3080.5	0	0
122	122	b	1	176	175.88	10	14.33	1758.81	2910	11955.3	43272.5	2.78	5.41	834.1	1623.2	0	0
122_R	122_R	b	1	15	14.22	10	14.33	142.22	2872	7420.4	1314.3	1.73	2.16	517.7	647.9	0	0
123	123	b	1	51	50.95	10	14.43	509.48	2404	10761.6	7802.8	2.49	3.77	745.8	1130.9	0	0
123_R	123_R	b	1	22	21.88	10	14.43	218.84	2572	8871.8	2394.7	2.05	2.64	614.8	791.4	0	0
124	124	b	1	380	379.26	10	19.52	3792.6	4406	21470.8	93728.2	3.67	5.59	1099.9	1677.4	0	0
124_R	124_R	b	1	317	316.79	10	19.52	3167.93	5078	17685.9	83977.3	3.02	6.46	906	1938.8	0	0
125	125	b	1	469	468.95	10	13.41	4689.52	4387	14891.9	147987.6	3.7	7.18	1110.9	2155.2	0	0
125_R	125_R	b	1	26	25.87	10	13.41	258.66	3798	8488	3243.2	2.11	3.27	633.2	979.8	0	0
126	126	b	1	1078	1077.67	10	14.76	10776.66	3819	20851.6	382199.4	4.71	7.89	1413	2367.5	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
126_R	126_R	b	1	310	309.32	10	14.76	3093.19	3363	15981.4	79331.2	3.61	6.01	1082.9	1803.4	0	0
127	127	b	1	2819	2818.92	10	10.38	28189.2	3889	18240.3	1427967	5.86	10.92	1757.5	3277.5	0	0
127_R	127_R	b	1	2044	2043.98	10	10.38	20439.8	3859	16438.3	986326.9	5.28	10.65	1583.9	3195.9	0	0
129	129	b	1	380	379.81	10	21.93	3798.06	6557	17264.9	114272.5	2.62	6.79	787.2	2038.3	0	0
129_R	129_R	b	1	49	48.64	10	21.93	486.41	5102	12840	7583.1	1.95	4.3	585.4	1290.7	0	0
130	130	b	1	197	196.59	10	20.29	1965.91	8089	17431.4	46453.8	2.86	5.9	859.3	1770.4	0	0
130_R	130_R	b	1	47	46.56	10	20.29	465.6	5537	13346.1	6126.6	2.19	3.2	657.9	958.8	0	0
131	131	b	1	783	782.85	10	16.47	7828.52	4459	16322.3	302494	3.3	8.27	991	2480.6	0	0
131_R	131_R	b	1	24	23.16	10	16.47	231.55	3394	8997	2666.2	1.82	3.01	546.3	903.2	0	0
132	132	b	1	23	22.89	10	21.81	228.93	3770	7589.1	2325.1	1.16	2.82	347.9	844.9	0	0
132_R	132_R	b	1	696	695.73	10	21.81	6957.29	4792	14139.4	275538.8	2.16	8.57	648.2	2570.2	0	0
133	133	b	1	19	18.42	10	19.78	184.19	2671	7136	1685	1.2	2.65	360.8	794	0	0
133_R	133_R	b	1	23	22.53	10	19.78	225.33	3093	7595.4	2263.4	1.28	2.72	384	816.9	0	0
134	134	b	1	92	91.36	10	29.23	913.6	4085	12145	17668.5	1.38	4.53	415.4	1359.7	0	0
134_R	134_R	b	1	1563	1562.58	10	29.23	15625.85	5678	18104.2	748125.5	2.06	9.81	619.3	2943.1	0	0
135	135	b	1	71	70.5	10	15.54	705	3890	8934.4	14615.6	1.92	4.83	574.9	1447.7	0	0
135_R	135_R	b	1	49	48.42	10	15.54	484.16	3324	8886.5	8350.3	1.91	4.17	571.8	1249.8	0	0
137	137	b	1	463	462.61	10	16.21	4626.08	5668	17252.4	143793.6	3.55	7.58	1064.4	2273.3	0	0
137_R	137_R	b	1	54	53.66	10	16.21	536.64	4094	11542.4	8053.5	2.37	3.68	712.1	1103.9	0	0
138	138	b	1	24	23.93	10	22.27	239.34	2994	8516.6	2456.4	1.27	2.94	382.4	882.6	0	0
138_R	138_R	b	1	42	41.85	10	22.27	418.53	3146	9004.3	6586.2	1.35	4.3	404.3	1291.1	0	0
139	139	b	1	40	39.56	10	21.21	395.59	2630	7242	6039.6	1.14	3.82	341.5	1145.7	0	0
139_R	139_R	b	1	14	13.48	10	21.21	134.81	2376	5549.7	920.1	0.87	2.51	261.7	753.8	0	0
142	142	b	1	23	23	10	14.44	229.96	3050	8011.6	2789.4	1.85	3.12	554.8	937	0	0
142_R	142_R	b	1	30	29.56	10	14.44	295.56	3004	8539.5	3876.7	1.97	3.12	591.4	936.5	0	0
143	143	b	1	11	10.09	10	14.85	100.91	2390	5396.4	735.2	1.21	1.98	363.4	594.6	0	0
143_R	143_R	b	1	12	11	10	14.85	110.02	2397	5531	884.7	1.24	2.34	372.5	702	0	0
144	144	b	1	15	14.82	10	19.95	148.22	2657	6663.1	1141.6	1.11	2.3	333.9	689	0	0
144_R	144_R	b	1	230	229.07	10	19.95	2290.67	4262	10252.7	75099.6	1.71	7.1	513.8	2130.8	0	0
145	145	b	1	362	361.44	10	13.8	3614.38	3709	12639.1	109689	3.05	6.72	915.8	2014.9	0	0
145_R	145_R	b	1	41	40.12	10	13.8	401.19	3468	9345.4	5814.1	2.26	3.36	677.1	1007.8	0	0
146	146	b	1	44	43.12	10	25.21	431.25	3017	11098.1	5598	1.47	3.49	440.2	1045.5	0	0
146_R	146_R	b	1	106	105.05	10	25.21	1050.45	4000	12968.6	20398	1.71	4.74	514.3	1422.8	0	0
148	148	b	1	1211	1210.82	10	14.99	12108.17	6777	19586.8	515728.1	4.36	9.16	1306.5	2749.4	0	0
148_R	148_R	b	1	501	500.91	10	14.99	5009.11	5170	16623.1	158298.4	3.7	7.59	1108.8	2278.1	0	0
151	151	b	1	204	203.52	10	21.34	2035.2	3339	13846.2	46598.3	2.16	5.25	648.7	1576.1	0	0
151_R	151_R	b	1	4095	4094.97	10	21.34	40949.69	6505	23909.7	2377123	3.73	12.65	1120.2	3795.2	0	0
152	152	b	1	1565	1564.55	10	26.61	15645.54	6241	26452.8	636283.6	3.31	8.77	994.2	2631.3	0	0
152_R	152_R	b	1	1681	1680.38	10	26.61	16803.78	7098	33298.6	611322	4.17	8.35	1251.4	2503.9	0	0
153	153	b	1	138	137.91	10	21.84	1379.1	4419	16666.7	27436.3	2.54	4.65	763.3	1395	0	0
153_R	153_R	b	1	437	436.37	10	21.84	4363.68	4738	20503.1	127730.2	3.13	7.16	939	2148.8	0	0
154	154	b	1	885	884.79	10	20.11	8847.85	5436	19084.8	344818.8	3.16	8.55	949	2564.4	0	0
154_R	154_R	b	1	313	312.6	10	20.11	3125.99	6966	18238.8	86079.8	3.02	6.45	906.9	1936.1	0	0
155	155	b	1	24	23.56	10	18.2	235.57	3720	8693.5	2682.3	1.59	3.13	477.6	940.3	0	0
155_R	155_R	b	1	423	422.29	10	18.2	4222.91	5103	12872.3	152884.8	2.36	7.79	707.2	2336.9	0	0
156	156	b	1	16	15.59	10	11.64	155.94	2063	5787.3	1720.1	1.66	2.88	497.2	863.5	0	0
156_R	156_R	b	1	21	20.69	10	11.64	206.9	2280	6298.7	2514	1.8	3.02	541.2	905.3	0	0
157	157	b	1	52	51.54	10	12.71	515.39	2854	8988.6	9197.2	2.36	4.31	707	1293.1	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
157_R	157_R	b	1	20	19.71	10	12.71	197.1	2255	7563.4	2246.8	1.98	2.85	594.9	855.5	0	0
158	158	b	1	7497	7496.73	10	20.08	74967.29	8951	24860.9	5239128	4.13	14.46	1238.2	4336.6	0	0
158_R	158_R	b	1	41	40.47	10	20.08	404.74	3249	12237.9	5046.7	2.03	3.2	609.5	958.8	0	0
159	159	b	1	308	307.44	10	17.97	3074.42	6008	19449.8	73026.6	3.61	5.52	1082.2	1654.6	0	0
159_R	159_R	b	1	6784	6783.09	10	17.97	67830.91	10114	29640.9	4250858	5.5	13.22	1649.3	3965.1	0	0
160	160	b	1	20	19.57	10	15.47	195.72	3678	8693.7	2045.5	1.87	2.67	562.1	801.3	0	0
160_R	158_R	b	1	445	444.83	10	15.47	4448.28	5397	15889.5	144934.7	3.42	7.17	1027.3	2151.6	0	0
161	161	b	1	113	112.02	10	9.6	1120.25	3303	9163.7	24227.8	3.18	4.84	955	1450.6	0	0
161_R	161_R	b	1	37	36.31	10	9.6	363.1	3134	6985.6	5538.4	2.43	3.67	728	1100.6	0	0
162	162	b	1	351	350.66	10	15.17	3506.62	5659	17407.5	90097	3.83	5.82	1147.6	1746	0	0
162_R	162_R	b	1	2480	2479.99	10	15.17	24799.88	6312	19347.4	1447458	4.25	13.17	1275.5	3952.5	0	0
163	163	b	1	72	71.72	10	10.51	717.2	2261	7879.3	14849.1	2.5	4.77	749.4	1431.7	0	0
163_R	163_R	b	1	87	86.11	10	10.51	861.12	3274	7943	19342.6	2.52	5.1	755.4	1529	0	0
164	164	b	1	89	88.77	10	9.55	887.74	2420	7734.6	20096.4	2.7	5.11	809.8	1533.2	0	0
164_R	164_R	b	1	289	288.55	10	9.55	2885.55	2677	10237.7	90759.7	3.57	7.13	1071.9	2138.2	0	0
165	165	b	1	200	200	10	17.56	1999.98	3087	9255.1	56531.7	1.76	6.16	527	1847.7	0	0
165_R	165_R	b	1	15	14.05	10	17.56	140.51	1938	5579.3	1156.8	1.06	2.48	317.7	743.1	0	0
166	166	b	1	200	200	10	17.56	1999.98	3087	9255.1	56531.7	1.76	6.16	527	1847.7	0	0
166_R	166_R	b	1	15	14.05	10	17.56	140.51	1938	5579.3	1156.8	1.06	2.48	317.7	743.1	0	0
167	167	b	1	182	181.88	10	16.96	1818.79	3389	14608.9	44434.2	2.87	5.79	861.2	1738.1	0	0
167_R	167_R	b	1	50	49.92	10	16.96	499.19	3737	11683.8	7391.7	2.3	3.75	688.7	1125.5	0	0
171	171	b	1	47	46.05	10	11.58	460.49	2649	8186.7	7749.4	2.36	3.91	707.2	1172.4	0	0
171_R	171_R	b	1	16	15.06	10	11.58	150.61	2224	6631.9	1588.5	1.91	2.63	572.9	789.6	0	0
172	172	b	1	162	161.87	10	24.11	1618.71	4350	13542.3	40490.5	1.87	6.03	561.6	1807.9	0	0
172_R	172_R	b	1	53	52.73	10	24.11	527.33	4058	12029.3	7134.6	1.66	3.39	498.9	1016.6	0	0
173	173	b	1	4528	4527.17	10	25.83	45271.74	6378	25919.1	2600016	3.34	12.61	1003.3	3781.8	0	0
173_R	173_R	b	1	8395	8394.02	10	25.83	83940.19	7993	29003.5	5706248	3.74	14.67	1122.7	4401.3	0	0
174	174	b	1	87	86.86	10	13.87	868.59	3245	10378.6	18420.9	2.49	5.27	748.2	1582.2	0	0
174_R	174_R	b	1	64	63.9	10	13.87	639.03	3560	10716.2	10756.9	2.58	4.63	772.5	1388.3	0	0
175	175	b	1	62	61.75	10	13.95	617.52	3382	7122.9	13108.3	1.7	4.79	510.7	1436.4	0	0
175_R	175_R	b	1	10	9.87	10	13.95	98.68	2141	5094	747.7	1.22	2.04	365.2	612.2	0	0
176	176	b	1	152	151.03	10	19.02	1510.33	4908	12118.4	42359.5	2.12	6.36	637.1	1909.4	0	0
176_R	175_R	b	1	945	944.71	10	19.02	9447.1	4589	24194.4	303055.2	4.24	7.32	1271.9	2197.4	0	0
177	177	b	1	42	41.67	10	15.71	416.73	2483	11563.6	5420.7	2.45	3.33	736.3	1000.3	0	0
177_R	177_R	b	1	85	84.64	10	15.71	846.39	3005	11841	18405.4	2.51	5.8	753.9	1738.6	0	0
178	178	b	1	164	163.74	10	22.62	1637.41	3683	13377.8	34611.2	1.97	4.79	591.4	1437.1	0	0
178_R	178_R	b	1	213	212.58	10	22.62	2125.84	3905	12679.4	54465.1	1.87	5.93	560.6	1779.4	0	0
179	179	b	1	1397	1396.37	10	45.57	13963.7	6831	47690	403792.8	3.49	6.53	1046.6	1958.4	0	0
179_R	179_R	b	1	128	127.18	10	45.57	1271.78	4739	26276.2	20974.3	1.92	4.06	576.7	1218.9	0	0
180	180	b	1	17	16.73	10	13.73	167.32	1775	7351.2	1755.7	1.79	2.7	535.5	810.5	0	0
180_R	180_R	b	1	65	64.8	10	13.73	647.98	2645	10178.9	11149.6	2.47	4.21	741.5	1262.2	0	0
181	181	b	1	140	139.19	10	37.53	1391.91	3648	29219.7	20755.4	2.6	3.7	778.7	1110.9	0	0
181_R	181_R	b	1	565	564.68	10	37.53	5646.85	5186	35927	149791.1	3.19	6.17	957.4	1852.3	0	0
182	182	b	1	6833	6832.66	10	39.77	68326.58	7816	42710.6	3808477	3.58	11.86	1073.8	3558.6	0	0
182_R	182_R	b	1	30418	30417.28	10	39.77	304172.8	12909	56628.2	26981769	4.75	19.21	1423.8	5761.7	0	0
184	184	b	1	80	79.13	10	16.44	791.26	2394	10061.3	14642.4	2.04	4.54	612	1362.7	0	0
184_R	184_R	b	1	62	61.14	10	16.44	611.39	2348	9093.7	10553.1	1.84	4.28	553.1	1283.3	0	0
187	187	b	1	1137	1136.54	10	12.09	11365.4	5281	16950.1	465165	4.67	9.52	1401.4	2855.1	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
187_R	187_R	b	1	47	46.15	10	12.09	461.46	4045	9541.2	6834.9	2.63	3.49	788.9	1048.3	0	0
188	188	b	1	3250	3249.86	10	21.19	32498.61	7680	43953.5	1224623	6.92	8.25	2074.7	2473.9	0	0
188_R	188_R	b	1	2790	2789.33	10	21.19	27893.28	7245	29019.1	1300128	4.57	10.56	1369.7	3167.1	0	0
189	189	b	1	2614	2613.4	10	16.19	26133.98	7323	24687.6	1189651	5.08	10.25	1524.6	3075.1	0	0
189_R	189_R	b	1	1069	1068.94	10	16.19	10689.38	6963	20093.9	395274.1	4.14	8.39	1240.9	2516.7	0	0
190	190	b	1	590	589.76	10	21.26	5897.57	5709	25403.8	166029.9	3.98	6.77	1194.7	2031.3	0	0
190_R	190_R	b	1	965	964.82	10	21.26	9648.21	9329	27418.5	331958.1	4.3	8.08	1289.4	2423.3	0	0
191	191	b	1	504	503.06	10	24.57	5030.58	5093	20892.4	165890	2.83	7.71	850.5	2311.7	0	0
191_R	191_R	b	1	899	898.89	10	24.57	8988.94	6681	25021.6	301928	3.4	7.54	1018.6	2260.9	0	0
192	192	b	1	2834	2833.22	10	49.51	28332.18	6552	48702.6	1307543	3.28	10.12	983.7	3036	0	0
192_R	192_R	b	1	240	239.14	10	49.51	2391.39	5561	36335.6	45216.4	2.45	5.17	733.9	1550.3	0	0
193	193	b	1	283	282.6	10	14.32	2826.04	4528	14601.7	74735.9	3.4	5.94	1019.6	1781.7	0	0
193_R	193_R	b	1	835	834.15	10	14.32	8341.55	6582	18154.8	291258.3	4.23	7.49	1267.7	2247.7	0	0
194	194	b	1	18	18	10	12.74	179.99	2510	7634.3	1927.8	2	2.66	599.1	799.2	0	0
194_R	194_R	b	1	24	23.36	10	12.74	233.59	2677	7767.8	3100.6	2.03	3.59	609.6	1075.6	0	0
195	195	b	1	18	18	10	12.74	179.99	2510	7634.3	1927.8	2	2.66	599.1	799.2	0	0
195_R	195_R	b	1	24	23.36	10	12.74	233.59	2677	7767.8	3100.6	2.03	3.59	609.6	1075.6	0	0
197	197	b	1	6022	6021.13	10	15.01	60211.33	6105	25266.6	3701764	5.61	12.89	1683.2	3866.2	0	0
197_R	197_R	b	1	34	33.34	10	15.01	333.4	4018	9316	4578.1	2.07	3.53	620.6	1059.4	0	0
200	200	b	1	51	50.55	10	12.99	505.53	3184	10119.8	7789.6	2.6	3.9	778.9	1169.5	0	0
200_R	200_R	b	1	30	29.02	10	12.99	290.22	3522	8847.8	3709.1	2.27	3.29	681	985.7	0	0
202	202	b	1	846	845.6	10	44.22	8455.96	7430	45184	225585.5	3.41	5.99	1021.8	1797.8	0	0
202_R	202_R	b	1	3231	3230.93	10	44.22	32309.3	9365	52813.4	1336231	3.98	9.71	1194.3	2913.1	0	0
203	203	b	1	24	23.97	10	32.01	239.74	2758	9380.4	1785.6	0.98	2.4	293.1	720.1	0	0
203_R	203_R	b	1	89	88.16	10	32.01	881.59	4346	14227.2	13490.4	1.48	4.08	444.5	1222.7	0	0
206	206	b	1	14	13.7	10	25.29	136.99	2986	6076.3	734.5	0.8	1.97	240.2	590.2	0	0
206_R	206_R	b	1	12	11.86	10	25.29	118.63	2696	5196.1	507.5	0.68	1.9	205.4	569.4	0	0
207	207	b	1	56	55.79	10	24.04	557.88	3479	9150.6	9557.3	1.27	4.68	380.7	1402.6	0	0
207_R	207_R	b	1	23	22.06	10	24.04	220.6	2835	7492	2022	1.04	2.71	311.7	812.6	0	0
208	208	b	1	1736	1735.86	10	28.43	17358.61	4046	21445.7	729130.2	2.51	9.72	754.3	2917	0	0
208_R	208_R	b	1	1957	1956.77	10	28.43	19567.71	4987	21669.3	849500.6	2.54	9.71	762.1	2914.1	0	0
209	209	b	1	20	19.26	10	23.2	192.59	2415	5743.5	1746.1	0.83	2.99	247.5	898.5	0	0
209_R	209_R	b	1	11	10.62	10	23.2	106.22	2076	4289.7	417.5	0.62	1.87	184.9	560.5	0	0
210	210	b	1	15	14.82	10	21.84	148.17	2906	5909.5	1062.7	0.9	2.52	270.6	756	0	0
210_R	210_R	b	1	28	27	10	21.84	270.04	3352	6617.4	3315.1	1.01	3.54	303	1061.2	0	0
211	211	b	1	99	98.34	10	38.08	983.43	5286	13029.9	19091	1.14	5.29	342.2	1586.1	0	0
211_R	211_R	b	1	32	31.37	10	38.08	313.71	4192	10151.8	2596.7	0.89	2.9	266.6	870.8	0	0
212	212	b	1	250	249.67	10	36.66	2496.7	5279	16820.5	61022.5	1.53	6.14	458.8	1840.6	0	0
212_R	212_R	b	1	2017	2016.97	10	36.66	20169.68	7664	22974.7	946377.9	2.09	11.44	626.7	3432.2	0	0
213	213	b	1	42640	42639.24	10	40.32	426392.4	17232	84874.6	33556608	7.02	17.48	2105.1	5243	0	0
213_R	213_R	b	1	13320	13319.83	10	40.32	133198.3	10992	47870.5	8715955	3.96	13.88	1187.3	4165.1	0	0
214	214	b	1	1601	1600.73	10	49.03	16007.33	6999	37719.2	555390.2	2.56	7.82	769.3	2344.6	0	0
214_R	214_R	b	1	1160	1159.77	10	49.03	11597.69	5204	31347.7	393380	2.13	7.04	639.4	2112.4	0	0
216	216	b	1	201	200.67	10	57.58	2006.67	4877	27480.8	35768.8	1.59	4.46	477.3	1337	0	0
216_R	216_R	b	1	122	121.45	10	57.58	1214.49	5549	22685.6	22043.6	1.31	5.35	394	1605.1	0	0
217	217	b	1	1681	1680.57	10	52.88	16805.72	7856	44063.2	572275.7	2.78	7.82	833.3	2344.6	0	0
217_R	217_R	b	1	13704	13703.19	10	52.88	137031.9	7032	50521.4	8824248	3.18	13.13	955.5	3938	0	0
219	219	b	1	10338	10337.87	10	63.37	103378.7	6128	61267	5211580	3.22	10.11	966.9	3034.1	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
219_R	219_R	b	1	11842	11841.85	10	63.37	118418.5	5961	62318.3	6187181	3.28	10.86	983.5	3258.7	0	0
220	220	b	1	660	659.93	10	61.21	6599.34	4309	30803.9	164047.9	1.68	5.5	503.2	1649.3	0	0
220_R	220_R	b	1	703	702.77	10	61.21	7027.72	4074	30536.1	178619.9	1.66	5.62	498.8	1687.4	0	0
221	221	b	1	4378	4377.5	10	45.18	43775.02	5273	40684.5	1899426	3	8.71	900.5	2612.7	0	0
221_R	221_R	b	1	4741	4740.56	10	45.18	47405.65	5056	40675.3	2100605	3	8.9	900.3	2670.1	0	0
222	222	b	1	3712	3711.93	10	38.81	37119.26	5431	22892.1	1937903	1.97	10.48	589.9	3144.7	0	0
222_R	222_R	b	1	3988	3987.89	10	38.81	39878.87	5651	23240.2	2119823	2	10.71	598.9	3213.8	0	0
223	223	b	1	40	39.81	10	40.29	398.1	3892	17934.9	3677.5	1.48	2.62	445.2	785.2	0	0
223_R	223_R	b	1	77	76.11	10	40.29	761.12	4636	20617.9	10910.7	1.71	4.37	511.8	1312.5	0	0
224	224	b	1	4056	4055.39	10	19.31	40553.86	8378	36121.8	1900490	6.23	10.25	1870.2	3073.5	0	0
224_R	224_R	b	1	4338	4337.71	10	19.31	43377.13	6445	33026.4	2196129	5.7	10.68	1710	3205.2	0	0
225	225	b	1	20	19.64	10	35.38	196.4	3011	6325.2	1039.5	0.6	2.49	178.8	748.4	0	0
225_R	225_R	b	1	19	18.68	10	35.38	186.8	2799	5988.8	909.1	0.56	2.42	169.2	725.3	0	0
226	226	b	1	45	44.1	10	33.27	440.98	2650	7284.6	6042.2	0.73	3.82	219	1145.7	0	0
226_R	226_R	b	1	19	18.02	10	33.27	180.21	2396	5602.4	923.4	0.56	2.51	168.4	753.8	0	0
227	227	b	1	41	40.68	10	15.42	406.8	1992	10638.5	5357.3	2.3	2.88	689.9	864.2	0	0
227_R	227_R	b	1	38	37.28	10	15.42	372.8	1133	10214.6	4815.4	2.21	2.84	662.4	852.1	0	0
228	228	b	1	151	150.08	10	13.78	1500.82	2574	12428.2	33282.1	3.01	4.7	901.9	1410	0	0
228_R	228_R	b	1	154	153.7	10	13.78	1536.98	1981	13102.7	32967.9	3.17	4.73	950.9	1419.2	0	0
229	229	b	1	9922	9921.2	10	14.18	99212.01	4426	36441.5	5882273	8.56	12.62	2569.2	3785.4	0	0
229_R	229_R	b	1	195	194.34	10	14.18	1943.43	2005	13808.5	44160	3.25	5	973.5	1499.8	0	0
230	230	b	1	64	63.36	10	7.09	633.56	2250	7346.8	11359.6	3.45	3.83	1035.7	1147.6	0	0
230_R	230_R	b	1	47	46.68	10	7.09	466.76	2039	6175.1	8221.2	2.9	3.79	870.5	1136.5	0	0
232	232	b	1	5902	5901.02	10	13.65	59010.23	3412	34527.6	2987330	8.43	10.49	2529	3148.5	0	0
232_R	232_R	b	1	194	193.97	10	13.65	1939.66	1845	13588.8	44121.7	3.32	5	995.3	1499.7	0	0
233	233	b	1	23	22.89	10	30.39	228.88	2651	7498.9	1700.1	0.82	2.51	246.7	754.1	0	0
233_R	233_R	b	1	42	41.21	10	30.39	412.13	3338	7939.1	5763.4	0.87	4.07	261.2	1221.1	0	0
234	234	b	1	24	23.37	10	18.06	233.73	2769	8704	2514	1.61	2.71	482	814.1	0	0
234_R	234_R	b	1	615	614.54	10	18.06	6145.39	5124	14579.3	237269.8	2.69	8.3	807.4	2490.3	0	0
235	235	b	1	39	38.22	10	14.46	382.2	1266	10188.9	5020.3	2.35	2.86	704.7	856.7	0	0
235_R	235_R	b	1	37	36.17	10	14.46	361.66	1133	9805	4705.6	2.26	2.84	678.1	851.3	0	0
236	236	b	1	14	13.94	10	9.27	139.38	1438	5075.7	1521	1.83	2.41	547.7	722.6	0	0
236_R	236_R	b	1	7	6.15	10	9.27	61.47	812	3585	440.8	1.29	1.75	386.8	525.5	0	0
237	237	b	1	39	38.03	10	13.96	380.31	1266	10188.9	5020.3	2.43	2.86	729.9	856.7	0	0
237_R	237_R	b	1	36	35.98	10	13.96	359.78	1133	9805	4705.6	2.34	2.84	702.4	851.3	0	0
238	238	b	1	42	41.44	10	15.92	414.42	2147	11336	5457.7	2.37	2.89	712.1	866.3	0	0
238_R	238_R	b	1	42	41.06	10	15.92	410.6	1776	11384.2	5341.7	2.38	2.84	715.1	852.3	0	0
240	240	b	1	220	219.2	10	37.18	2191.98	5167	18714	47792.4	1.68	5.03	503.3	1510	0	0
240_R	240_R	b	1	46	45.51	10	37.18	455.13	4334	13885	4953.6	1.24	3.2	373.4	959	0	0
241	241	b	1	29	28.29	10	35.86	282.87	3531	8620.4	2327.1	0.8	2.78	240.4	834.3	0	0
241_R	241_R	b	1	3294	3293.13	10	35.86	32931.26	6296	19203.7	2015527	1.79	12.59	535.5	3777.6	0	0
242	242	b	1	143	142.18	10	48.71	1421.82	4481	22781	23744.9	1.56	4.17	467.7	1250.5	0	0
242_R	242_R	b	1	47	46.4	10	48.71	463.96	3905	17629.1	4410.9	1.21	2.81	361.9	843.2	0	0
243	243	b	1	117	116.57	10	31.72	1165.71	5605	18505.2	18955.3	1.94	3.94	583.5	1180.6	0	0
243_R	243_R	b	1	569	568.72	10	31.72	5687.24	6285	19472.1	195266.1	2.05	7.19	614	2158.1	0	0
245	245	b	1	19	18.56	10	20.88	185.56	2565	6069.2	1764.4	0.97	2.99	290.7	896.8	0	0
245_R	245_R	b	1	10	9.69	10	20.88	96.92	2083	4381.4	414.9	0.7	1.77	209.9	532	0	0
246	246	b	1	1621	1620.9	10	52.25	16209.03	7688	39401.5	558869.8	2.51	7.82	754.1	2344.6	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
246_R	246_R	b	1	1164	1163.36	10	52.25	11633.62	5076	32740.9	393745.5	2.09	7.04	626.6	2112.4	0	0
248	248	b	1	18	17.09	10	34.1	170.86	2791	6344.7	754.8	0.62	1.93	186.1	579.9	0	0
248_R	248_R	b	1	18	17.66	10	34.1	176.64	2822	6334.6	822.7	0.62	2.09	185.8	625.6	0	0
249	249	b	1	29	28.74	10	29.38	287.4	3303	9234.7	2708.1	1.05	2.98	314.3	893.7	0	0
249_R	249_R	b	1	24	23.34	10	29.38	233.35	2939	8398.8	1865.9	0.95	2.54	285.8	761.7	0	0
251	251	b	1	13831	13830.09	10	41.28	138300.9	7497	32406.2	9930466	2.62	15.27	785	4580.5	0	0
251_R	251_R	b	1	23	22.63	10	41.28	226.34	3260	9329.4	1201.7	0.75	2.25	226	676.4	0	0
252	252	b	1	80	79.03	10	18.37	790.35	3825	11618.5	13949.3	2.11	4.04	632.5	1213.1	0	0
252_R	252_R	b	1	61	60.73	10	18.37	607.26	3784	11194.9	9467.8	2.03	3.84	609.4	1153.2	0	0
253	253	b	1	238	237.61	10	28.82	2376.05	4595	25531.1	48853.7	2.95	5.06	885.9	1516.6	0	0
253_R	253_R	b	1	189	188.79	10	28.82	1887.89	3543	23325.2	35936.8	2.7	4.58	809.4	1372.7	0	0
254	254	b	1	123	122.99	10	40.24	1229.93	4597	14722	23449.9	1.22	4.5	365.8	1350	0	0
254_R	254_R	b	1	376	375.16	10	40.24	3751.63	5191	20552.5	104625.6	1.7	7.02	510.7	2105.2	0	0
256	256	b	1	10445	10444.48	10	17.12	104444.8	5692	28924.5	7026822	5.63	14.4	1689.5	4321.1	0	0
256_R	256_R	b	1	27	26.38	10	17.12	263.82	2907	9621.9	3078.4	1.87	2.81	562	844.1	0	0
257	257	b	1	598	597.18	10	39.75	5971.78	7122	26855.4	153776.5	2.25	6.94	675.7	2082.2	0	0
257_R	257_R	b	1	91	90.24	10	39.75	902.45	3930	16293.2	13291.4	1.37	4.16	409.9	1248.2	0	0
258	258	b	1	35	34.32	10	41.89	343.16	4441	16030.8	2870.6	1.28	2.63	382.7	788	0	0
258_R	258_R	b	1	42	41.32	10	41.89	413.21	4111	16634.7	3999	1.32	2.7	397.1	809.4	0	0
259	259	b	1	22	21.44	10	16.42	214.41	2700	8173.5	2278.6	1.66	2.63	497.9	787.7	0	0
259_R	259_R	b	1	609	608.43	10	16.42	6084.28	5139	14507.5	234612.7	2.95	8.28	883.7	2484.3	0	0
260	260	b	1	95	94.09	10	36.95	940.88	3719	26292.3	12395.1	2.37	3.25	711.6	975.8	0	0
260_R	260_R	b	1	181	180.86	10	36.95	1808.56	4715	28331.6	33338.9	2.56	4.52	766.8	1355.8	0	0
263	263	b	1	37	36.03	10	16.92	360.35	2832	10113.9	4757.4	1.99	3.21	597.6	961.6	0	0
263_R	263_R	b	1	1907	1906.66	10	16.92	19066.63	4762	20666.3	838011	4.07	9.43	1221.1	2829.8	0	0
264	264	b	1	8426	8425.6	10	16.11	84255.97	6725	25039.7	5912882	5.18	14.79	1554.3	4437.5	0	0
264_R	264_R	b	1	44	43.09	10	16.11	430.92	4008	10926.2	6329.2	2.26	4.07	678.2	1222	0	0
265	265	b	1	16	15.91	10	33.06	159.09	2878	5763.6	647.6	0.58	1.97	174.3	590.2	0	0
265_R	265_R	b	1	15	14.71	10	33.06	147.07	2734	5132.9	496.2	0.52	1.91	155.2	572.1	0	0
266	266	b	1	17	16.58	10	34.85	165.8	2878	5763.6	647.6	0.55	1.97	165.4	590.2	0	0
266_R	266_R	b	1	16	15.38	10	34.85	153.77	2734	5132.9	496.2	0.49	1.91	147.3	572.1	0	0
BRT3	BRT3	B	2	31	30.54	3	44.1	91.63	268306	3834532	132750.2	66.88	110.6	86950.1	143777.3	0	0
BRT3_R	BRT3_R	B	2	31	30.54	3	44.1	91.61	270681	3990027	138129.4	69.6	111.56	90476	145030.2	0	0

Scenario 4: Rationalized Bus Route with BRT																	
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
10	10	b	1	51	50.13	10	17.33	501.31	4428	12447.6	8621.3	2.39	4.28	718.1	1283.9	0	0
10_R	10_R	b	1	660	659.35	10	17.33	6593.52	7100	24579.2	210313.8	4.73	7.71	1418	2313.5	0	0
11A	11A	b	1	1487	1486.03	10	20.27	14860.34	7516	23319.1	658787.5	3.83	9.06	1150.5	2717.3	0	0
11A_R	11A_R	b	1	484	483.01	10	20.27	4830.11	6253	23833.6	134515.5	3.92	6.42	1175.8	1925.3	0	0
11B	11B	b	1	87	86.89	10	32.53	868.86	4286	23630.2	12995.4	2.42	3.73	726.4	1118.1	0	0
11B_R	11B_R	b	1	145	144.48	10	32.53	1444.79	5080	24970.9	28731.5	2.56	5.43	767.6	1630.2	0	0
11C	11C	b	1	1899	1898.01	10	39.81	18980.07	8518	33801	863256.5	2.83	9.88	849.1	2964	0	0
11C_R	11C_R	b	1	1796	1795.41	10	39.81	17954.1	9238	33491.5	814413.7	2.8	10.14	841.3	3041.1	0	0
12A	12A	b	1	151	150.41	10	27.4	1504.08	6146	19298	30905.7	2.35	4.68	704.4	1405	0	0
12A_R	12A_R	b	1	279	278.47	10	27.4	2784.71	6815	20192.5	74115.7	2.46	6.02	737.1	1806.1	0	0
12B	12B	b	1	108	107.24	10	30.08	1072.4	7214	13724.4	24072.9	1.52	5.44	456.2	1632.4	0	0
12B_R	12B_R	b	1	96	95.87	10	30.08	958.68	6888	14277	19871.3	1.58	4.91	474.6	1473.4	0	0
13	13	b	1	2615	2614.31	10	29.07	26143.07	8917	34004.5	1337609	3.9	11.11	1169.9	3332	0	0
13_R	13_R	b	1	3886	3885.44	10	29.07	38854.36	10196	33832.2	2258872	3.88	13.34	1164	4000.7	0	0
14A	14A	b	1	2735	2734.34	10	25.89	27343.39	6053	33148.2	1359714	4.27	10.21	1280.2	3063.3	0	0
14A_R	14A_R	b	1	63	62.83	10	25.89	628.31	5032	17795.2	9501.9	2.29	3.65	687.3	1093.5	0	0
14B	14B	b	1	282	281.05	10	26.32	2810.5	6567	23022.3	69155.6	2.92	5.46	874.8	1637.5	0	0
14B_R	14B_R	b	1	286	285.93	10	26.32	2859.34	7059	18884.3	96471.9	2.39	7.48	717.5	2245.3	0	0
15A	15A	b	1	343	342.88	10	32.99	3428.85	6008	23316	101033.7	2.36	7.56	706.8	2269.3	0	0
15A_R	15A_R	b	1	2486	2485.58	10	32.99	24855.82	6298	29777.6	1236059	3.01	10.79	902.7	3237.5	0	0
15B	15B	b	1	3086	3085.07	10	30.5	30850.75	10448	28033.9	2070124	3.06	14.61	919	4383.9	0	0
15B_R	15B_R	b	1	422	421.57	10	30.5	4215.72	8911	22887.1	130743	2.5	7.42	750.3	2227.4	0	0
16A	16A	b	1	2867	2866.64	10	28.11	28666.41	11661	36331.6	1517352	4.31	12.26	1292.4	3678.3	0	0
16A_R	16A_R	b	1	19332	19331.33	10	28.11	193313.3	13336	46081.6	19083091	5.46	21.06	1639.2	6317.2	0	0
16B	16B	b	1	381	380.95	10	23.3	3809.47	6633	27596.7	91573.2	3.95	5.46	1184.4	1636.7	0	0
16B_R	16B_R	b	1	56380	56379.9	10	23.3	563799	13034	72851.4	58467566	10.42	23.36	3126.6	7008.6	0	0
16C	16C	b	1	304	303.21	10	18.29	3032.05	5389	10010.3	131193.2	1.82	8.96	547.3	2688.5	0	0
16C_R	16C_R	b	1	171	170.55	10	18.29	1705.47	4232	11851.3	47189.1	2.16	5.83	647.9	1749.5	0	0
16D	16D	b	1	12800	12799.44	10	40.09	127994.4	23307	69830.2	7964763	5.81	14.55	1742	4363.8	0	0
16D_R	16D_R	b	1	19883	19882.65	10	40.09	198826.5	26027	74546.7	14873953	6.2	18.35	1859.7	5506.3	0	0
17	17	b	1	5636	5635.33	10	74.25	56353.31	6052	57153.1	2670151	2.57	9.73	769.7	2918.9	0	0
17_R	17_R	b	1	6139	6138.89	10	74.25	61388.93	6031	58126.3	2974112	2.61	9.94	782.8	2983	0	0
18	18	b	1	88	87.35	10	26.27	873.54	2093	16817.4	14878.5	2.13	3.95	640.1	1183.7	0	0
18_R	18_R	b	1	44	43.93	10	26.27	439.32	1654	14441.4	5767.6	1.83	3.12	549.7	936.6	0	0
19	19	b	1	720	719.85	10	35.22	7198.5	2340	31648.7	213551.2	3	6.46	898.6	1938.4	0	0
19_R	19_R	b	1	1169	1168.17	10	35.22	11681.67	2603	35754.8	390952.9	3.38	7.35	1015.2	2205.9	0	0
1A	1A	b	1	22	21.62	10	19.32	216.25	3178	7144.3	2857.6	1.23	3.56	369.8	1068.9	0	0
1A_R	1A_R	b	1	10	9.6	10	19.32	96.03	2891	6158.7	669.6	1.06	2.17	318.8	651.4	0	0
1B	1B	b	1	6917	6916.65	10	36.55	69166.48	15885	42471.2	4326870	3.87	14.04	1162.1	4211.4	0	0
1B_R	1B_R	b	1	10716	10715.03	10	36.55	107150.3	16882	52097.5	7077955	4.75	14.31	1425.5	4292.8	0	0
1C	1C	b	1	31	30.77	10	25.75	307.67	2569	13351.4	3607.7	1.73	2.97	518.5	891.4	0	0
1C_R	1C_R	b	1	39	38.26	10	25.75	382.6	2556	13782.1	5051.2	1.78	3.39	535.3	1018.2	0	0
1D	1D	b	1	3917	3916.28	10	39.25	39162.81	7147	37177.8	2404411	3.16	12.76	947.2	3828.7	0	0
1D_R	1D_R	b	1	62	61.51	10	39.25	615.08	3968	24824.3	7576.8	2.11	2.9	632.5	870.1	0	0
20	20	b	1	3067	3067	10	22.77	30669.99	4338	24664.9	1741907	3.61	11.41	1083.1	3422.7	0	0
20_R	20_R	b	1	3374	3373.52	10	22.77	33735.21	6210	36838.5	1616917	5.39	10.87	1617.6	3261.9	0	0
21	21	b	1	78	77.57	10	30.84	775.68	2322	20523.2	11762.8	2.22	3.52	665.4	1057.5	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
21_R	21_R	b	1	82	81.75	10	30.84	817.54	2427	20312.5	12875.6	2.2	3.68	658.6	1102.5	0	0
22	22	b	1	227	226.02	10	71.35	2260.2	3286	45798.1	38419.1	2.14	4.39	641.8	1315.8	0	0
22_R	22_R	b	1	199	198.06	10	71.35	1980.62	3111	43953.7	32899.8	2.05	4.35	616	1304.5	0	0
23	23	b	1	77	76.95	10	55.38	769.51	1696	37239.4	8710.1	2.24	2.35	672.5	706	0	0
23_R	23_R	b	1	88	87.33	10	55.38	873.35	2170	37462.6	10878	2.26	3.51	676.5	1052.3	0	0
24	24	b	1	185	184.84	10	28.92	1848.37	2051	24152.5	37295.2	2.78	4.41	835	1323.4	0	0
24_R	24_R	b	1	193	192.08	10	28.92	1920.79	2064	24580.2	38581.2	2.83	4.38	849.8	1313.5	0	0
2A	2A	b	1	834	833.86	10	24.57	8338.58	7587	28909.1	265276.1	3.92	7.52	1176.4	2257.3	0	0
2A_R	2A_R	b	1	82	81.07	10	24.57	810.73	4586	14255.7	15969.9	1.93	4.74	580.1	1423.4	0	0
2B	2B	b	1	47	46.37	10	22.51	463.68	3663	10654.6	7995.8	1.58	4.22	473.4	1266.7	0	0
2B_R	2B_R	b	1	14	13.69	10	22.51	136.94	3087	8688.7	1109.2	1.29	2.14	386.1	642.9	0	0
3A	3A	b	1	1043	1042.28	10	29.27	10422.8	4428	28523	373556.2	3.25	7.53	974.5	2259.1	0	0
3A_R	3A_R	b	1	7334	7333.93	10	29.27	73339.26	7629	48780.2	4204850	5.56	12.38	1666.6	3714.6	0	0
3B	3B	b	1	1043	1042.07	10	28.53	10420.67	4428	28523	373556.2	3.33	7.53	999.9	2259.1	0	0
3B_R	3B_R	b	1	7334	7333.71	10	28.53	73337.13	7629	48780.2	4204850	5.7	12.38	1710	3714.6	0	0
4A	4A	b	1	14170	14169.3	10	31.28	141693	9941	63183.5	9568992	6.73	14.42	2019.6	4327.4	0	0
4A_R	4A_R	b	1	97158	97157.25	10	31.28	971572.5	19840	117210.1	96794880	12.49	25.05	3746.6	7514.9	0	0
4B	4B	b	1	3047	3046.72	10	29.06	30467.19	10125	37930.9	1723867	4.35	12.84	1305.4	3851	0	0
4B_R	4B_R	b	1	355	354.59	10	29.06	3545.91	6232	28675.7	89354.6	3.29	5.96	986.9	1787.2	0	0
4C	4C	b	1	1082	1081.64	10	36.46	10816.38	3213	42176.9	348663.6	3.86	7.1	1156.7	2131.3	0	0
4C_R	4C_R	b	1	936	935.19	10	36.46	9351.92	3151	38829.9	294488.9	3.55	6.89	1064.9	2066.4	0	0
5	5	b	1	16607	16606.48	10	22.86	166064.8	8706	63125.5	10629010	9.2	13.62	2761.3	4087.3	0	0
5_R	5_R	b	1	37	36.08	10	22.86	360.81	2918	13873.4	4727.9	2.02	3.25	606.9	976.1	0	0
6	6	b	1	1430	1429.23	10	36.42	14292.26	8545	44061.5	507951.7	4.03	8.46	1209.9	2538.1	0	0
6_R	6_R	b	1	6129	6128.93	10	36.42	61289.32	11418	59800.1	3196953	5.47	12.17	1642.1	3651.8	0	0
7A	7A	b	1	1187	1186.84	10	20.56	11868.43	8926	25735.4	472142	4.17	8.9	1251.8	2669.7	0	0
7A_R	7A_R	b	1	1701	1700.14	10	20.56	17001.39	7578	27041.4	773212.6	4.38	10.74	1315.3	3221.7	0	0
7B	7B	b	1	47	46.93	10	18	469.33	4544	12537.9	7244.7	2.32	3.83	696.5	1149.7	0	0
7B_R	7B_R	b	1	12705	12704.21	10	18	127042.1	8564	35198.8	9938361	6.52	17.71	1955.4	5314.1	0	0
8	8	b	1	3539	3538.92	10	30.68	35389.21	11194	41053	1930779	4.46	11.83	1338	3548.5	0	0
8_R	8_R	b	1	9628	9627.83	10	30.68	96278.31	14310	42298.4	8212522	4.6	18.12	1378.5	5436.1	0	0
9A	9A	b	1	5004	5003.21	10	32.91	50032.05	16880	41809.4	3422225	4.23	14.61	1270.4	4382.5	0	0
9A_R	9A_R	b	1	364	363.3	10	32.91	3633.03	9019	31211.4	93238.1	3.16	6.42	948.4	1927.3	0	0
9B	9B	b	1	4891	4890.84	10	22.4	48908.41	9336	31083.5	3177233	4.63	14.11	1387.7	4231.6	0	0
9B_R	9B_R	b	1	202	201.44	10	22.4	2014.43	6512	17999	62680.2	2.68	7.54	803.5	2262.1	0	0
BRT3	BRT3	B	2	30	29.5	3	42.59	88.51	312807	4041423	139937.3	72.99	131.6	94889.1	171073.6	0	0
BRT3_R	BRT3_R	B	2	30	29.5	3	42.59	88.49	304025	4012688	138948.5	72.48	125.82	94223.3	163568.8	0	0

Scenario 5: Existing Bus Route with MRT																	
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
101	101	b	1	355	354.1	10	48.09	3541.03	4445	24604.8	79478.1	1.71	5.72	511.7	1716.3	0	0
101_R	101_R	b	1	339	338.71	10	48.09	3387.12	4939	25025.7	73285.5	1.73	5.58	520.4	1672.8	0	0
102	102	b	1	105	104.3	10	34.84	1043.04	3004	8951.8	21182.6	0.86	4.83	256.9	1449.9	0	0
102_R	102_R	b	1	232	231.42	10	34.84	2314.15	4105	10499.6	63017	1	6.07	301.4	1822.3	0	0
103	103	b	1	21	20.21	10	36.86	202.14	2893	6212	1038	0.56	2.12	168.5	636.9	0	0
103_R	103_R	b	1	57	56.6	10	36.86	565.95	3837	8508.4	8258.7	0.77	4	230.8	1200.5	0	0
104	104	b	1	97	96.58	10	37.67	965.78	4259	15052.4	16953.6	1.33	4.38	399.6	1315.2	0	0
104_R	104_R	b	1	30	29.28	10	37.67	292.81	3619	12924.1	2589	1.14	3.08	343.1	922.8	0	0
105	105	b	1	16	15.58	10	30.82	155.82	2245	7235.7	790.6	0.78	2.08	234.8	625.4	0	0
105_R	105_R	b	1	14	13.47	10	30.82	134.69	2046	7266.5	576.4	0.79	1.53	235.8	458	0	0
106	106	b	1	34	33.38	10	42.15	333.83	4598	12649.3	2741.8	1	2.64	300.1	792.4	0	0
106_R	106_R	b	1	83	82.65	10	42.15	826.48	5539	16897.1	12593.1	1.34	4	400.9	1200.5	0	0
107	107	b	1	28	27.83	10	48.63	278.31	4272	11371.6	1612.3	0.78	2.12	233.8	636.9	0	0
107_R	107_R	b	1	96	95.52	10	48.63	955.21	5386	14352.8	14801.3	0.98	4	295.1	1200.5	0	0
109	109	b	1	49	48.65	10	32.93	486.5	2639	7566.8	7494	0.77	4.14	229.8	1242.9	0	0
109_R	109_R	b	1	2207	2206.58	10	32.93	22065.85	6444	17067.5	1064938	1.73	10.47	518.3	3140.9	0	0
110	110	b	1	21	20.11	10	35.89	201.07	2940	10228.8	1193.1	0.95	2.08	285	625.4	0	0
110_R	110_R	b	1	20	19.19	10	35.89	191.87	2537	11248.9	1136.3	1.04	1.76	313.4	527.4	0	0
111	111	b	1	50	49.77	10	33.98	497.69	3821	7614.3	7360	0.75	4.32	224.1	1295.7	0	0
111_R	111_R	b	1	151	150.08	10	33.98	1500.8	3685	8975.9	41258.7	0.88	6.15	264.2	1845.5	0	0
112	112	b	1	37	36.47	10	32.76	364.67	2980	7673	4844.4	0.78	3.9	234.2	1169.1	0	0
112_R	112_R	b	1	89	88.09	10	32.76	880.86	3428	8749.5	20149.4	0.89	5.35	267.1	1604.4	0	0
113	113	b	1	780	779.7	10	39.03	7797.01	6068	16497	305595.4	1.41	8.56	422.7	2569.4	0	0
113_R	112_R	b	1	682	681.24	10	39.03	6812.41	5487	15703.6	286183.4	1.34	9.09	402.3	2727.1	0	0
114	114	b	1	40	39.69	10	35.95	396.88	3635	12684.2	4069.1	1.18	2.93	352.9	877.6	0	0
114_R	114_R	b	1	888	887.26	10	35.95	8872.61	5301	18104.7	347352.9	1.68	8.24	503.6	2473.3	0	0
115	115	b	1	32	31.3	10	34.49	313	4125	12737.6	2780.7	1.23	2.54	369.3	763.2	0	0
115_R	114_R	b	1	306	305.42	10	34.49	3054.24	5987	18612.8	87117.4	1.8	6.44	539.7	1932.3	0	0
116	116	b	1	15	14.34	10	32.35	143.42	2184	4774.9	471.6	0.49	1.86	147.6	559.3	0	0
116_R	116_R	b	1	23	22.14	10	32.35	221.39	2403	6824.6	1587.3	0.7	2.62	210.9	784.9	0	0
117	117	b	1	83	82.52	10	37.68	825.16	4393	12046	13799.5	1.07	4.37	319.7	1310.4	0	0
117_R	117_R	b	1	1319	1318.49	10	37.68	13184.88	6355	15099.5	672615.5	1.34	10.45	400.8	3135.9	0	0
118	118	b	1	14	13.45	10	27.86	134.51	1735	5378.8	592.7	0.64	1.96	193.1	587.4	0	0
118_R	118_R	b	1	16	15.93	10	27.86	159.29	1668	6761.1	937.5	0.81	2.12	242.7	635.1	0	0
119	119	b	1	105	104.3	10	34.84	1043.04	3004	8951.8	21182.6	0.86	4.83	256.9	1449.9	0	0
119_R	119_R	b	1	232	231.42	10	34.84	2314.15	4105	10499.6	63017	1	6.07	301.4	1822.3	0	0
120	120	b	1	26	25.37	10	37.01	253.69	3291	8869.5	1874.5	0.8	2.64	239.7	792.4	0	0
120_R	120_R	b	1	39	38.77	10	37.01	387.69	3446	11127.1	4573.8	1	3.46	300.7	1039.5	0	0
122	122	b	1	16	15.58	10	30.82	155.82	2245	7235.7	790.6	0.78	2.08	234.8	625.4	0	0
122_R	122_R	b	1	14	13.47	10	30.82	134.69	2046	7266.5	576.4	0.79	1.53	235.8	458	0	0
123	123	b	1	12	11.88	10	31.03	118.84	1600	2491.1	167.1	0.27	1.09	80.3	328	0	0
123_R	123_R	b	1	13	12.06	10	31.03	120.61	1642	2749	201.1	0.3	1.56	88.6	467.7	0	0
124	124	b	1	789	788.82	10	41.97	7888.2	6584	16887.2	329433.8	1.34	8.94	402.4	2681.3	0	0
124_R	124_R	b	1	1224	1223.82	10	41.97	12238.19	8114	26827.9	421409	2.13	8	639.2	2399.4	0	0
125	125	b	1	12	11.97	10	28.82	119.67	1655	2450.2	266.7	0.28	2.06	85	618.9	0	0
125_R	125_R	b	1	12	11.14	10	28.82	111.37	1393	2260.1	161.9	0.26	1.45	78.4	434.4	0	0
126	126	b	1	24	23.49	10	31.73	234.95	2458	7360	1927.3	0.77	2.79	232	837.8	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
126_R	126_R	b	1	38	37.11	10	31.73	371.05	2830	9383.2	4301.8	0.99	3.31	295.7	991.9	0	0
127	127	b	1	10	9.48	10	22.31	94.79	1202	4251.1	338.6	0.64	1.57	190.5	471.2	0	0
127_R	127_R	b	1	10	9.57	10	22.31	95.67	1047	5103.4	387.5	0.76	1.32	228.7	395.3	0	0
129	129	b	1	50	49.76	10	47.16	497.61	5409	15090.5	5634.4	1.07	3.49	320	1045.9	0	0
129_R	129_R	b	1	64	63.03	10	47.16	630.32	5759	16871.3	8440.9	1.19	3.62	357.8	1084.9	0	0
130	130	b	1	2253	2252.27	10	43.61	22522.69	7137	22673.1	1097090	1.73	10.23	519.9	3068.6	0	0
130_R	130_R	b	1	23247	23246.47	10	43.61	232464.7	10238	32582.8	21176695	2.49	18.62	747.1	5587.3	0	0
131	131	b	1	127	126.06	10	35.41	1260.55	4374	16373.7	24455.7	1.54	4.83	462.4	1449.9	0	0
131_R	131_R	b	1	240	239.05	10	35.41	2390.5	5346	15984	64179.7	1.5	6.07	451.4	1822.3	0	0
132	132	b	1	619	618.15	10	46.9	6181.53	5763	21663.8	232504.9	1.54	8.89	461.9	2667.4	0	0
132_R	132_R	b	1	1219	1218.46	10	46.9	12184.59	7079	27447.3	449855.2	1.95	8.03	585.2	2409.2	0	0
133	133	b	1	3679	3678.19	10	42.52	36781.9	9291	27767	1941707	2.18	12.13	653	3638.9	0	0
133_R	133_R	b	1	12959	12958.07	10	42.52	129580.7	8970	35369.2	9706447	2.77	15.29	831.8	4588.4	0	0
134	134	b	1	1997	1996.87	10	62.86	19968.69	6926	41548.5	824084.6	2.2	8.57	661	2570.5	0	0
134_R	134_R	b	1	3601	3600.17	10	62.86	36001.74	9405	52204.9	1558859	2.77	9.23	830.6	2768.2	0	0
135	135	b	1	21	20.9	10	33.42	208.97	3046	9683.2	1365.5	0.97	2.18	289.8	653.1	0	0
135_R	135_R	b	1	19	18.96	10	33.42	189.63	2780	9313.7	1157.5	0.93	2.21	278.7	663.1	0	0
137	137	b	1	22	21.72	10	34.85	217.25	2850	10206.6	1430.1	0.98	2.11	292.9	631.5	0	0
137_R	137_R	b	1	885	884.65	10	34.85	8846.53	4743	17976.5	346985.6	1.72	8.24	515.8	2473.3	0	0
138	138	b	1	651	650.43	10	47.89	6504.28	5729	21964.2	225078	1.53	8.07	458.7	2421.6	0	0
138_R	138_R	b	1	1206	1205.52	10	47.89	12055.16	7890	25618.7	447743.1	1.78	7.99	535	2395.7	0	0
139	139	b	1	291	290.73	10	45.6	2907.35	5411	22388.4	65119.4	1.64	5.15	491	1544.3	0	0
139_R	139_R	b	1	178	177.93	10	45.6	1779.26	3582	19548.4	34184.4	1.43	4.3	428.7	1288.9	0	0
142	142	b	1	51	50.98	10	31.05	509.83	4271	12520.9	7159.6	1.34	3.83	403.3	1148.2	0	0
142_R	142_R	b	1	28	27.61	10	31.05	276.08	3058	10918.6	2746.1	1.17	3.07	351.7	921.1	0	0
143	143	b	1	185	184.49	10	31.92	1844.93	4004	16864	41212.6	1.76	5.05	528.3	1514	0	0
143_R	143_R	b	1	25	24.06	10	31.92	240.57	3087	10847	1913.8	1.13	2.45	339.8	736.5	0	0
144	144	b	1	79	78.05	10	42.9	780.46	4366	13421.4	12186.1	1.04	4.55	312.9	1364.7	0	0
144_R	144_R	b	1	986	985.44	10	42.9	9854.38	5692	19571.3	378669.3	1.52	7.98	456.2	2394.8	0	0
145	145	b	1	145	144.84	10	29.67	1448.43	4214	18597.2	28051.1	2.09	4.96	626.7	1489.1	0	0
145_R	145_R	b	1	344	343.63	10	29.67	3436.32	4397	14639.8	118260.2	1.64	7.34	493.4	2203	0	0
146	146	b	1	1011	1010.89	10	54.21	10108.9	5354	20454.5	389963.7	1.26	8.03	377.3	2409.2	0	0
146_R	146_R	b	1	52	51.49	10	54.21	514.94	3302	14472.9	5318	0.89	3.04	267	912.6	0	0
148	148	b	1	31	30.53	10	32.23	305.25	3195	12797.1	2855.8	1.32	2.86	397	857.3	0	0
148_R	148_R	b	1	48	47.19	10	32.23	471.86	3634	15324	5452.2	1.58	3.02	475.4	905.7	0	0
151	151	b	1	1009	1008.64	10	45.89	10086.39	4984	20937	390064	1.52	8.03	456.2	2409.2	0	0
151_R	151_R	b	1	68	67.95	10	45.89	679.52	3115	16109.6	8440.9	1.17	3.14	351	942.9	0	0
152	152	b	1	5434	5433.03	10	57.21	54330.28	7430	34103.5	3273126	1.99	12.6	596.1	3780.1	0	0
152_R	152_R	b	1	175	174.23	10	57.21	1742.31	4677	20040.6	37867.5	1.17	5.28	350.3	1584	0	0
153	153	b	1	61	60.17	10	46.95	601.67	5105	18119.6	7295.9	1.29	3.51	386	1052.4	0	0
153_R	153_R	b	1	281	280.4	10	46.95	2803.98	5900	20432.7	81450.2	1.45	6.44	435.2	1932.3	0	0
154	154	b	1	143	142.39	10	43.24	1423.86	7634	24211.2	23745.7	1.87	4.32	560	1295.7	0	0
154_R	154_R	b	1	1378	1377.17	10	43.24	13771.67	7875	37908.4	461767.1	2.92	8.07	876.8	2421.2	0	0
155	155	b	1	11367	11366.51	10	39.14	113665.1	10351	28703.2	9206103	2.44	17	733.4	5101	0	0
155_R	155_R	b	1	94	93.17	10	39.14	931.73	4394	13622.1	17212.9	1.16	4.56	348.1	1368.7	0	0
156	156	b	1	43	42.32	10	25.02	423.2	2802	6693.2	7497.4	0.89	4.55	267.5	1364.7	0	0
156_R	156_R	b	1	19	18.98	10	25.02	189.8	2407	7149.4	1471.4	0.95	2.53	285.7	759.4	0	0
157	157	b	1	36	35.67	10	27.33	356.75	2765	13935.5	3826.6	1.7	2.81	509.8	842.4	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
157_R	157_R	b	1	56	55.04	10	27.33	550.42	2992	15049.5	7162.6	1.84	3.33	550.6	999.8	0	0
158	158	b	1	5451	5450.71	10	43.17	54507.13	8096	36130.4	3277072	2.79	12.6	836.9	3780.1	0	0
158_R	158_R	b	1	1852	1851.38	10	43.17	18513.78	8927	32737.7	847108.9	2.53	10.07	758.3	3020	0	0
159	159	b	1	250	250	10	38.64	2499.97	5330	26265.5	56075.6	2.27	5.19	679.8	1558.4	0	0
159_R	159_R	b	1	778	777.35	10	38.64	7773.53	7030	32264.9	259532.1	2.78	7.68	835	2303.3	0	0
160	160	b	1	1178	1177.82	10	33.25	11778.18	5922	19846.1	518540.4	1.99	9.02	596.8	2706.2	0	0
160_R	158_R	b	1	7123	7122.41	10	33.25	71224.06	9148	31671.1	4920597	3.17	14.12	952.4	4236.9	0	0
161	161	b	1	111	110.05	10	20.63	1100.49	4269	15180.5	19397	2.45	3.9	735.8	1170.6	0	0
161_R	161_R	b	1	1670	1669.86	10	20.63	16698.63	7199	22556.3	781980.6	3.64	10.47	1093.3	3142.2	0	0
162	162	b	1	9645	9644.35	10	32.61	96443.49	10295	42469.6	5650820	4.34	12.54	1302.3	3762.7	0	0
162_R	162_R	b	1	394	393.48	10	32.61	3934.8	8157	25640.5	104936.4	2.62	6.08	786.2	1824.8	0	0
163	163	b	1	56	55.85	10	22.61	558.52	3841	13233.6	8016	1.95	3.83	585.4	1147.5	0	0
163_R	163_R	b	1	33	32.65	10	22.61	326.51	3865	11719.7	3748.9	1.73	3.1	518.4	929.8	0	0
164	164	b	1	18	17.24	10	20.53	172.38	2101	6089.5	1503.8	0.99	2.54	296.5	763.2	0	0
164_R	164_R	b	1	259	258.6	10	20.53	2586	3487	11386.9	78668.4	1.85	6.4	554.5	1919.4	0	0
165	165	b	1	3663	3662.86	10	37.76	36628.65	8751	28205.9	1937959	2.49	12.13	747	3638.9	0	0
165_R	165_R	b	1	12985	12984.02	10	37.76	129840.2	9253	32651.1	9715898	2.88	15.29	864.7	4588.4	0	0
166	166	b	1	3663	3662.86	10	37.76	36628.65	8751	28205.9	1937959	2.49	12.13	747	3638.9	0	0
166_R	166_R	b	1	12985	12984.02	10	37.76	129840.2	9253	32651.1	9715898	2.88	15.29	864.7	4588.4	0	0
167	167	b	1	3400	3399.43	10	36.47	33994.26	6842	21563.5	1939659	1.97	12.29	591.2	3686.9	0	0
167_R	167_R	b	1	306	305.38	10	36.47	3053.82	6088	16009.2	83738	1.46	6.09	438.9	1825.9	0	0
171	171	b	1	45	44.96	10	24.89	449.65	2644	15051.8	5537.6	2.02	3.08	604.8	924.5	0	0
171_R	171_R	b	1	680	679.96	10	24.89	6799.62	4218	24085	229217.2	3.23	7.58	967.7	2273.6	0	0
172	172	b	1	935	934.51	10	51.84	9345.1	7474	26507.6	331019.7	1.7	8.79	511.3	2637.5	0	0
172_R	172_R	b	1	256	255.95	10	51.84	2559.49	5878	23054.2	50624.3	1.48	4.66	444.7	1396.9	0	0
173	173	b	1	4571	4570.77	10	55.54	45707.69	7675	38992.6	2611079	2.34	12.62	702	3786.9	0	0
173_R	173_R	b	1	9634	9633.18	10	55.54	96331.77	13502	47027.7	6921838	2.82	16.78	846.7	5033.7	0	0
174	174	b	1	885	884.53	10	29.82	8845.31	5261	17687.3	306372.1	1.98	7.5	593	2248.7	0	0
174_R	174_R	b	1	146	145.96	10	29.82	1459.57	4546	11281.8	32445.2	1.26	5.06	378.3	1516.7	0	0
175	175	b	1	20	19.44	10	29.99	194.36	2334	9190.8	1324.1	1.02	2.18	306.5	653.1	0	0
175_R	175_R	b	1	19	18.32	10	29.99	183.22	2154	9154.5	1207.3	1.02	2.18	305.3	653.5	0	0
176	176	b	1	604	603.91	10	40.9	6039.14	6097	16776.9	235322.3	1.37	8.25	410.2	2473.5	0	0
176_R	175_R	b	1	178	177.3	10	40.9	1773.01	6010	19809	36964.9	1.61	5.1	484.4	1530.6	0	0
177	177	b	1	206	205.22	10	33.77	2052.16	3199	18803	42198.9	1.86	4.35	556.8	1305	0	0
177_R	177_R	b	1	162	161.78	10	33.77	1617.84	3252	17589.2	30632.6	1.74	4.03	520.9	1207.9	0	0
178	178	b	1	50	49.21	10	48.63	492.06	2710	12859.5	5208.8	0.88	3.04	264.4	912.6	0	0
178_R	178_R	b	1	1009	1008.25	10	48.63	10082.5	4586	18459.7	389802.8	1.27	8.03	379.6	2409.2	0	0
179	179	b	1	221	220.41	10	97.97	2204.11	3468	45425.5	31641.3	1.55	3.55	463.7	1065	0	0
179_R	179_R	b	1	215	214.55	10	97.97	2145.52	3002	44422.5	31592.6	1.51	3.72	453.4	1116	0	0
180	180	b	1	14	13.22	10	29.51	132.17	1733	5246	488.9	0.59	1.67	177.7	502.3	0	0
180_R	180_R	b	1	13	12.6	10	29.51	126.01	1486	5978.2	465.7	0.68	1.39	202.6	417.4	0	0
181	181	b	1	187	186.79	10	80.68	1867.92	5252	43118.2	25597.3	1.78	3.56	534.4	1067.7	0	0
181_R	181_R	b	1	159	158.7	10	80.68	1586.95	4610	38998.3	20875.4	1.61	3.31	483.4	991.6	0	0
182	182	b	1	1108	1107.06	10	85.51	11070.58	3200	55150.5	304243.4	2.15	5.82	644.9	1744.5	0	0
182_R	182_R	b	1	758	757.28	10	85.51	7572.81	4311	55295.3	177085.8	2.16	5.49	646.6	1648.2	0	0
184	184	b	1	16884	16883.62	10	35.35	168836.2	6755	23366.1	15198690	2.2	18.02	661.1	5406.2	0	0
184_R	184_R	b	1	20132	20131.85	10	35.35	201318.5	6945	23667.8	18941946	2.23	18.83	669.6	5649.6	0	0
187	187	b	1	280	279.95	10	26	2799.46	5626	20768.9	64456	2.66	5.27	798.7	1580.1	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
187_R	187_R	b	1	51515	51514.73	10	26	515147.3	10041	44056.5	52923086	5.65	21.19	1694.2	6358.3	0	0
188	188	b	1	27	26.12	10	45.55	261.17	3269	8970.2	1426.8	0.66	2.12	196.9	636.9	0	0
188_R	188_R	b	1	66	65.14	10	45.55	651.41	4433	12343.1	9012.8	0.9	4	271	1200.5	0	0
189	189	b	1	194	193.14	10	34.81	1931.43	5690	20202.5	42046.8	1.93	5.4	580.3	1619.1	0	0
189_R	189_R	b	1	203	202.98	10	34.81	2029.77	6005	16923.4	54052.6	1.62	5.84	486.1	1751.9	0	0
190	190	b	1	2390	2389.61	10	45.72	23896.07	5947	26626.2	1176822	1.94	10.35	582.4	3106.2	0	0
190_R	190_R	b	1	15784	15783.23	10	45.72	157832.3	9050	54202.1	9939775	3.95	13.23	1185.6	3967.8	0	0
191	191	b	1	238	237.71	10	52.82	2377.13	6165	27097.7	49583.5	1.71	5.27	513.1	1580	0	0
191_R	191_R	b	1	755	754.63	10	52.82	7546.27	6797	29254.3	264321.7	1.85	7.86	553.9	2356.6	0	0
192	192	b	1	412	411.45	10	106.44	4114.54	7431	58035.8	77881.3	1.82	5.36	545.2	1609.1	0	0
192_R	192_R	b	1	302	301.2	10	106.44	3012.03	7859	57569.8	48703.7	1.8	4.86	540.9	1458.6	0	0
193	193	b	1	23	22.19	10	30.79	221.9	3715	10258.4	1741.6	1.11	2.54	333.2	760.7	0	0
193_R	193_R	b	1	19	18.17	10	30.79	181.7	3221	10152.3	1190.9	1.1	2.03	329.7	608.4	0	0
194	194	b	1	39	38.32	10	27.4	383.21	2189	15611.5	4022.5	1.9	2.42	569.8	726.6	0	0
194_R	194_R	b	1	40	39.06	10	27.4	390.57	2040	15749.5	4109.9	1.92	2.41	574.9	722.5	0	0
195	195	b	1	39	38.32	10	27.4	383.21	2189	15611.5	4022.5	1.9	2.42	569.8	726.6	0	0
195_R	195_R	b	1	40	39.06	10	27.4	390.57	2040	15749.5	4109.9	1.92	2.41	574.9	722.5	0	0
197	197	b	1	95	94.75	10	32.27	947.54	4805	12973.9	18305.5	1.34	4.8	402	1440.8	0	0
197_R	197_R	b	1	3134	3133.37	10	32.27	31333.68	8088	16917.3	2291960	1.75	14.78	524.2	4435.2	0	0
200	200	b	1	21	20.47	10	27.93	204.67	2623	6985.4	1620	0.83	2.64	250.1	792.4	0	0
200_R	200_R	b	1	36	35.36	10	27.93	353.55	2724	8982.8	4498.8	1.07	3.46	321.6	1039.5	0	0
202	202	b	1	159	158.02	10	95.08	1580.22	5413	39884.3	19456	1.4	3.18	419.5	955.1	0	0
202_R	202_R	b	1	152	151.41	10	95.08	1514.12	5107	38826	19151.3	1.36	3.31	408.4	991.6	0	0
203	203	b	1	19911	19910.18	10	68.81	199101.8	16853	83087.1	13228595	4.02	15.3	1207.4	4589.9	0	0
203_R	203_R	b	1	390	389.72	10	68.81	3897.21	7628	38687.2	80258.2	1.87	4.92	562.2	1477.2	0	0
206	206	b	1	19351	19350.28	10	54.38	193502.8	13580	63316.7	13229141	3.88	14.95	1164.4	4485	0	0
206_R	206_R	b	1	8015	8014.13	10	54.38	80141.27	13647	52467.8	4807364	3.22	13.43	964.9	4030.2	0	0
207	207	b	1	7663	7662.88	10	51.68	76628.75	10073	43975.9	4643312	2.84	13.09	850.9	3926.6	0	0
207_R	207_R	b	1	1393	1392.79	10	51.68	13927.94	8506	35808.8	547294.4	2.31	9.03	692.9	2708.2	0	0
208	208	b	1	2431	2430.43	10	61.13	24304.32	8928	50341.7	858886.6	2.75	7.73	823.5	2319.8	0	0
208_R	208_R	b	1	4434	4433.34	10	61.13	44333.41	10723	60397.8	1841823	3.29	9.72	988	2915	0	0
209	209	b	1	7631	7630.02	10	49.89	76300.22	9139	41589.2	4636468	2.78	13.09	833.7	3926.6	0	0
209_R	209_R	b	1	1492	1491.73	10	49.89	14917.27	8644	35352.3	573829.9	2.36	9.03	708.7	2708.2	0	0
210	210	b	1	8164	8163.73	10	46.96	81637.32	9115	40897.5	4837085	2.9	12.53	870.9	3757.8	0	0
210_R	210_R	b	1	1243	1242.83	10	46.96	12428.34	5453	32413.7	405184.9	2.3	6.71	690.2	2014.4	0	0
211	211	b	1	1444	1443.21	10	81.87	14432.14	11717	51133.7	594893.9	2.08	9.81	624.6	2942.6	0	0
211_R	211_R	b	1	562	561.56	10	81.87	5615.55	9921	39917.2	182558.6	1.63	7.65	487.6	2295.2	0	0
212	212	b	1	343	342.43	10	78.82	3424.28	8256	47304.1	62595.6	2	4.54	600.2	1362.8	0	0
212_R	212_R	b	1	456	455.28	10	78.82	4552.81	8492	45795.1	105537.1	1.94	5.51	581	1653.5	0	0
213	213	b	1	95208	95207.61	10	86.68	952076.1	20373	1.07E+05	1.00E+08	4.11	22.61	1231.8	6782	0	0
213_R	213_R	b	1	7033	7032.48	10	86.68	70324.75	12593	60257.2	5414751	2.32	16.55	695.1	4964.4	0	0
214	214	b	1	5021	5020.09	10	105.41	50200.9	8606	58791.4	2882722	1.86	11.76	557.7	3527.1	0	0
214_R	214_R	b	1	6314	6313.69	10	105.41	63136.92	8479	60680.7	3663705	1.92	12.02	575.7	3606.6	0	0
216	216	b	1	6530	6529.44	10	123.79	65294.35	8668	72672.5	3619534	1.96	11.8	587.1	3541.2	0	0
216_R	216_R	b	1	2298	2297.02	10	123.79	22970.23	7353	83179.5	734464.1	2.24	6.74	671.9	2023.2	0	0
217	217	b	1	5038	5037.01	10	113.68	50370.09	9115	60838.4	2884748	1.78	11.76	535.2	3527.1	0	0
217_R	217_R	b	1	7402	7401.43	10	113.68	74014.26	11798	68927.3	4342788	2.02	12.38	606.3	3715	0	0
219	219	b	1	72437	72436.61	10	136.24	724366.1	6970	254857	42999098	6.24	12.72	1870.7	3816.6	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
219_R	219_R	b	1	79495	79494.46	10	136.24	794944.6	8946	263437.7	48322544	6.45	12.97	1933.7	3889.9	0	0
220	220	b	1	4679	4678.91	10	131.61	46789.07	4594	128909.8	1384288	3.26	6.56	979.5	1968.8	0	0
220_R	220_R	b	1	4976	4975.88	10	131.61	49758.82	5443	131836	1500944	3.34	6.71	1001.7	2014.2	0	0
221	221	b	1	40171	40170.64	10	97.13	401706.4	10205	162720.4	23569485	5.58	11.92	1675.2	3577.1	0	0
221_R	221_R	b	1	41993	41992.69	10	97.13	419926.9	9508	162241.3	25070319	5.57	12.05	1670.3	3615.4	0	0
222	222	b	1	16578	16577.37	10	83.44	165773.7	12432	106251.3	10560130	4.24	15.89	1273.5	4767.1	0	0
222_R	222_R	b	1	5684	5683.13	10	83.44	56831.32	8205	87030	2204522	3.48	7.98	1043.1	2394.3	0	0
223	223	b	1	58661	58660.8	10	86.62	586608	9386	86020.9	53306155	3.31	19.3	993.1	5790.6	0	0
223_R	223_R	b	1	9241	9240.16	10	86.62	92401.56	7230	65154.4	5214921	2.51	11.97	752.2	3590.8	0	0
224	224	b	1	22	21.31	10	41.53	213.12	2227	8291.6	1006.9	0.67	2	199.7	600.8	0	0
224_R	224_R	b	1	33	32.62	10	41.53	326.24	2066	10367.7	2793.1	0.83	2.91	249.7	873.1	0	0
225	225	b	1	432	431.79	10	76.08	4317.9	8220	46919.5	86576.5	2.06	4.79	616.7	1436.7	0	0
225_R	225_R	b	1	327	326.11	10	76.08	3261.06	7094	41232.7	72839.2	1.81	5.72	542	1716.8	0	0
226	226	b	1	348	347.05	10	71.52	3470.48	7104	42740.2	65612.2	1.99	4.54	597.6	1362.8	0	0
226_R	226_R	b	1	96	95.99	10	71.52	959.87	5292	31828.8	10674.8	1.48	3.05	445	913.7	0	0
227	227	b	1	133	132.05	10	33.15	1320.46	2195	25246.8	19810.9	2.54	3.25	761.5	974.4	0	0
227_R	227_R	b	1	109	108.18	10	33.15	1081.82	1661	24170.9	15201.1	2.43	3.06	729.1	917.8	0	0
228	228	b	1	58575	58574.61	10	29.63	585746.1	10274	98257.1	46234405	11.06	17.45	3316.5	5236.1	0	0
228_R	228_R	b	1	88011	88010.43	10	29.63	880104.3	11996	90866.6	81954030	10.22	19.87	3067.1	5960.2	0	0
229	229	b	1	35164	35163.89	10	30.5	351638.9	5732	91426.6	23746411	9.99	15.09	2998	4526.4	0	0
229_R	229_R	b	1	4581	4580.08	10	30.5	45800.83	6656	57229.3	1788291	6.26	8.2	1876.6	2458.6	0	0
230	230	b	1	14145	14144.36	10	15.25	141443.6	8698	36277.5	10632812	7.93	15.68	2378.6	4703.2	0	0
230_R	230_R	b	1	5620	5619.26	10	15.25	56192.6	5511	32697.7	3089015	7.15	11.82	2143.9	3545.6	0	0
232	232	b	1	43694	43693.44	10	29.35	436934.4	9034	96909.4	30896659	11	15.07	3301.5	4520.5	0	0
232_R	232_R	b	1	4464	4463.15	10	29.35	44631.52	5180	54627.5	1750902	6.2	8.2	1861	2458.6	0	0
233	233	b	1	19293	19292.65	10	65.34	192926.5	9511	80984.4	11354320	4.13	12.1	1239.4	3628.9	0	0
233_R	233_R	b	1	2422	2421.64	10	65.34	24216.41	5547	47343.5	864222.7	2.42	7.57	724.6	2269.7	0	0
234	234	b	1	496	495.35	10	38.82	4953.45	6307	25865.7	177985.4	2.22	8.41	666.3	2523.7	0	0
234_R	234_R	b	1	408	407.27	10	38.82	4072.67	5035	27682.5	104114.7	2.38	6.48	713.1	1945.2	0	0
235	235	b	1	128	127.39	10	31.09	1273.87	1352	24316.5	19206.6	2.61	3.25	782.2	974.4	0	0
235_R	235_R	b	1	104	103.77	10	31.09	1037.72	1661	23055.8	14661.8	2.47	3.06	741.6	917.8	0	0
236	236	b	1	8395	8394.44	10	19.93	83944.35	4010	41747.1	4488567	6.98	12.62	2095.1	3787.5	0	0
236_R	236_R	b	1	571	570.85	10	19.93	5708.49	1923	22018.3	150639.5	3.68	6.02	1105	1805.6	0	0
237	237	b	1	127	126.98	10	30.01	1269.83	1352	24316.5	19206.6	2.7	3.25	810.2	974.4	0	0
237_R	237_R	b	1	104	103.37	10	30.01	1033.68	1661	23055.8	14661.8	2.56	3.06	768.2	917.8	0	0
238	238	b	1	355	354.43	10	34.23	3544.27	2891	34017.4	72950.3	3.31	5.18	993.9	1552.6	0	0
238_R	238_R	b	1	155	154.69	10	34.23	1546.85	1359	27872.3	24119.7	2.71	3.36	814.3	1007.3	0	0
240	240	b	1	15985	15984.43	10	79.94	159844.3	15117	71253.9	11741310	2.97	16.25	891.4	4875.7	0	0
240_R	240_R	b	1	716	715.84	10	79.94	7158.41	10304	43997.9	180395.1	1.83	6.25	550.4	1875.5	0	0
241	241	b	1	336	335.79	10	77.1	3357.92	7620	44658.4	61737.3	1.93	4.54	579.2	1362.8	0	0
241_R	241_R	b	1	231	230.94	10	77.1	2309.45	7749	37583.7	51114.1	1.62	6.15	487.5	1845.5	0	0
242	242	b	1	6641	6640.89	10	104.72	66408.9	10483	73320.6	3645776	2.33	11.8	700.2	3541.2	0	0
242_R	242_R	b	1	2069	2068.36	10	104.72	20683.65	10523	79106.6	631083.5	2.52	6.67	755.4	2002.1	0	0
243	243	b	1	7669	7668.43	10	68.19	76684.29	12431	52252.5	4641008	2.55	13.09	766.3	3926.6	0	0
243_R	243_R	b	1	1663	1662.81	10	68.19	16628.14	12294	46840.8	624617	2.29	9.03	686.9	2708.2	0	0
245	245	b	1	52	51.75	10	44.88	517.51	3418	15586.5	5736.6	1.16	3.04	347.3	912.6	0	0
245_R	245_R	b	1	4270	4269.9	10	44.88	42699.01	10548	30938.1	2743814	2.3	14.83	689.3	4447.8	0	0
246	246	b	1	5020	5019.44	10	112.34	50194.44	7832	58131.3	2882196	1.72	11.76	517.5	3527.1	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
246_R	246_R	b	1	6309	6308.13	10	112.34	63081.29	7902	57899.2	3662543	1.72	12.02	515.4	3606.6	0	0
248	248	b	1	3731	3730.72	10	73.31	37307.16	9203	73493	1327492	3.34	7.88	1002.5	2365	0	0
248_R	248_R	b	1	2439	2438.04	10	73.31	24380.45	6830	54981.3	866094.4	2.5	7.57	750	2269.7	0	0
249	249	b	1	4462	4461.2	10	63.17	44612.04	11870	60243.7	1848660	3.18	9.72	953.6	2915	0	0
249_R	249_R	b	1	2441	2440.23	10	63.17	24402.26	9981	52087.2	859643.2	2.75	7.73	824.5	2319.8	0	0
251	251	b	1	11660	11659.45	10	88.75	116594.5	17667	97203.3	6097607	3.65	12.76	1095.2	3829.2	0	0
251_R	251_R	b	1	3124	3123.92	10	88.75	31239.24	11876	69452.9	1133662	2.61	8.27	782.5	2482.2	0	0
252	252	b	1	501	500.55	10	39.5	5005.53	6354	24424.9	175289.7	2.06	8.3	618.4	2490.2	0	0
252_R	252_R	b	1	398	397.03	10	39.5	3970.3	4869	26270.9	101925.4	2.22	6.48	665.2	1945.2	0	0
253	253	b	1	1321	1320.28	10	61.96	13202.81	5400	58370.9	367387.4	3.14	6.55	942.1	1963.8	0	0
253_R	253_R	b	1	1168	1167.57	10	61.96	11675.7	6210	58723.8	308179.7	3.16	6.23	947.7	1868.4	0	0
254	254	b	1	9197	9196.71	10	86.52	91967.05	16357	83967.1	5157681	3.23	13.46	970.5	4037.5	0	0
254_R	254_R	b	1	6659	6658.62	10	86.52	66586.22	12486	74157.9	3200615	2.86	10.67	857.1	3201.6	0	0
256	256	b	1	9015	9014.89	10	36.81	90148.95	10529	52275.4	4878676	4.73	11.03	1420.2	3309.4	0	0
256_R	256_R	b	1	688	687.43	10	36.81	6874.32	4460	29186.4	216009.6	2.64	7.08	792.9	2125.2	0	0
257	257	b	1	10532	10531.23	10	85.45	105312.3	14700	90234.5	5584006	3.52	12.76	1056	3829.2	0	0
257_R	257_R	b	1	4419	4418.98	10	85.45	44189.84	11446	70131	1780335	2.74	9.75	820.7	2925.6	0	0
258	258	b	1	58648	58647.88	10	90.06	586478.8	9668	92465.7	53303005	3.42	19.3	1026.7	5790.6	0	0
258_R	258_R	b	1	10095	10094.41	10	90.06	100944.1	11059	80431.9	5533308	2.98	11.98	893.1	3593.5	0	0
259	259	b	1	226	225.5	10	35.3	2254.98	5219	21853.3	59272.8	2.06	6.54	619.1	1961.9	0	0
259_R	259_R	b	1	398	397.03	10	35.3	3970.34	5022	27196.1	101652.9	2.57	6.48	770.5	1945.2	0	0
260	260	b	1	139	138.22	10	79.44	1382.19	4376	37419.5	17253.3	1.57	3.18	471.1	955.1	0	0
260_R	260_R	b	1	151	150.5	10	79.44	1504.96	4101	39754.7	19643.8	1.67	3.31	500.5	991.6	0	0
263	263	b	1	5283	5282.68	10	36.39	52826.84	4679	28189.8	2777512	2.58	11.26	774.7	3376.7	0	0
263_R	263_R	b	1	5801	5800.61	10	36.39	58006.08	4617	29201.1	3109528	2.67	11.29	802.5	3388.4	0	0
264	264	b	1	71	70.83	10	34.64	708.29	4035	15042.8	10770.6	1.45	4.14	434.3	1242.9	0	0
264_R	264_R	b	1	2215	2214.65	10	34.64	22146.48	7725	22639.6	1066106	2.18	10.47	653.6	3140.9	0	0
265	265	b	1	3884	3883.68	10	71.09	38836.85	10571	76033.6	1382098	3.57	7.88	1069.6	2365	0	0
265_R	265_R	b	1	2459	2458.34	10	71.09	24583.35	7174	56511.7	870115.6	2.65	7.57	795	2269.7	0	0
266	266	b	1	517	516.95	10	74.92	5169.46	9515	48854.8	123708.7	2.17	6.87	652.1	2060	0	0
266_R	266_R	b	1	128	127.29	10	74.92	1272.93	6589	37132.3	16025.4	1.65	3.41	495.6	1024.2	0	0
MRT1	MRT1	M	3	20	19.33	3.5	38.19	67.66	181527	1398679	41306.6	21.36	72.09	36620.5	123585.4	0	0
MRT1_R	MRT1_R	M	3	20	19.33	3.5	38.19	67.65	180944	1418937	41887	21.67	72.43	37150.9	124165.9	0	0
MRT5_N	MRT5_N	M	3	10	9.73	3.5	19.23	34.07	142206	1158577	34205.3	35.14	46.64	60246.7	79947.5	0	0
MRT5_N_F	MRT5_N_F	M	3	10	9.73	3.5	19.23	34.06	159924	1250776	36922	37.94	54.34	65041.1	93158	0	0
MRT5_S	MRT5_S	M	3	9	8.45	3.5	16.68	29.57	31480	211929	6263.8	7.41	18.36	12708.5	31480.3	0	0
MRT5_S_R	MRT5_S_R	M	3	9	8.45	3.5	16.68	29.56	8232	22409.3	661.8	0.78	4.8	1343.8	8231.6	0	0
MRT6	MRT6	M	3	10	9.81	3.5	19.37	34.33	159574	1311146	38738.9	39.49	59.89	67690.4	102661.4	0	0
MRT6_R	MRT6_R	M	3	10	9.81	3.5	19.37	34.32	152039	1260976	37251.6	37.98	54.55	65100.3	93507.4	0	0

Scenario 6: Rationalized Bus Route with MRT																	
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
10	10	b	1	11	10.91	10	17.33	109.07	3520	8036.2	928.6	1.55	2.26	463.6	676.7	0	0
10_R	10_R	b	1	12	11.39	10	17.33	113.87	3761	8018.1	1005.1	1.54	2.45	462.6	736.4	0	0
11A	11A	b	1	7740	7739.94	10	20.27	77399.42	8721	21560.1	6630512	3.55	17.65	1063.7	5294.2	0	0
11A_R	11A_R	b	1	1940	1939.77	10	20.27	19397.73	10038	25303.8	958147.8	4.16	10.84	1248.4	3252.6	0	0
11B	11B	b	1	88	87.41	10	32.53	874.07	4972	20794.3	16582.9	2.13	5.27	639.2	1580	0	0
11B_R	11B_R	b	1	214	213.65	10	32.53	2136.54	5614	26192.4	46779.5	2.68	5.2	805.2	1559.7	0	0
11C	11C	b	1	11454	11453.23	10	39.81	114532.3	9326	42265.6	8341363	3.54	14.89	1061.8	4467.4	0	0
11C_R	11C_R	b	1	13699	13698.06	10	39.81	136980.6	11746	47494.2	10232834	3.98	16.51	1193.1	4954.1	0	0
12A	12A	b	1	4524	4523.84	10	27.4	45238.4	8071	28238.7	2948142	3.44	13.25	1030.5	3974.6	0	0
12A_R	12A_R	b	1	9625	9624.9	10	27.4	96248.98	8244	28982.9	7706741	3.53	16.68	1057.7	5003.7	0	0
12B	12B	b	1	414	413.64	10	30.09	4136.41	8538	21942.6	153082.8	2.43	8.54	729.2	2562.3	0	0
12B_R	12B_R	b	1	15435	15434.68	10	30.09	154346.8	12372	35697.3	13661685	3.95	17.83	1186.3	5349.5	0	0
13	13	b	1	90	89.3	10	29.07	893	4659	21252.9	14160.9	2.44	3.83	731.2	1149.4	0	0
13_R	13_R	b	1	79	78.27	10	29.07	782.73	5340	20730.7	12254.7	2.38	4.11	713.3	1233.5	0	0
14A	14A	b	1	66	65.4	10	25.89	654.01	5743	16465.7	10670.3	2.12	3.96	635.9	1187.1	0	0
14A_R	14A_R	b	1	48	47.64	10	25.89	476.35	5383	16210.4	6535.8	2.09	3.2	626	958.8	0	0
14B	14B	b	1	855	854.01	10	26.32	8540.1	6208	24377.2	311853.1	3.09	9.31	926.3	2794.2	0	0
14B_R	14B_R	b	1	3539	3538.23	10	26.32	35382.34	9269	27942.2	2263022	3.54	14.35	1061.7	4306.1	0	0
15A	15A	b	1	2927	2926.26	10	32.99	29262.62	10544	29591.2	1655975	2.99	11.79	897	3537.1	0	0
15A_R	15A_R	b	1	46604	46603.42	10	32.99	466034.2	17711	67734.2	42703088	6.84	19.37	2053.3	5809.6	0	0
15B	15B	b	1	311	310.81	10	30.51	3108.11	6500	25750.8	86068.7	2.81	6.65	844	1996.2	0	0
15B_R	15B_R	b	1	18669	18668.41	10	30.51	186684.1	9897	39029.9	17408916	4.26	18.94	1279.2	5682.1	0	0
16A	16A	b	1	7021	7020.9	10	28.11	70209.01	8467	34255.9	4556769	4.06	13.74	1218.5	4121.6	0	0
16A_R	16A_R	b	1	519	518.77	10	28.11	5187.68	7088	24355.3	159228.5	2.89	7.01	866.4	2104.4	0	0
16B	16B	b	1	25	24.41	10	23.3	244.09	4419	13483.4	2627.2	1.93	2.63	578.7	789.6	0	0
16B_R	16B_R	b	1	53	52.64	10	23.3	526.4	5188	15312.1	8475.4	2.19	4.2	657.2	1259.4	0	0
16C	16C	b	1	4966	4965.63	10	18.3	49656.34	6134	22112.6	3330855	4.03	13.66	1208.5	4097.4	0	0
16C_R	16C_R	b	1	7733	7732.04	10	18.3	77320.38	6875	23265.4	5867829	4.24	15.81	1271.5	4741.6	0	0
16D	16D	b	1	9522	9521.84	10	40.09	95218.43	14525	52172.9	6309287	4.34	15.58	1301.5	4675.3	0	0
16D_R	16D_R	b	1	12168	12167.57	10	40.09	121675.7	14215	48850	8976233	4.06	16.93	1218.6	5077.8	0	0
17	17	b	1	7915	7914.41	10	74.25	79144.15	6918	77860	4072267	3.5	13.33	1048.6	3999.6	0	0
17_R	17_R	b	1	9101	9100.27	10	74.25	91002.67	7318	80850.9	4868891	3.63	14.16	1088.9	4248.6	0	0
18	18	b	1	15346	15345.56	10	26.27	153455.6	7905	23147.3	17213818	2.94	22.49	881.1	6747.1	0	0
18_R	18_R	b	1	67	66.97	10	26.27	669.7	2039	16426.1	10119.2	2.08	3.57	625.2	1071.9	0	0
19	19	b	1	117	116.58	10	35.22	1165.83	1827	21675.7	20739.3	2.05	4.16	615.4	1246.8	0	0
19_R	19_R	b	1	258	257.92	10	35.22	2579.24	2019	25756	58051.5	2.44	5.17	731.3	1550	0	0
1A	1A	b	1	87	86.19	10	19.33	861.91	4445	13433.8	22346.9	2.32	6.51	695	1953.2	0	0
1A_R	1A_R	b	1	18685	18684.72	10	19.33	186847.2	9732	31356.6	17420318	5.41	18.94	1622.3	5682.1	0	0
1B	1B	b	1	2142	2141.67	10	36.55	21416.68	8834	34549.7	1165296	3.15	13.13	945.1	3938.3	0	0
1B_R	1B_R	b	1	1954	1953.9	10	36.55	19539.03	8058	35077.3	931580.4	3.2	10.34	959.6	3100.9	0	0
1C	1C	b	1	2401	2400.97	10	25.75	24009.67	7642	29409.1	1262864	3.81	11.14	1142.1	3343.4	0	0
1C_R	1C_R	b	1	344	343.5	10	25.75	3435	4707	30616.1	78773.4	3.96	6.5	1189	1949.2	0	0
1D	1D	b	1	2118	2117.49	10	39.25	21174.89	10337	49579.9	805921.1	4.21	8.27	1263.2	2482.2	0	0
1D_R	1D_R	b	1	1679	1678.27	10	39.25	16782.74	8942	43096.5	644755.3	3.66	8.56	1098	2567.9	0	0
20	20	b	1	700	699.6	10	22.77	6995.99	3319	21308.9	266792	3.12	7.86	935.7	2357.1	0	0
20_R	20_R	b	1	3085	3084.05	10	22.77	30840.47	5963	32761.9	1656780	4.8	11.66	1438.6	3497.8	0	0
21	21	b	1	54	53.62	10	30.84	536.22	2011	18842.7	7157.3	2.04	3.23	610.9	968.7	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
21_R	21_R	b	1	62	61.42	10	30.84	614.19	2182	19477.1	8531	2.1	3.27	631.5	980.2	0	0
22	22	b	1	335	334.42	10	71.35	3344.24	3637	51233.1	69187.7	2.39	5.69	718	1707.9	0	0
22_R	22_R	b	1	249	248.48	10	71.35	2484.75	4096	48252.6	44936.5	2.25	4.98	676.2	1493.4	0	0
23	23	b	1	897	896.59	10	55.38	8965.91	2711	52056.8	252364.6	3.13	5.77	940	1729.8	0	0
23_R	23_R	b	1	494	493.02	10	55.38	4930.2	2322	47822.3	117526.2	2.88	4.99	863.6	1497.1	0	0
24	24	b	1	526	525.01	10	28.92	5250.14	2719	33486.1	132248.6	3.86	5.39	1157.7	1617	0	0
24_R	24_R	b	1	306	305.15	10	28.92	3051.53	2810	25992	75384.5	3	5.58	898.6	1672.6	0	0
2A	2A	b	1	2745	2744.01	10	24.57	27440.11	7332	22797.4	1579144	3.09	11.73	927.7	3519.9	0	0
2A_R	2A_R	b	1	11848	11847.22	10	24.57	118472.2	8965	28889	9876970	3.92	16.82	1175.6	5046.4	0	0
2B	2B	b	1	78	77.95	10	22.51	779.49	4700	13681.1	20907.9	2.03	6.53	607.7	1957.9	0	0
2B_R	2B_R	b	1	75	74.68	10	22.51	746.77	4391	13280.5	20181.3	1.97	6.5	589.9	1949.2	0	0
3A	3A	b	1	7335	7334.21	10	29.28	73342.14	9220	27036	5386462	3.08	14.91	923.4	4472	0	0
3A_R	3A_R	b	1	12052	12051.84	10	29.28	120518.4	10020	29758.5	10178931	3.39	17.64	1016.4	5292.4	0	0
3B	3B	b	1	7277	7276.8	10	28.53	72767.98	7267	25585.2	5367771	2.99	14.91	896.6	4472	0	0
3B_R	3B_R	b	1	11995	11994.9	10	28.53	119949	8071	28310.7	10160434	3.31	17.64	992.2	5292.4	0	0
4A	4A	b	1	930	929.36	10	31.29	9293.56	8397	26241.2	346392.2	2.8	7.96	838.7	2388.3	0	0
4A_R	4A_R	b	1	507	506.57	10	31.29	5065.74	8000	21879.2	167537.9	2.33	7.79	699.3	2336.6	0	0
4B	4B	b	1	1980	1979.46	10	29.06	19794.64	8148	29581.5	901608.4	3.39	11.59	1018	3477.9	0	0
4B_R	4B_R	b	1	16684	16683.11	10	29.06	166831.1	11123	42639.1	14536656	4.89	19.04	1467.4	5711.6	0	0
4C	4C	b	1	120	119.34	10	36.47	1193.41	1909	24821	21327.6	2.27	4.13	680.7	1237.7	0	0
4C_R	4C_R	b	1	141	140.44	10	36.47	1404.43	2084	24390	27111.6	2.23	4.36	668.9	1308.8	0	0
5	5	b	1	2115	2114.13	10	22.86	21141.3	5911	17101.1	1312239	2.49	12.86	748	3856.6	0	0
5_R	5_R	b	1	2084	2083.59	10	22.86	20835.9	7631	18418.4	1209810	2.69	12.77	805.6	3832.3	0	0
6	6	b	1	133	132.71	10	36.42	1327.14	6312	22625.3	25918	2.07	4.47	621.3	1341.5	0	0
6_R	6_R	b	1	140	139.12	10	36.42	1391.24	5826	22559.1	27729.5	2.06	4.61	619.4	1383	0	0
7A	7A	b	1	457	456.27	10	20.56	4562.68	9517	18589.6	159970.9	3.01	7.95	904.2	2386.1	0	0
7A_R	7A_R	b	1	425	424.24	10	20.56	4242.36	7249	15998.5	153764.1	2.59	8.01	778.2	2402.5	0	0
7B	7B	b	1	22	21.13	10	18	211.27	4376	8620	2844.6	1.6	3.56	478.9	1066.8	0	0
7B_R	7B_R	b	1	111	110.27	10	18	1102.73	4280	12382.3	24562.1	2.29	4.95	687.9	1484.4	0	0
8	8	b	1	59	58.52	10	30.69	585.19	5683	18455.5	8936.1	2	3.66	601.3	1098.5	0	0
8_R	8_R	b	1	48	47.31	10	30.69	473.11	5262	17121.7	6717.9	1.86	3.45	557.9	1035.9	0	0
9A	9A	b	1	183	182.45	10	32.91	1824.55	11069	22463.7	47770.7	2.28	6.97	682.6	2092.2	0	0
9A_R	9A_R	b	1	323	322.83	10	32.91	3228.3	10311	26882	89453	2.72	7.04	816.8	2113.2	0	0
9B	9B	b	1	126	125.08	10	22.4	1250.84	6446	14081	37025.2	2.1	6.94	628.6	2081.4	0	0
9B_R	9B_R	b	1	4117	4116.37	10	22.4	41163.7	9570	21076.6	3325356	3.14	16.79	940.9	5038.2	0	0
MRT1	MRT1	M	3	20	19.34	3.5	38.21	67.68	170326	1370498	40475.8	20.92	68.46	35871	117367.5	0	0
MRT1_R	MRT1_R	M	3	20	19.34	3.5	38.21	67.67	171277	1390603	41052.8	21.23	69.05	36397.2	118366.9	0	0
MRT5_N	MRT5_N	M	3	10	9.75	3.5	19.26	34.11	100362	877120.1	25893.6	26.57	30.49	45547.8	52261.7	0	0
MRT5_N_R	MRT5_N_R	M	3	10	9.74	3.5	19.26	34.1	111105	900830.1	26586.9	27.29	31.66	46779.1	54276.3	0	0
MRT5_S	MRT5_S	M	3	9	8.43	3.5	16.64	29.5	84208	465059.6	13745.7	16.31	25.21	27954.5	43215.8	0	0
MRT5_S_R	MRT5_S_R	M	3	9	8.43	3.5	16.64	29.49	88270	488433	14433.7	17.13	26.29	29359.5	45063.4	0	0
MRT6	MRT6	M	3	10	9.79	3.5	19.33	34.25	121856	1004245	29671	30.31	42.19	51964.4	72333.6	0	0
MRT6_R	MRT6_R	M	3	10	9.78	3.5	19.33	34.24	113019	919356.4	27159	27.75	39.09	47571.9	67019.7	0	0

Scenario 7: Existing Bus Route with MRT and BRT																	
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
101	101	b	1	60	59.99	10	48.09	599.95	2464	13611.4	6986.1	0.94	3.4	283.1	1020.8	0	0
101_R	101_R	b	1	1469	1468.13	10	48.09	14681.27	4095	30614.7	493157.1	2.12	7.25	636.7	2173.6	0	0
102	102	b	1	15	14.16	10	34.84	141.61	1700	3107.4	281.8	0.3	1.8	89.2	540.3	0	0
102_R	102_R	b	1	14	13.91	10	34.84	139.07	1624	3221.4	261.5	0.31	1.66	92.5	498.8	0	0
103	103	b	1	17	16.79	10	36.86	167.87	2082	4901.2	561.5	0.44	1.99	133	596.3	0	0
103_R	103_R	b	1	19	18.39	10	36.86	183.88	1882	5462.5	769.8	0.49	2.16	148.2	648.1	0	0
104	104	b	1	25	24.97	10	37.67	249.68	2825	9318.1	1758.9	0.82	2.46	247.4	736.7	0	0
104_R	104_R	b	1	23	22.07	10	37.67	220.73	2640	8739.4	1330.9	0.77	2.2	232	661.2	0	0
105	105	b	1	13	12.97	10	30.82	129.73	1832	5036.2	405.8	0.54	1.49	163.4	446.5	0	0
105_R	105_R	b	1	15	14.67	10	30.82	146.71	2018	5444.9	626.1	0.59	2.02	176.7	607.1	0	0
106	106	b	1	44	43.05	10	42.15	430.54	4374	12705.1	4624.9	1	3.37	301.4	1012.4	0	0
106_R	106_R	b	1	21	20.39	10	42.15	203.92	3370	9451.3	942.2	0.75	1.81	224.2	542.4	0	0
107	107	b	1	22	21.74	10	48.63	217.36	2997	7713.4	765.5	0.53	1.99	158.6	596.3	0	0
107_R	107_R	b	1	24	23.22	10	48.63	232.19	2744	8136.7	957.3	0.56	2.16	167.3	648.1	0	0
109	109	b	1	16	15.33	10	32.93	153.3	1817	3168.5	537.8	0.32	2.61	96.2	782.6	0	0
109_R	109_R	b	1	14	13.84	10	32.93	138.4	1676	3065.3	331.4	0.31	2.21	93.1	661.6	0	0
110	110	b	1	25	24.3	10	35.89	242.97	2799	9210.9	1751.9	0.86	2.46	256.7	736.7	0	0
110_R	110_R	b	1	22	21.4	10	35.89	214.04	2599	8651.6	1325.5	0.8	2.2	241.1	661.2	0	0
111	111	b	1	14	13.05	10	33.98	130.45	1223	2507.1	171.2	0.25	1.17	73.8	351.3	0	0
111_R	111_R	b	1	14	13.01	10	33.98	130.09	1223	2311.3	157.8	0.23	1.25	68	374	0	0
112	112	b	1	13	12.39	10	32.76	123.89	1148	2172.7	138.9	0.22	0.87	66.3	262.4	0	0
112_R	112_R	b	1	13	12.43	10	32.76	124.33	1216	2265.6	147.2	0.23	1.01	69.2	301.7	0	0
113	113	b	1	38	37.42	10	39.03	374.19	2130	6815.3	3872.7	0.58	3.18	174.6	952.5	0	0
113_R	112_R	b	1	47	46.44	10	39.03	464.39	2328	7438.1	5701.9	0.64	3.47	190.6	1041.6	0	0
114	114	b	1	20	19.31	10	35.95	193.08	2620	6742.6	988.9	0.63	2.31	187.6	691.9	0	0
114_R	114_R	b	1	23	22.07	10	35.95	220.73	2388	7349.1	1392.3	0.68	2.51	204.4	753.9	0	0
115	115	b	1	18	17.37	10	34.49	173.67	2412	6933.6	793.1	0.67	1.83	201	548.7	0	0
115_R	114_R	b	1	18	17.29	10	34.49	172.92	2229	7201.5	803.4	0.7	1.75	208.8	525.4	0	0
116	116	b	1	13	12.43	10	32.35	124.27	1129	2882.1	193.1	0.3	1.06	89.1	317.1	0	0
116_R	116_R	b	1	13	12.42	10	32.35	124.21	954	2733.4	183.7	0.28	1.08	84.5	322.6	0	0
117	117	b	1	20	19.85	10	37.68	198.54	2858	6478.6	929.4	0.57	2.06	172	617.3	0	0
117_R	117_R	b	1	24	23.85	10	37.68	238.49	3171	6573.3	1512.6	0.58	2.58	174.5	773.2	0	0
118	118	b	1	12	11.69	10	27.86	116.94	1348	4081.9	340	0.49	1.52	146.5	455.7	0	0
118_R	118_R	b	1	12	11.89	10	27.86	118.91	1361	4045.5	360.8	0.48	1.65	145.2	494.8	0	0
119	119	b	1	15	14.16	10	34.84	141.61	1700	3107.4	281.8	0.3	1.8	89.2	540.3	0	0
119_R	119_R	b	1	14	13.91	10	34.84	139.07	1624	3221.4	261.5	0.31	1.66	92.5	498.8	0	0
120	120	b	1	21	20.96	10	37.01	209.63	3054	7559	1206.4	0.68	2.3	204.2	691	0	0
120_R	120_R	b	1	17	16.36	10	37.01	163.58	2781	6495.7	585.9	0.59	1.59	175.5	476	0	0
122	122	b	1	13	12.97	10	30.82	129.73	1832	5036.2	405.8	0.54	1.49	163.4	446.5	0	0
122_R	122_R	b	1	15	14.67	10	30.82	146.71	2018	5444.9	626.1	0.59	2.02	176.7	607.1	0	0
123	123	b	1	13	12.02	10	31.03	120.18	1348	1980.4	148.3	0.21	1.48	63.8	445	0	0
123_R	123_R	b	1	12	11.97	10	31.03	119.74	1271	1972.4	144.7	0.21	1.45	63.6	436.1	0	0
124	124	b	1	121	120.77	10	41.97	1207.69	3051	13128.1	20717.2	1.04	4.15	312.8	1246.1	0	0
124_R	124_R	b	1	1162	1161.59	10	41.97	11615.93	6446	20608	428541.4	1.64	7.8	491	2338.5	0	0
125	125	b	1	11	10.88	10	28.82	108.85	799	1221.1	78.6	0.14	0.86	42.4	259.2	0	0
125_R	125_R	b	1	11	10.86	10	28.82	108.62	712	1135.7	72.1	0.13	0.65	39.4	196.4	0	0
126	126	b	1	15	14.44	10	31.73	144.39	1588	5017.1	528.7	0.53	1.87	158.1	562.2	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
126_R	126_R	b	1	15	14.19	10	31.73	141.9	1728	4632.8	480.9	0.49	1.84	146	552.8	0	0
127	127	b	1	138	137.61	10	22.31	1376.12	1781	6420.9	34798	0.96	5.38	287.8	1613.9	0	0
127_R	127_R	b	1	26	25.11	10	22.31	251.14	1227	4252.9	2929.7	0.64	3.22	190.6	967	0	0
129	129	b	1	45	44.83	10	47.16	448.35	5025	14832.2	4705.1	1.05	3.4	314.5	1018.7	0	0
129_R	129_R	b	1	30	29.59	10	47.16	295.87	4628	12813.8	2007.9	0.91	2.36	271.7	709.4	0	0
130	130	b	1	34	33.81	10	43.61	338.1	4141	12294.7	2688.1	0.94	2.66	281.9	797.5	0	0
130_R	130_R	b	1	40	39.37	10	43.61	393.68	4683	12033.8	3911.1	0.92	3.16	275.9	947.5	0	0
131	131	b	1	19	18.27	10	35.41	182.74	2395	5658.2	861.7	0.53	2.31	159.8	691.9	0	0
131_R	131_R	b	1	21	20.24	10	35.41	202.43	2335	6106	1169.8	0.57	2.51	172.4	753.9	0	0
132	132	b	1	20	19.19	10	46.9	191.91	2358	4738.8	416.9	0.34	1.83	101	548.4	0	0
132_R	132_R	b	1	20	19.97	10	46.9	199.69	2462	5232.4	532.5	0.37	2.11	111.6	632.6	0	0
133	133	b	1	18	17.78	10	42.52	177.82	1866	5081.1	458.6	0.4	1.69	119.5	507.9	0	0
133_R	133_R	b	1	19	18.41	10	42.52	184.07	1911	5039.1	530.7	0.4	1.91	118.5	572.7	0	0
134	134	b	1	32	31.84	10	62.86	318.37	2860	11140.1	1430.3	0.59	1.92	177.2	575.8	0	0
134_R	134_R	b	1	29	28.49	10	62.86	284.91	2761	10724.6	1037.8	0.57	1.65	170.6	496.2	0	0
135	135	b	1	17	16.12	10	33.42	161.24	2903	6548.6	706.8	0.65	1.93	196	578.9	0	0
135_R	135_R	b	1	16	15.09	10	33.42	150.89	2753	6229	576.8	0.62	1.72	186.4	515.8	0	0
137	137	b	1	18	17.74	10	34.85	177.35	2919	7381.7	854.1	0.71	1.88	211.8	565.1	0	0
137_R	137_R	b	1	18	17.81	10	34.85	178.11	2511	7434.5	863	0.71	2.02	213.3	605.4	0	0
138	138	b	1	21	20.01	10	47.89	200.13	3014	5408.4	491.9	0.38	1.85	112.9	554	0	0
138_R	138_R	b	1	20	19.55	10	47.89	195.51	2943	5395.5	446.2	0.38	1.69	112.7	507.5	0	0
139	139	b	1	18	17.92	10	45.6	179.18	1730	3286.4	259.5	0.24	1.66	72.1	498.5	0	0
139_R	139_R	b	1	18	17.75	10	45.6	177.48	1686	3656.1	264.9	0.27	1.34	80.2	401.1	0	0
142	142	b	1	14	13.09	10	31.05	130.87	2294	6702	503.6	0.72	1.48	215.9	445	0	0
142_R	142_R	b	1	14	13.02	10	31.05	130.17	2377	6438.2	482.9	0.69	1.37	207.4	411.8	0	0
143	143	b	1	14	13.34	10	31.92	133.4	2500	4750.3	388.2	0.5	1.54	148.8	462.2	0	0
143_R	143_R	b	1	14	13.18	10	31.92	131.81	2656	5116.5	392.8	0.53	1.37	160.3	410.2	0	0
144	144	b	1	18	17.29	10	42.9	172.91	2610	4983.8	385.6	0.39	1.53	116.2	457.7	0	0
144_R	144_R	b	1	17	16.99	10	42.9	169.94	2555	4796.7	350.9	0.37	1.37	111.8	409.6	0	0
145	145	b	1	23	22.64	10	29.67	226.39	2590	8359.7	1767.4	0.94	2.46	281.7	736.7	0	0
145_R	145_R	b	1	20	19.51	10	29.67	195.11	2339	7689	1312.9	0.86	2.22	259.1	666.6	0	0
146	146	b	1	21	20.75	10	54.21	207.51	1958	3991.5	269.3	0.25	1.31	73.6	393.9	0	0
146_R	146_R	b	1	21	20.78	10	54.21	207.8	1918	3731.1	257.2	0.23	1.43	68.8	428.5	0	0
148	148	b	1	30	29.41	10	76.83	294.07	23804	198769.5	12476.4	8.62	44.5	2587.2	13348.5	0	0
148_R	148_R	b	1	30	29.59	10	76.83	295.86	25991	226709.6	14235.5	9.84	48.61	2950.9	14583.5	0	0
151	151	b	1	18	17.77	10	45.89	177.66	1372	3256.4	233.1	0.24	1.31	71	393.9	0	0
151_R	151_R	b	1	18	17.83	10	45.89	178.32	1341	3967.9	281.6	0.29	1.43	86.5	428.5	0	0
152	152	b	1	819	818.03	10	57.21	8180.34	3539	30929.3	231276.7	1.8	6.17	540.6	1851.2	0	0
152_R	152_R	b	1	1123	1122.58	10	57.21	11225.78	4152	34874.4	331695.2	2.03	6.56	609.6	1968.2	0	0
153	153	b	1	25	24.03	10	46.95	240.33	3035	11337.6	1209	0.8	1.8	241.5	540.8	0	0
153_R	153_R	b	1	27	26.33	10	46.95	263.31	3737	11411.3	1515.4	0.81	2.14	243.1	641	0	0
154	154	b	1	41	40.23	10	43.24	402.26	4072	13961.7	3986.5	1.08	3.07	322.9	920.4	0	0
154_R	154_R	b	1	168	167.25	10	43.24	1672.47	5119	19269.9	32731.2	1.49	4.84	445.7	1451	0	0
155	155	b	1	17	16.59	10	39.14	165.86	3656	6627.3	537.4	0.56	1.47	169.3	442.5	0	0
155_R	155_R	b	1	17	16.88	10	39.14	168.8	3902	7028.1	590.4	0.6	1.71	179.6	512.1	0	0
156	156	b	1	10	9.93	10	25.02	99.32	1561	3429.9	245.7	0.46	1.36	137.1	409.2	0	0
156_R	156_R	b	1	10	9.8	10	25.02	98.03	1479	3257.2	225.6	0.43	1.34	130.2	401.7	0	0
157	157	b	1	48	47.71	10	71.93	477.06	24952	205681.4	15472.4	9.53	44.5	2859.6	13348.5	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
157_R	157_R	b	1	75	74.89	10	71.93	748.87	27336	235095.8	22060.8	10.9	48.61	3268.5	14583.5	0	0
158	158	b	1	838	837.05	10	43.17	8370.47	5331	34840.1	235280.3	2.69	6.17	807.1	1851.2	0	0
158_R	158_R	b	1	1474	1473.33	10	43.17	14733.28	5275	43047.9	451312.1	3.32	6.63	997.2	1990.2	0	0
159	159	b	1	47	46.39	10	38.64	463.87	3776	17968.7	4799.7	1.55	2.62	465	785.9	0	0
159_R	159_R	b	1	325	324.79	10	38.64	3247.86	5571	26536.4	72955.6	2.29	5.04	686.8	1512.2	0	0
160	160	b	1	37	36.34	10	33.25	363.37	4466	14048.1	3538.6	1.41	2.67	422.5	800.3	0	0
160_R	158_R	b	1	28	27.29	10	33.25	272.88	3951	12698.9	2258.9	1.27	2.35	381.9	706.1	0	0
161	161	b	1	20	19.02	10	20.63	190.24	2729	8896.3	1688.3	1.44	2.24	431.2	672.9	0	0
161_R	161_R	b	1	66	65.68	10	20.63	656.77	3549	12292.5	10256.8	1.99	3.65	595.8	1095.1	0	0
162	162	b	1	611	610.09	10	32.61	6100.87	6177	25006.1	189126.6	2.56	6.81	766.8	2043	0	0
162_R	162_R	b	1	1003	1002.33	10	32.61	10023.28	4610	25919.2	324861.8	2.65	6.94	794.8	2083	0	0
163	163	b	1	96	95.1	10	22.61	951.02	3315	11910.7	19714.1	1.76	4.75	526.9	1423.9	0	0
163_R	163_R	b	1	69	68.36	10	22.61	683.57	2981	10636.8	12885.9	1.57	4.37	470.5	1310.5	0	0
164	164	b	1	10	9.62	10	20.53	96.22	1263	3541.2	368.4	0.57	1.61	172.4	482.1	0	0
164_R	164_R	b	1	11	10.47	10	20.53	104.65	1333	3886.6	475.1	0.63	1.72	189.3	517.4	0	0
165	165	b	1	24	23.26	10	37.76	232.57	2190	4854.5	1697.7	0.43	3.2	128.6	958.6	0	0
165_R	165_R	b	1	34	33.21	10	37.76	332.14	2407	5254.5	3963.2	0.46	3.89	139.2	1165.6	0	0
166	166	b	1	24	23.26	10	37.76	232.57	2190	4854.5	1697.7	0.43	3.2	128.6	958.6	0	0
166_R	166_R	b	1	34	33.21	10	37.76	332.14	2407	5254.5	3963.2	0.46	3.89	139.2	1165.6	0	0
167	167	b	1	26	25.43	10	36.47	254.25	3736	9879.2	1820.9	0.9	2.3	270.9	691	0	0
167_R	167_R	b	1	20	19.48	10	36.47	194.76	2804	8493.1	1018.3	0.78	1.93	232.9	578.8	0	0
171	171	b	1	48	47.7	10	24.89	476.98	3272	14461.6	6213.4	1.94	3.22	581	965.2	0	0
171_R	171_R	b	1	66	65.3	10	24.89	653.01	3039	14871.9	9869.2	1.99	3.77	597.5	1131.6	0	0
172	172	b	1	44	43.55	10	51.84	435.53	3222	8060.9	4303.3	0.52	3.5	155.5	1050.7	0	0
172_R	172_R	b	1	23	22.92	10	51.84	229.21	2687	6708.3	684	0.43	1.72	129.4	515	0	0
173	173	b	1	1240	1239.09	10	55.54	12390.87	4436	27237.9	403246.2	1.63	6.89	490.4	2066	0	0
173_R	173_R	b	1	1573	1572.24	10	55.54	15722.36	4754	26529.3	562414.6	1.59	7.45	477.6	2236.2	0	0
174	174	b	1	13	12.59	10	29.82	125.92	2482	4210.8	358.3	0.47	1.59	141.2	478.5	0	0
174_R	174_R	b	1	13	12.46	10	29.82	124.64	2579	4384.9	357.7	0.49	1.57	147	471.6	0	0
175	175	b	1	14	13.24	10	29.99	132.37	2013	5633.8	487.5	0.63	1.56	187.9	466.6	0	0
175_R	175_R	b	1	16	15.01	10	29.99	150.05	2178	6056.4	720.2	0.67	2.06	202	617.7	0	0
176	176	b	1	21	20.47	10	40.9	204.72	3979	8794.7	999.9	0.72	2.18	215	652.9	0	0
176_R	175_R	b	1	20	19.8	10	40.9	198.05	3899	8889.1	923.7	0.72	1.88	217.3	563.6	0	0
177	177	b	1	197	196.21	10	33.77	1962.12	3366	14151.2	58576.1	1.4	6.56	419.1	1967.7	0	0
177_R	177_R	b	1	147	146.69	10	33.77	1466.87	2872	12967	40082.6	1.28	6.08	384	1823.7	0	0
178	178	b	1	19	18.62	10	48.63	186.24	1501	2743.3	193	0.19	1.43	56.4	428.5	0	0
178_R	178_R	b	1	19	18.54	10	48.63	185.38	1490	2624	179.2	0.18	1.31	54	393.9	0	0
179	179	b	1	726	725.63	10	97.97	7256.29	4112	51871.7	161731.9	1.76	5.15	529.5	1544.8	0	0
179_R	179_R	b	1	420	419.98	10	97.97	4199.83	3131	47160.1	81999.1	1.6	4.61	481.4	1382.8	0	0
180	180	b	1	13	12.3	10	29.51	122.98	1367	3976.3	331.1	0.45	1.49	134.7	446.5	0	0
180_R	180_R	b	1	14	13.97	10	29.51	139.72	1430	4187.5	537.4	0.47	2.02	141.9	607.1	0	0
181	181	b	1	425	424.62	10	80.68	4246.19	3786	42527.8	85477.8	1.76	4.64	527.1	1391	0	0
181_R	181_R	b	1	349	348.09	10	80.68	3480.93	3531	40119.1	67062.1	1.66	4.46	497.3	1339.4	0	0
182	182	b	1	280	279.64	10	85.51	2796.36	4146	40519.7	50313	1.58	4.3	473.8	1291	0	0
182_R	182_R	b	1	1594	1593.11	10	85.51	15931.07	6245	55620.9	513830.2	2.17	7.32	650.4	2195.3	0	0
184	184	b	1	30	29.2	10	35.35	292.04	1607	7761.1	2723.2	0.73	2.99	219.6	896.9	0	0
184_R	184_R	b	1	19	18.81	10	35.35	188.13	1439	7343.5	963.4	0.69	2.02	207.8	606.4	0	0
187	187	b	1	154	153.48	10	26	1534.81	5526	17874.6	33303.6	2.29	4.91	687.4	1473.5	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
187_R	187_R	b	1	87	86.44	10	26	864.4	5002	15916.5	15441.9	2.04	4.38	612.1	1313.1	0	0
188	188	b	1	21	20.03	10	45.55	200.32	1785	4562.4	539.7	0.33	1.99	100.2	596.3	0	0
188_R	188_R	b	1	22	21.63	10	45.55	216.27	1551	5002.9	740.4	0.37	2.16	109.8	648.1	0	0
189	189	b	1	18	17.79	10	34.81	177.88	2503	6818.3	875.4	0.65	2.11	195.8	633.3	0	0
189_R	189_R	b	1	17	16.42	10	34.81	164.19	2366	6995	711.8	0.67	1.97	200.9	590.5	0	0
190	190	b	1	71	70.97	10	45.72	709.66	2406	15316.3	9020.5	1.12	3.64	335	1090.7	0	0
190_R	190_R	b	1	32	31.76	10	45.72	317.61	1983	11744.7	2186.6	0.86	2.32	256.9	696.9	0	0
191	191	b	1	629	628.34	10	52.82	6283.35	3641	27783.2	165750.5	1.75	5.77	526	1731.8	0	0
191_R	191_R	b	1	738	737.71	10	52.82	7377.12	3832	30867.3	196795.6	1.95	5.93	584.4	1780.3	0	0
192	192	b	1	471	470.27	10	106.44	4702.71	5286	55248.1	90907.3	1.73	4.64	519	1391	0	0
192_R	192_R	b	1	23811	23810.03	10	106.44	238100.3	8658	90016.3	16791174	2.82	14.79	845.7	4437.3	0	0
193	193	b	1	13	12.08	10	30.79	120.81	1768	3542.5	249.2	0.38	1.2	115.1	358.7	0	0
193_R	193_R	b	1	13	12.38	10	30.79	123.78	1767	4153.1	308.2	0.45	1.31	134.9	392.4	0	0
194	194	b	1	42	41.38	10	27.4	413.81	2187	15257.1	4714	1.86	2.93	556.9	878.4	0	0
194_R	194_R	b	1	63	62.67	10	27.4	626.68	2244	16378.9	8777	1.99	3.52	597.8	1056.1	0	0
195	195	b	1	42	41.38	10	27.4	413.81	2187	15257.1	4714	1.86	2.93	556.9	878.4	0	0
195_R	195_R	b	1	63	62.67	10	27.4	626.68	2244	16378.9	8777	1.99	3.52	597.8	1056.1	0	0
197	197	b	1	13	12.73	10	32.27	127.34	1788	3720	268.4	0.38	1.26	115.3	378.7	0	0
197_R	197_R	b	1	13	12.64	10	32.27	126.42	1491	3510.2	250.5	0.36	1.39	108.8	415.7	0	0
200	200	b	1	18	17.35	10	27.93	173.5	2142	5611.2	1075.5	0.67	2.3	200.9	691	0	0
200_R	200_R	b	1	13	12.72	10	27.93	127.21	1814	4530.2	452.2	0.54	1.59	162.2	476	0	0
202	202	b	1	447	446.2	10	139.67	4461.96	26713	237111	97624.5	5.66	44.5	1697.6	13348.5	0	0
202_R	202_R	b	1	370	369.88	10	139.67	3698.85	28679	261957	80929.9	6.25	48.61	1875.5	14583.5	0	0
203	203	b	1	39	38.6	10	68.81	385.98	3678	10399.6	2034.4	0.5	2.47	151.1	740.6	0	0
203_R	203_R	b	1	32	31.28	10	68.81	312.81	3492	9713.3	1042.1	0.47	1.78	141.2	533.1	0	0
206	206	b	1	25	24.28	10	54.38	242.81	3562	5298	735.9	0.32	2.61	97.4	783.5	0	0
206_R	206_R	b	1	23	22.76	10	54.38	227.55	3549	5501.8	540.6	0.34	2.21	101.2	661.6	0	0
207	207	b	1	23	22.03	10	51.68	220.33	2382	6112.4	598.3	0.39	1.85	118.3	553.6	0	0
207_R	207_R	b	1	21	20.81	10	51.68	208.08	2307	5584.8	442.4	0.36	1.49	108.1	447.9	0	0
208	208	b	1	24	23.63	10	61.13	236.27	1820	3615.3	265.2	0.2	1.43	59.1	429.8	0	0
208_R	208_R	b	1	24	23.67	10	61.13	236.75	1753	4293.5	309.9	0.23	1.43	70.2	428.5	0	0
209	209	b	1	20	19.63	10	49.89	196.26	2356	3650.1	288	0.24	1.66	73.2	498.5	0	0
209_R	209_R	b	1	20	19.89	10	49.89	198.94	2375	4254.1	345	0.28	1.59	85.3	477.1	0	0
210	210	b	1	20	19.27	10	46.96	192.68	1981	4499.2	404.5	0.32	1.68	95.8	504.1	0	0
210_R	210_R	b	1	19	18.96	10	46.96	189.58	1961	4526.8	378.5	0.32	1.69	96.4	505.6	0	0
211	211	b	1	34	33.06	10	78.99	330.63	3751	8123.1	751.4	0.34	1.65	102.8	496	0	0
211_R	211_R	b	1	96	95.99	10	78.99	959.88	4965	10718.6	15504.4	0.45	4.76	135.7	1427.8	0	0
212	212	b	1	36	35.76	10	75.94	357.63	3093	8555	1332.4	0.38	2.51	112.7	753.9	0	0
212_R	212_R	b	1	34	33.49	10	75.94	334.92	3032	8249.7	997.3	0.36	2.31	108.6	691.9	0	0
213	213	b	1	13664	13663.18	10	86.68	136631.8	7594	77262	7704268	2.97	11.53	891.3	3458.1	0	0
213_R	213_R	b	1	136	135.41	10	86.68	1354.09	4339	35797.7	16259.6	1.38	3.13	413	938.8	0	0
214	214	b	1	64	63.11	10	105.41	631.09	3660	29074.7	3968.8	0.92	2.22	275.8	664.8	0	0
214_R	214_R	b	1	147	146.22	10	105.41	1462.25	4480	38469.9	17284	1.22	3.37	365	1009.5	0	0
216	216	b	1	336	335.43	10	123.79	3354.35	4433	44694.7	56519.9	1.2	4.21	361.1	1262.5	0	0
216_R	216_R	b	1	611	610.46	10	123.79	6104.58	5239	46620	146247.1	1.26	5.46	376.6	1639	0	0
217	217	b	1	75	74.12	10	113.68	741.22	4600	32423	5168.3	0.95	2.75	285.2	824.2	0	0
217_R	217_R	b	1	152	151.6	10	113.68	1515.97	4939	40854.8	17646.5	1.2	3.37	359.4	1009.5	0	0
219	219	b	1	27	26.74	10	68.71	267.4	2543	3699.7	294.7	0.18	1.66	53.8	498.5	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
219_R	219_R	b	1	27	26.75	10	68.71	267.48	2714	4086.8	314.5	0.2	1.43	59.5	429.8	0	0
220	220	b	1	27	26.51	10	68.2	265.07	2542	3557.1	282.1	0.17	1.66	52.2	498.5	0	0
220_R	220_R	b	1	27	26.53	10	68.2	265.33	2720	4033.3	309.2	0.2	1.43	59.1	429.8	0	0
221	221	b	1	27	26.51	10	68.2	265.07	2542	3557.1	282.1	0.17	1.66	52.2	498.5	0	0
221_R	221_R	b	1	27	26.53	10	68.2	265.33	2720	4033.3	309.2	0.2	1.43	59.1	429.8	0	0
222	222	b	1	29	28.42	10	71.74	284.25	2967	4835	404.4	0.22	1.66	67.4	498.5	0	0
222_R	222_R	b	1	28	27.96	10	71.74	279.56	2862	4836.6	364.9	0.22	1.43	67.4	429.8	0	0
223	223	b	1	92	91.21	10	86.62	912.14	3025	28900.6	8798.7	1.11	2.67	333.7	802.3	0	0
223_R	223_R	b	1	68	67.67	10	86.62	676.73	3155	27084.7	5357.9	1.04	2.57	312.7	771.4	0	0
224	224	b	1	27	26.2	10	41.53	262.04	1887	7263.1	1620.9	0.58	2.46	174.9	736.7	0	0
224_R	224_R	b	1	24	23.29	10	41.53	232.88	1632	6686.1	1191.7	0.54	2.2	161	661.2	0	0
225	225	b	1	38	37.04	10	73.2	370.39	3247	6864.2	1552.6	0.31	2.48	93.8	744	0	0
225_R	225_R	b	1	30	29.35	10	73.2	293.47	2990	5886.6	497.1	0.27	1.6	80.4	481.3	0	0
226	226	b	1	27	26.69	10	68.64	266.93	2142	3612	287.8	0.18	1.66	52.6	498.5	0	0
226_R	226_R	b	1	27	26.54	10	68.64	265.43	2134	4015	297	0.19	1.43	58.5	429.8	0	0
227	227	b	1	469	468.09	10	33.15	4680.91	2064	34306.5	100318	3.45	4.57	1034.8	1371.5	0	0
227_R	227_R	b	1	382	381.73	10	33.15	3817.34	1757	33029.4	77652.5	3.32	4.36	996.3	1308.1	0	0
228	228	b	1	47140	47139.72	10	29.63	471397.2	10006	93368	37472816	10.5	17.11	3151.5	5133.2	0	0
228_R	228_R	b	1	5719	5718.49	10	29.63	57184.93	5096	46130.1	2842332	5.19	10.14	1557	3042.1	0	0
229	229	b	1	8717	8716.57	10	30.5	87165.69	6741	55421.2	4654301	6.06	11.18	1817.4	3353.3	0	0
229_R	229_R	b	1	3946	3945.23	10	30.5	39452.34	4186	53091.9	1577779	5.8	8.72	1741	2617.5	0	0
230	230	b	1	7	6.22	10	15.25	62.23	631	3338.6	233.8	0.73	1.25	218.9	374.9	0	0
230_R	230_R	b	1	7	6.6	10	15.25	66.05	498	3768.9	287.6	0.82	1.41	247.1	422.7	0	0
232	232	b	1	1980	1979.41	10	29.35	19794.12	4342	43353.9	664387.3	4.92	7.18	1477	2153.2	0	0
232_R	232_R	b	1	4004	4003.29	10	29.35	40032.91	4234	52944.3	1601980	6.01	8.72	1803.7	2617.5	0	0
233	233	b	1	26	25.45	10	65.34	254.51	1849	3747.5	290.6	0.19	1.53	57.4	457.7	0	0
233_R	233_R	b	1	26	25.24	10	65.34	252.38	1952	3942.7	286.3	0.2	1.43	60.3	429.8	0	0
234	234	b	1	90	89.14	10	38.82	891.41	2935	19498.6	12673.9	1.67	3.59	502.3	1076.3	0	0
234_R	234_R	b	1	116	115	10	38.82	1150.02	3706	19506.9	19474.8	1.67	4.22	502.5	1266.5	0	0
235	235	b	1	468	467.22	10	31.09	4672.18	1729	33937.6	100289.5	3.64	4.57	1091.7	1371.5	0	0
235_R	235_R	b	1	373	372.19	10	31.09	3721.94	1757	31640	76153.8	3.39	4.36	1017.8	1308.1	0	0
236	236	b	1	361	360.25	10	19.93	3602.47	1682	19698.3	84377.2	3.3	4.94	988.6	1481	0	0
236_R	236_R	b	1	18	17.67	10	19.93	176.68	892	8557	1518.5	1.43	2.08	429.4	624.7	0	0
237	237	b	1	467	466.81	10	30.01	4668.15	1729	33937.6	100289.5	3.77	4.57	1130.8	1371.5	0	0
237_R	237_R	b	1	372	371.79	10	30.01	3717.9	1757	31640	76153.8	3.51	4.36	1054.2	1308.1	0	0
238	238	b	1	672	671.53	10	34.23	6715.32	2856	41505.4	153711.7	4.04	4.92	1212.7	1475.5	0	0
238_R	238_R	b	1	436	435.47	10	34.23	4354.67	1788	34965.1	92240.7	3.41	4.51	1021.6	1354.2	0	0
240	240	b	1	671	670.11	10	79.94	6701.06	5042	28625.9	181904.9	1.19	6.16	358.1	1848.3	0	0
240_R	240_R	b	1	685	684.52	10	79.94	6845.18	5527	30903.3	181733.5	1.29	5.92	386.6	1776.1	0	0
241	241	b	1	30	29.25	10	74.22	292.54	2478	4730.5	392.4	0.21	1.59	63.7	477.5	0	0
241_R	241_R	b	1	29	28.76	10	74.22	287.56	2345	4625.5	342.3	0.21	1.43	62.3	429.8	0	0
242	242	b	1	326	325.82	10	104.72	3258.2	5390	40843	54888.9	1.3	4.11	390	1232.4	0	0
242_R	242_R	b	1	594	593.44	10	104.72	5934.4	5922	41852.3	143869.2	1.33	5.46	399.7	1637.9	0	0
243	243	b	1	62	61.11	10	68.19	611.14	5074	17117.8	5833.5	0.84	3.07	251	920.4	0	0
243_R	243_R	b	1	238	237.41	10	68.19	2374.08	5402	24024.3	45268	1.17	4.39	352.3	1318	0	0
245	245	b	1	18	17.91	10	44.88	179.11	2260	3922.3	316.3	0.29	1.66	87.4	498.5	0	0
245_R	245_R	b	1	18	17.97	10	44.88	179.73	2005	4256	341.7	0.32	1.59	94.8	478.2	0	0
246	246	b	1	66	65.34	10	112.34	653.39	3653	28228.3	3894.5	0.84	2.22	251.3	664.8	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
246_R	246_R	b	1	149	148.26	10	112.34	1482.61	4330	37335	17177.6	1.11	3.37	332.4	1009.5	0	0
248	248	b	1	32	31.48	10	73.31	314.83	3226	6153.1	731.2	0.28	2.09	83.9	627.6	0	0
248_R	248_R	b	1	31	30.14	10	73.31	301.41	2850	6239.5	582.5	0.28	1.77	85.1	530.2	0	0
249	249	b	1	28	27.75	10	63.17	277.54	2915	6489.3	752.5	0.34	2.09	102.7	625.8	0	0
249_R	249_R	b	1	27	26.28	10	63.17	262.78	2573	6547	594.8	0.35	1.76	103.6	529.4	0	0
251	251	b	1	793	792.91	10	88.75	7929.11	4532	32121.9	209444.4	1.21	5.92	361.9	1776.2	0	0
251_R	251_R	b	1	55	54.37	10	88.75	543.7	3651	15907.6	3260.3	0.6	2.58	179.2	773.9	0	0
252	252	b	1	88	87.41	10	39.5	874.06	2582	17126.9	12332.9	1.45	3.59	433.6	1076.1	0	0
252_R	252_R	b	1	108	107.31	10	39.5	1073.13	3168	16011.2	18168.8	1.35	4.21	405.4	1264.2	0	0
253	253	b	1	526	525.74	10	61.96	5257.44	5031	43748	117691.4	2.35	5.25	706.1	1574	0	0
253_R	253_R	b	1	647	646.31	10	61.96	6463.07	5237	46453.3	147094.5	2.5	5.08	749.7	1524.3	0	0
254	254	b	1	36	35.49	10	83.64	354.94	3142	11293	991.6	0.45	1.69	135	506.9	0	0
254_R	254_R	b	1	36	35.19	10	83.64	351.85	3106	11332.7	963.7	0.45	1.64	135.5	491	0	0
256	256	b	1	3501	3500.17	10	36.81	35001.73	5890	36734.5	1759580	3.33	10.53	998	3160.2	0	0
256_R	256_R	b	1	2444	2443.95	10	36.81	24439.45	6865	39783	1004595	3.6	9.3	1080.8	2790	0	0
257	257	b	1	786	785.84	10	85.45	7858.44	4266	32554	207546.3	1.27	5.91	381	1773.7	0	0
257_R	257_R	b	1	46	45.87	10	85.45	458.73	3185	15223.3	2257.3	0.59	2.16	178.1	647.1	0	0
258	258	b	1	95	94.48	10	90.06	944.82	4133	30923.9	9114.5	1.14	2.67	343.4	802.3	0	0
258_R	258_R	b	1	73	72.02	10	90.06	720.22	4209	29328.4	5822.6	1.09	2.57	325.7	771.4	0	0
259	259	b	1	88	87.64	10	35.3	876.37	2951	18994.4	12605.6	1.79	3.59	538.1	1076.3	0	0
259_R	259_R	b	1	114	113.18	10	35.3	1131.79	3699	19245.4	19400.1	1.82	4.22	545.3	1266.5	0	0
260	260	b	1	427	426.99	10	79.44	4269.92	3737	43200.4	85781.5	1.81	4.64	543.8	1391	0	0
260_R	260_R	b	1	365	364.42	10	79.44	3644.24	3830	42320.1	69675	1.78	4.46	532.7	1339.4	0	0
263	263	b	1	18	17.57	10	36.39	175.74	2335	4365	690.1	0.4	2.61	120	782.6	0	0
263_R	263_R	b	1	32	31.74	10	36.39	317.43	2725	5491.7	3270.8	0.5	3.36	150.9	1007.4	0	0
264	264	b	1	20	19.87	10	34.64	198.7	2538	5773.6	1121.1	0.56	2.61	166.7	782.6	0	0
264_R	264_R	b	1	21	20.6	10	34.64	206.05	2428	6037.7	1245.1	0.58	2.51	174.3	753.9	0	0
265	265	b	1	29	28.23	10	71.09	282.27	3261	4759.9	406.4	0.22	1.66	67	498.5	0	0
265_R	265_R	b	1	29	28.06	10	71.09	280.6	3364	5073.1	408.4	0.24	1.57	71.4	471.6	0	0
266	266	b	1	29	28.59	10	72.04	285.87	3261	4759.9	406.4	0.22	1.66	66.1	498.5	0	0
266_R	266_R	b	1	29	28.42	10	72.04	284.2	3364	5073.1	408.4	0.23	1.57	70.4	471.6	0	0
BRT3	BRT3	B	2	30	29.31	3	42.32	87.94	250753	2752967	95353.5	50.04	97.23	65056.4	126399.6	0	0
BRT3_R	BRT3_R	B	2	30	29.31	3	42.32	87.93	256307	2920493	101152.1	53.09	100.95	69015.3	131235.1	0	0
MRT1	MRT1	M	3	20	19.33	3.5	38.19	67.66	114882	817096	24134.4	12.48	37.9	21393.4	64967.2	0	0
MRT1_R	MRT1_R	M	3	20	19.33	3.5	38.19	67.65	103449	761495.9	22487.2	11.63	31.23	19937.6	53533.6	0	0
MRT5_N	MRT5_N	M	3	10	9.73	3.5	19.23	34.07	100750	872924.9	25767.7	26.48	32.4	45392.6	55541.5	0	0
MRT5_N_R	MRT5_N_R	M	3	10	9.73	3.5	19.23	34.06	105076	913175.8	26949.6	27.7	33.56	47485.7	57524.8	0	0
MRT5_S	MRT5_S	M	3	9	8.45	3.5	16.68	29.57	104640	535766	15838	18.74	39.94	32127.7	68470.1	0	0
MRT5_S_R	MRT5_S_R	M	3	9	8.45	3.5	16.68	29.56	100169	533866.8	15777.8	18.67	39.37	32013.8	67490.7	0	0
MRT6	MRT6	M	3	10	9.81	3.5	19.37	34.33	94933	699353.4	20662.5	21.06	30.77	36105.5	52742.4	0	0
MRT6_R	MRT6_R	M	3	10	9.81	3.5	19.37	34.32	86662	621135.9	18348.5	18.71	26.6	32067.3	45593	0	0

Scenario 8: Rationalized Bus Route with MRT																	
Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
10	10	b	1	11	10.63	10	17.33	106.25	3823	7615.2	888	1.46	2.12	439.3	636.1	0	0
10_R	10_R	b	1	25	24.05	10	17.33	240.51	4144	9164.1	3595.2	1.76	3.96	528.7	1188.3	0	0
11A	11A	b	1	1820	1819.44	10	20.27	18194.41	6955	23397.8	860980.3	3.85	10.15	1154.3	3044.5	0	0
11A_R	11A_R	b	1	4136	4135.9	10	20.27	41359.01	7400	26986.9	2402173	4.44	11.8	1331.4	3539.7	0	0
11B	11B	b	1	4701	4700.35	10	32.53	47003.49	10888	40942.4	2926432	4.2	13.56	1258.6	4067.3	0	0
11B_R	11B_R	b	1	123	122.98	10	32.53	1229.78	4704	22937.4	24322.3	2.35	4.85	705.1	1453.8	0	0
11C	11C	b	1	2751	2750.76	10	39.81	27507.62	8024	33362.5	1412240	2.79	11.97	838.1	3591.8	0	0
11C_R	11C_R	b	1	165	164.68	10	39.81	1646.82	5990	23107.8	35329.1	1.93	5.77	580.5	1731.5	0	0
12A	12A	b	1	21	20.48	10	27.4	204.82	4464	11786	1930.9	1.43	2.59	430.1	778.2	0	0
12A_R	12A_R	b	1	20	19.26	10	27.4	192.65	4162	11280.8	1746.4	1.37	2.71	411.7	813	0	0
12B	12B	b	1	144	143.53	10	30.09	1435.32	6769	13282.2	42876	1.47	6.77	441.4	2030.2	0	0
12B_R	12B_R	b	1	55	54.35	10	30.09	543.52	6264	12199.4	10715.9	1.35	5.03	405.4	1508.7	0	0
13	13	b	1	5812	5811.11	10	29.07	58111.13	11320	33160.9	3873092	3.8	13.89	1140.9	4168.4	0	0
13_R	13_R	b	1	3517	3516.46	10	29.07	35164.64	8950	30177.4	2105389	3.46	12.36	1038.3	3707.3	0	0
14A	14A	b	1	109	108.24	10	25.89	1082.43	5405	17341.1	21575.2	2.23	4.73	669.7	1419	0	0
14A_R	14A_R	b	1	69	68.73	10	25.89	687.26	4671	16379.1	11929.6	2.11	3.96	632.6	1188.8	0	0
14B	14B	b	1	291	290.82	10	26.32	2908.21	7542	20401.3	86995.9	2.58	7.08	775.2	2123	0	0
14B_R	14B_R	b	1	47	46.97	10	26.32	469.65	5603	15094.2	7153.8	1.91	4.12	573.5	1235.7	0	0
15A	15A	b	1	2876	2875.14	10	32.99	28751.4	8322	29295.2	1518177	2.96	10.69	888.1	3206.5	0	0
15A_R	15A_R	b	1	340	339.13	10	32.99	3391.29	6328	22528.4	91732.1	2.28	6.18	682.9	1855.1	0	0
15B	15B	b	1	106	105.17	10	30.51	1051.68	6717	17458.8	21354.5	1.91	4.82	572.2	1446.4	0	0
15B_R	15B_R	b	1	2020	2019.76	10	30.51	20197.61	8424	25306.4	1064535	2.76	11.87	829.4	3559.7	0	0
16A	16A	b	1	2844	2843.14	10	28.11	28431.44	8267	31120.9	1449241	3.69	10.72	1107	3217.3	0	0
16A_R	16A_R	b	1	2708	2707.55	10	28.11	27075.5	8573	30342.6	1297267	3.6	10.81	1079.3	3243.5	0	0
16B	16B	b	1	3837	3836.76	10	23.3	38367.63	8210	29223	2283512	4.18	12.96	1254.2	3887.2	0	0
16B_R	16B_R	b	1	562	561.82	10	23.3	5618.16	6814	22020.6	186444.8	3.15	7.64	945.1	2292.4	0	0
16C	16C	b	1	11	10.96	10	18.3	109.59	3150	6919.6	876.5	1.26	2.08	378.2	623.8	0	0
16C_R	16C_R	b	1	11	10.68	10	18.3	106.76	3014	6747.1	842.6	1.23	2.18	368.7	653.4	0	0
16D	16D	b	1	1520	1519.84	10	40.09	15198.44	13943	37597.8	630747.6	3.13	10.15	937.9	3046.3	0	0
16D_R	16D_R	b	1	4457	4456.9	10	40.09	44569.01	14824	48230.5	2331693	4.01	11.79	1203.2	3536.6	0	0
17	17	b	1	1838	1837.75	10	74.25	18377.46	5121	44689.9	651318.5	2.01	7.33	601.9	2199.8	0	0
17_R	17_R	b	1	2002	2001.51	10	74.25	20015.12	5320	45938.2	725453.1	2.06	7.49	618.7	2248.2	0	0
18	18	b	1	159	158.17	10	26.27	1581.67	2938	19693.9	32168.9	2.5	4.66	749.6	1398.2	0	0
18_R	18_R	b	1	60	59.88	10	26.27	598.75	2008	16163.4	8440.5	2.05	3.14	615.2	942	0	0
19	19	b	1	183	182.69	10	35.22	1826.9	1761	23244.9	37452.8	2.2	4.55	660	1366.5	0	0
19_R	19_R	b	1	284	283.29	10	35.22	2832.89	1947	25985.7	65503.6	2.46	5.17	737.8	1552.1	0	0
1A	1A	b	1	9	8.88	10	19.33	88.84	2653	5841.1	568.6	1.01	2	302.2	600.8	0	0
1A_R	1A_R	b	1	11	10.13	10	19.33	101.3	2875	6544	745	1.13	2.26	338.6	677	0	0
1B	1B	b	1	4895	4894.66	10	36.55	48946.59	15948	37155.8	3358251	3.39	14.79	1016.4	4436.9	0	0
1B_R	1B_R	b	1	1719	1718.22	10	36.55	17182.19	11252	34565.3	737824.4	3.15	9.37	945.6	2811	0	0
1C	1C	b	1	16	15.03	10	25.75	150.29	3357	10246.5	1207.5	1.33	2.42	397.9	725.7	0	0
1C_R	1C_R	b	1	23	22.8	10	25.75	228.05	3320	11353.6	2398.7	1.47	3.04	440.9	912.4	0	0
1D	1D	b	1	2759	2758.3	10	39.25	27582.96	7687	36649.9	1473090	3.11	11.42	933.7	3425.2	0	0
1D_R	1D_R	b	1	5545	5544.75	10	39.25	55447.49	7932	38825.6	3517614	3.3	13.32	989.2	3997.4	0	0
20	20	b	1	4428	4427.51	10	22.77	44275.12	8349	37402.5	2318257	5.47	11.58	1642.4	3472.7	0	0
20_R	20_R	b	1	559	558.04	10	22.77	5580.35	4072	24674	166001	3.61	6.75	1083.4	2024.5	0	0
21	21	b	1	175	174.6	10	30.84	1746.04	2630	22769.8	36185.1	2.46	4.77	738.2	1432.2	0	0

Line	Description	Mode	Vehicle	No. veh. (int)	No. veh. (float)	Headway	Length	Time	Passenger	Pass. Dist.	Pass. Hour.	Avrg. Load	Max. load	Avrg. Vol	Max. vol	Op cost	consum
21_R	21_R	b	1	7794	7793.21	10	30.84	77932.1	5345	38294.6	5078880	4.14	13.4	1241.6	4019.5	0	0
22	22	b	1	519	518.33	10	71.35	5183.28	4472	57735.1	120838	2.7	6.3	809.1	1889.7	0	0
22_R	22_R	b	1	553	552.74	10	71.35	5527.44	3407	54673.9	153588.6	2.55	7.14	766.2	2140.8	0	0
23	23	b	1	1192	1191	10	55.38	11910.03	2966	62080.2	351106.4	3.74	6.14	1121	1841.7	0	0
23_R	23_R	b	1	1152	1151.09	10	55.38	11510.94	2738	54792.5	351096.2	3.3	6.25	989.4	1873.7	0	0
24	24	b	1	723	722.62	10	28.92	7226.17	4488	36039.2	200687.3	4.15	6.36	1246	1907.1	0	0
24_R	24_R	b	1	601	600.39	10	28.92	6003.94	3135	34982.5	152624.4	4.03	5.41	1209.4	1621.8	0	0
2A	2A	b	1	14	13.52	10	24.57	135.25	3690	8870.3	1053.6	1.2	2.39	361	718	0	0
2A_R	2A_R	b	1	22	21.37	10	24.57	213.66	3998	9011.9	2678.9	1.22	3.72	366.7	1117.5	0	0
2B	2B	b	1	15	14.99	10	22.51	149.86	4173	8828.7	1304.6	1.31	2.54	392.2	762.2	0	0
2B_R	2B_R	b	1	16	15.49	10	22.51	154.88	4114	8678.7	1412	1.28	2.61	385.5	782.6	0	0
3A	3A	b	1	16	15.35	10	29.28	153.51	3752	9069.1	1102.3	1.03	2.27	309.8	681.8	0	0
3A_R	3A_R	b	1	17	16.67	10	29.28	166.72	3793	10122.7	1313	1.15	2.33	345.8	699.4	0	0
3B	3B	b	1	16	15.14	10	28.53	151.38	3752	9069.1	1102.3	1.06	2.27	317.8	681.8	0	0
3B_R	3B_R	b	1	17	16.46	10	28.53	164.59	3793	10122.7	1312.9	1.18	2.33	354.7	699.4	0	0
4A	4A	b	1	4163	4162.41	10	31.29	41624.13	8112	30980.2	2419090	3.3	11.81	990.2	3541.6	0	0
4A_R	4A_R	b	1	3394	3393.84	10	31.29	33938.36	10049	34057.4	1700592	3.63	11.21	1088.6	3363.5	0	0
4B	4B	b	1	2058	2057.55	10	29.06	20575.48	6807	28346.6	971277.7	3.25	11.45	975.5	3436.2	0	0
4B_R	4B_R	b	1	2801	2800.54	10	29.06	28005.37	6490	32062.6	1368720	3.68	11.14	1103.4	3340.6	0	0
4C	4C	b	1	285	284.67	10	36.47	2846.73	2528	29007.9	64931.2	2.65	5.08	795.5	1525.1	0	0
4C_R	4C_R	b	1	243	242.65	10	36.47	2426.45	3086	27101.7	52586.2	2.48	4.88	743.2	1465.3	0	0
5	5	b	1	79	78.4	10	22.86	784.05	3481	10868.5	20168.9	1.58	5.87	475.4	1761.8	0	0
5_R	5_R	b	1	87	86.24	10	22.86	862.44	4534	9990.7	23589.1	1.46	6.07	437	1821.5	0	0
6	6	b	1	135	134.24	10	36.42	1342.37	6367	23011.4	25819.7	2.11	4.73	631.9	1418.5	0	0
6_R	6_R	b	1	99	98.92	10	36.42	989.2	5927	21599.1	16992.6	1.98	3.96	593.1	1188.8	0	0
7A	7A	b	1	20	19.23	10	20.56	192.34	5272	10585.4	2036.4	1.72	2.73	514.9	820.3	0	0
7A_R	7A_R	b	1	17	16.58	10	20.56	165.82	5326	10293.7	1615.2	1.67	2.62	500.7	785.2	0	0
7B	7B	b	1	10	9.81	10	18	98.08	4459	7737.3	769.1	1.43	2.07	429.8	622.3	0	0
7B_R	7B_R	b	1	12	11.92	10	18	119.19	4332	8159.4	1083.5	1.51	2.64	453.3	791.2	0	0
8	8	b	1	141	140.74	10	30.69	1407.42	7072	21955.6	29091.8	2.38	5.09	715.4	1525.6	0	0
8_R	8_R	b	1	163	162.36	10	30.69	1623.63	6998	21430.1	36413.8	2.33	5.45	698.3	1633.6	0	0
9A	9A	b	1	60	59.91	10	32.91	599.1	10624	20119.7	8901.2	2.04	3.99	611.3	1197	0	0
9A_R	9A_R	b	1	27	26.04	10	32.91	260.45	8671	16847.1	2533.4	1.71	2.69	511.9	807.4	0	0
9B	9B	b	1	115	114.88	10	22.4	1148.77	6171	13414.6	32532.5	2	6.45	598.9	1936.1	0	0
9B_R	9B_R	b	1	31	30.32	10	22.4	303.25	5039	12427.5	4204.8	1.85	3.91	554.8	1173.9	0	0
BRT3	BRT3	B	2	30	29.31	3	42.31	87.94	254294	3106394	107576.4	56.47	93.96	73412.1	122154.1	0	0
BRT3_R	BRT3_R	B	2	30	29.31	3	42.31	87.93	259270	3224095	111656.7	58.61	97.77	76193.7	127102.5	0	0
MRT1	MRT1	M	3	20	19.34	3.5	38.21	67.68	65381	399958.5	11812.5	6.11	19.85	10468.3	34035.4	0	0
MRT1_R	MRT1_R	M	3	20	19.34	3.5	38.21	67.67	66813	415313.1	12261.6	6.34	20.69	10870.1	35468.8	0	0
MRT5_N	MRT5_N	M	3	10	9.75	3.5	19.26	34.11	82654	742700	21922.8	22.5	30.76	38567.5	52736.7	0	0
MRT5_N_R	MRT5_N_R	M	3	10	9.74	3.5	19.26	34.1	87742	740277.5	21843.7	22.42	30.83	38441.8	52853.6	0	0
MRT5_S	MRT5_S	M	3	9	8.43	3.5	16.64	29.5	85939	470715.2	13915.1	16.51	33.67	28294.5	57716.6	0	0
MRT5_S_R	MRT5_S_R	M	3	9	8.43	3.5	16.64	29.49	91093	506893.1	14980.6	17.77	36.18	30469.1	62024.5	0	0
MRT6	MRT6	M	3	10	9.79	3.5	19.33	34.25	77211	628067.8	18556.7	18.96	27.93	32499.2	47871.9	0	0
MRT6_R	MRT6_R	M	3	10	9.78	3.5	19.33	34.24	67278	534366	15786.3	16.13	23.69	27650.6	40617.3	0	0