INFRASTRUCTURE ASSESSMENT OF CHURCH STREET AND SCOPE FOR PEDESTRIANISATION

A situation analysis of Church Street



REPORT SUBMITTED TO BBMP, GOVT. OF KARNATAKA

BY



DEPARTMENT OF CIVIL ENGINEERING GLOBAL ACADEMY OF TECHNOLOGY BENGALURU NOVEMBER 2019

ACKNOWDLEDGEMENT

This study was undertaken with the support and co-operation from different quarters; each of their support is wholeheartedly appreciated.

The efforts of the project team comprising of **Mr. Kiran L, Mr. Basavaraj M R, Ms. Anjali Gupta** [Teaching Staff], **Mr. Anil, Mr. Balaraju, Mr. Sarath, Mr. Prasanth** [Technical Staff], **Mr. Atishamul Haq, Ms. Ranjini R and Ms. Babitha Gowda** [Project Staffs] is highly appreciated. I would also like to express my sincere gratitude and admiration to the students, faculty and management of **Global Academy of Technology Bengaluru**.

The efforts of **Mr. Nagendra Reddy**, Managing Director, **VTRAC Worldwide** and his team towards their support in carrying out data collection at Church Street is highly appreciated.

I would like to express my heartfelt thanks to **Mr. Deepak Batavia**, President, Church Street Shop Owners' Association, **Mr. Deepak Sood, Mr. Mohammed Yusuf** [Asha Enclave], **Times Network, Mr. & Mrs. Ambarish and Mr. Santosh** [Members of Deauville Apartments] for the support extended for the smooth conduction of studies. I would like to thank all the shop owners, staffs and customers who participated in the study and gave their time and valuable input.

This acknowledgement is incomplete without a word of gratitude towards **Dr. A. Veeraragavan**, Professor, IIT Madras, **Mr. Sivasurbramaniam**, Manager -Transport Systems, ITDP, **Mr. Shamanth Kuchangi**, Technical Head, Directorate of Urban Land Transport [DULT] and **Dr. C. V. Srinivasa**, Professor & Head of the Department, GAT Bengaluru, for their technical advice, support and timely guidance towards the completion of this study.

> Reashma P S Project Investigator, Assistant Professor, Global Academy of Technology Bengaluru

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CHAPTER 1 INTRODUCTION

CHURCH STREET

Bengaluru is a city of vibrant streets and these streets to the day continue to be destinations for food, entertainment, shopping and everyday life. Central Bengaluru popularly called as the central business district (CBD) planned during the British rule in India lies adjacent to the cantonment and is an employment and entertainment center. Church Street is one amongst the several much-visited street destinations in the CBD of Bengaluru.

The "Church Street" owes its name to its east west alignment leading to the St. Mark's Cathedral. The street is 750-metres in length and connects Brigade Road to St. Mark's Road and runs parallel to MG Road. The street owing to its location is dominated by restaurants, small scale food joints, bookshops and offices and hence is a thriving destination for pedestrians.



Figure 1: Church Street, Bengaluru

Street level connectivity

Church Street is operational as a one-way road and serves as a connecting link between Brigade Road and St. Mark's Road. This connectivity is amplified especially since the metro has a direct exit to Church Street which draws several commuters to access the station through Church Street from surrounding offices, schools, public buildings and commercial outlets. There are two crossroads that transversely connects Church Street to MG Road and Museum Road.

However, the interiors still retain the residential charm despite a visible trend in commercialization of existing buildings. The following image illustrates the traffic circulation at Church Street and its surroundings.



Figure 2: Traffic Movements in and around Church Street

Accessing the street is straightforward and seamless. The Street has accessibility through all modes – both private and public transportation. The MG Road metro station has a direct entry/exit on Church Street and offers metro commuters seamless access to this area.



Figure 3: Metro entry/exit at Church Street

Nature of Built Use

Church Street is destination to over two dozen restaurants and is a favorite amongst booklovers. The street has over 5 popular bookstores that is frequented by regulars. While the ground floor that defines the street level frontage is dominated by uses such as restaurants, banks, ATMs and quirky retail outlets, the higher floors are often occupied by office use. The street is hence an integral part of Bengaluru with high rental values and high employment opportunities. While Church Street is predominantly commercial, the street and its surroundings still have several upscale residential quarters. In fact, the street itself is home to several apartment complexes like the Ghar, Daffodils and Deauville alongside a few remaining bungalow type residential units.

Lying adjacent to Brigade Road, Church Street also bears witness to grand New Year's Eve celebrations and is attended by thousands.

CHAPTER 2

PEDESTRIAN FRIENDLY DESIGN - CHURCH STREET

CHURCH STREET- NEED FOR IMPROVEMENT

The images below illustrate the dismal condition of Church Street before the re-development project was taken up better than words would. Despite high footfall and thriving commercial activity, the street remained neglected with decaying infrastructure for several years. Inconsistent and broken sidewalks (footpaths), varying Right of Way (RoW), damaged pavement surface with ruts/cracks and potholes, haphazard parking, uncontrolled hawkers/street vendor activities, improper waste management and poor drainage plagued the street.







Figure 4: Church Street before Redevelopment

The street offered neither a pleasant experience to visitors nor adequate infrastructure for the commercial activity it supported and hence the redevelopment of Church Street was essential to continue to retain the significance of the street in the city.

TENDER SURE DESIGN GUIDELINES AT CHURCH STREET

Bruhat Bengaluru Mahanagara palike (BBMP) undertook the redevelopment of Church Street as per the Tender SURE (Specifications for Urban Road Execution) guidelines. Tender SURE was designed to address the need for standardizing specifications for urban roads in Bengaluru. It focused on providing safe and pleasant urban roads through a sustainable approach to geometric street design, its standards and specifications. Emphasis was laid on giving shape to not just a welldesigned and walkable street in insolation but to create a network of streets that supports all forms of mobility and integrates the needs of pedestrians, cyclists, public transport along with private transportation.

The objectives/key features of Tender SURE are as follows:

- Redesign of urban streets with hierarchy of pedestrians and cyclists at foremost followed by public transport and motorized vehicles.
- Wide sidewalks and segregated/shared cycle tracks to ensure the safety of pedestrians and bicyclists.
- ✤ Reform the roads with consistent travel lanes to improve the travel time
- Formalize road space with bus stops and on-street parking bays and make the street more user friendly
- Aligning all street furniture's in single line even considering street vendors as part of design
- Integrate and streamline all sub-terrain utility lines to avoid the repeated road cuttings

Tender SURE guidelines lay down a collection of urban road design templates that demonstrates best practices in design of various street elements that especially meets the progressing world

standards in design that promotes livability and sustainable mobility. Tender SURE guidelines use a system of road hierarchy – Arterial, Sub-arterial, Collector, Local and Sub-Local Roads – to demonstrate the various ways in which one can equitably distribute road space across various Right of Ways.

The recent efforts made towards revamping few selected urban roads in Bengaluru as per Tender SURE model has been widely appreciated for successfully improving the quality of urban life on streets, especially for pedestrians. The studies taken up after the implementation of Tender SURE evaluated that the infrastructure after redevelopment achieved a Pedestrian Level of Service "PLoS A" and a walkability index (WI) of 150 above¹². The degree of improvement exhibited through Tender SURE has also ensured that the Tender SURE guidelines were accepted as Smart Road Design Guidelines under the Smart City Mission.

Considering the high pedestrian activity experienced by Church Street and its location, BBMP undertook the improvement of Church Street as per Tender SURE guidelines. The various design decisions and specification that were adopted in the redesign of Church Street is tabulated in Table 1 and illustrated in figure 5.

BBMP on Church Street provided a uniform carriageway of 6m width (5m+0.5m+0.5m), a continuous sidewalk on both sides of the carriageway (sidewalk width varies at each side), designated on-street parking bays, street lights and other street features and an organized and newly laid underground utility system. The carriageway was cobblestoned and the architect adopted a Kasuti pattern while laying the stones. The 'kasuti design' used not only elevated the street aesthetically but also adds interest to the street by its cultural reference. The design made use of locally sourced cobblestone and sadarahalli granite stone. The rough textured granite cobblestone when laid in a staggered pattern also serves as a traffic calming measure by reducing vehicle speed. Following table lists the major features of the design.

Design Elements	Remarks
Carriage way	Uniform width of 6 m
Sidewalk	Pedestrian sidewalk of 3-4 m width
	Min. sidewalk width - 1.2m with parking bay
	Min. sidewalk width - 2.2m without parking bay
 Parking Bays 	Total of 8 parking bays [varying capacity]
• Intersection	Channelization with divisional island to ease the traffic flow
Design	

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¹ Reports on Performance Assessment of Tender SURE Sidewalks Phase 1, Vol. 1-3, 2017-18, Global Academy of Technology, Bengaluru.

² Basavaraj Kabade, K. T. Nagaraja, Swathi Ramanathan, A. Veeraragavan, P. S. Reashma. Improvement to Pedestrian Walkway Facilities to Enhance Pedestrian Safety-Initiatives in India, International Journal of Transport and Vehicle Engineering Vol.12, No:3, 2018.

• Shift in Utilities	
• Amenities	Cycle stand, LED lights, Waste Disposal bins

The work on the stretch began on February 22, 2017. There was delay in the completion of the project as it took considerable effort and time to lay new storm water drains, sewage and Cauvery water supply pipelines. The street was reopened for public use on 1st March, 2018.



Figure 5: Tender SURE Design Template Implemented at Church Street

The following pictures narrates the salient features of the design.



Uniform Carriageway laid with Cobble Stones



Pedestrian Friendly Sidewalks



Channelization and Intersection design

Cycle Stands on sidewalks









Lighting and Street Art Figure 6: Tender SURE Design – salient Features

The impact of the development can be understood by comparing the street before and after the implementation of the Tender SURE Guidelines. The following pictures show a comparative view of Church Street before and after the development.





Figure 7: Church Street - Before and After Redevelopment





Figure 8: Church Street - Before and After Redevelopment





Figure 9: Church Street - Before and After Redevelopment





Figure 10: Church Street - Before and After Redevelopment





Figure 11: Church Street - Before and After Redevelopment

The redevelopment of Church Street is a harbinger of change for every Indian Street; aiming to be a "legacy design". Church Street with its unique design and the revamped look has always been in the limelight.

Civic agencies and urban planners are exploring new ways to make the street more pedestrian friendly. A complete evaluation and technical assessment of the street is a prerequisite to judge the efficacy of the implemented design, and its impact on street usage and performance.

CHAPTER 3 STUDY OBJECTIVES AND METHODOLOGY

The scope of the present study is to evaluate Church Street and measure the impacts of the new design. The study also extends its scope to identify present issues and propose possible measures that civic bodies can introduce/implement to make the street more pedestrian friendly.

OBJECTIVES

- 1. To perform a complete evaluation of Church Street, measuring approximately 750 m in length
- 2. To assess present day pedestrian and vehicular volumes and use patterns
- 3. To assess the infrastructure and derive its Level of service, Pedestrian Level of Service (PLoS), Walkability Index (WI), Parking Demand-Supply etc.
- 4. To study the "Pedestrianization" concept and global best practices and suggest recommendations for further improvement of the street

METHODOLOGY

A street designed to cater to the needs of all users and uses, through equitable allocation of road space is considered as a "complete street". Drafting a methodology for the design of complete street is complex owing to the several stakeholders involved in the design and implementation process. Though there are guidelines available for design of pedestrian infrastructure³ and performance evaluation of the same⁴, hardly any guidelines are available in India which describes how to perform complete street studies. The document published by ITDP⁵ titled "Complete Streets Framework Toolkit" served as a base for this study. The toolkit consists of seven volumes

³ Guidelines for Pedestrian Facilities, Indian Roads Congress, IRC: 103-2012, New Delhi, India.

Pedestrian Design Guidelines, Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre UTTIPEC, New Delhi, November 2009

Better streets, better cities a guide to street design in urban India, Institute of Transportation and Development Policy, ITDP, December 2011.

Guidelines for Planning & Implementation of Pedestrian Infrastructure, Directorate of Urban Land Transport, DULT, Government of Karnataka, January 2014.

⁴ Indian Highway Capacity Manual (Indo-HCM), CSIR - Central Road Research Institute, New Delhi, 2017.

⁵ Complete Streets Framework Toolkit, Institute of Transportation and Development Policy, ITDP, December 2011.

and volume six enlists Complete Streets Evaluation Metrics. This toolkit can also be applied for continuous monitoring and evaluation studies which helps in furthering planning for improving a street.

The scope of this study is limited to making an assessment of the existing scenario post implementation of the project and to quantify the impact. A methodology has been drafted accordingly to meet the scope of the study and the same is depicted in the following chart.



Figure 12: Study Methodology

The following section enlists the various studies performed at Church Street and the data collection carried out in detail.

PROPOSED STUDIES/DATA COLLECTION

Table 2: Proposed Studies and Data Collection	on Details
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1	Design Aspect	Improvement in the street la other facilities	ayout in terms of design, amenities and
2	Pedestrian Studies	Pedestrian Usage	 Pedestrian volume count survey - 24 hours survey on 9 days [5 weekday and 2 weekends]

		Pedestrian Sidewalk service	 Pedestrian flow studies Peak Hours Pedestrian Level of Service [PLoS]
		Pedestrian Comfort	Qualitative AssessmentWalkability Index [WI]
3	Bicycle and Motor vehicle Studies	Vehicle Usage	 Vehicle volume count survey - 24 hours survey on 9 days [5 weekday and 2 weekends]
		Speed	• Travel time studies
4	Parking Studies	Parking Usage	 Identification of parking facilities On-street parking surveys Parking demand of street Parking lot utilization
5	Adjacent land use and activities	Street activities and nature	• Shops/residence etc.
6	Public Opinion Survey	Users opinion on project	 Pedestrians Motor vehicles Land use owners/shops Bicyclists Residents

CHAPTER 4 CHURCH STREET LAND USE AND COMMERCIAL ACTIVTIES

Church Street known for its popular restaurants and bookshops is a "recreational hotspot" in the city of Bengaluru. The 750-meter road stretch is home to around 187 shops. The shop details and the nature of the shop activity is listed in the following table. While most of the shops are eateries and recreational serves, office spaces, co-working spaces, book shops, gaming centers, clothing shops, quirky outlets selling wares ranging from music instruments to toys, and few government buildings also has a presence on Church Street.

No.	Building	Shop details	Type/activity
1	Arrow		Textile
2	Орро		Mobile
3	People		Textile
4	Citi talk plaza	Nike	Sports accessories
5		Mobigo	Mobile accessories
6		Tattoo sutra	Tattoo
7		I2i computer shop	Electronics
8	Prestige group rr	Beir	Eatery
9		Anupam's coast 2 coast	Eatery
10		Star bucks	Eatery
11		Ilahui	Gift shop
12		Haya foreign money exchange	Money exchage
13		Celtel	Mobile service
14		Arts and craft emporium	Textile
15	Purvankara	We work	Co-work
16		Lacoste	Textile
17		Book worm	Books
18		Ayda Persian and Indian rest.	Eatery
19		Travel point	Travel agency
20		20-20 sports	Sports accessories
21		Sahara India life insurance company ltd.	Pvt agency
22	Hiproflies business center	Wolfish	Eatery
23		Easy tiger	Eatery
24	Empty house	-	-
25	BPL		Company
26	Prestige commercial complex	Matteo	Eatery
27		Franchise India	Consultancy

Table 3: List of Buildings/Shops on Church Street

28		Blossoms	Books
29		ACC	Service center
30		G4s secure solution private ltd.	Consultancy
31		Mel's Korner	Eatery
32	Msr west park	Rasta	Eatery
33		HDFC	Bank
34		Gangaram's	Books
35		Work Shala	Co-work
36	Phoneix arcade	Book hive	Books
37		Thej	Eatery
38		99 pank cakes	Eatery
39		SK Multi Prands	Textile
40		Little goa	Hookah acessories
41		Zam zam art empordium	Gift shop
42		Café enzo	Eatery
43	Hotel Maya ltd.	Green paparika	Eatery
44	Sujay pride building	Irfans	Textile
45		Aranyani	Gift Accessories
46		Somilan steak house	Eatery
47	Metro station	Chai point	Eatery
48		Dominos	Eatery
49	Deauville apartment		Residence
50	Brigade gardens	Nisarga builders	Pvt agency
51		Mark dsouza and co	Pvt agency
52		France home shopping pvt ltd.	Service center
53		Lokkur stocks and shares pvt ltd.	Pvt agency
54		Bird group(amadeus india pvt ltd)	Pvt agency
55		Genixo info solution pvt ltd	Pvt agency
56		Amadeus india pvt ltd	Pvt agency
57		GK vale and co	Photo shop
58		Kou-Chan	Pvt agency
59		India ideas com limited	Pvt agency
60		Resbird technologies pvt ltd	Pvt agency
61		Venus games	Gaming
62		Nepal airlines	Travel agency
63		Xerox.priniting,stationery	Stationary
64		Rooster guitors	Musical instrument dealers
65		Revel travel links pvt ltd	Travel agency
66		Aspire	Pvt agency
67		Rr exporters and textile consultants	Pvt agency

68	G & f india	Pvt agency
69	Mussy musical	Music school
70	Leonia	Pvt agency
71	Business estate	Pvt agency
72	Volcate f & b pvt ltd	Pvt agency
73	Multi foreign money exchange	Money exchange
74	Water mark	Pvt agency
75	First flight couriers ltd prime time logistics	Couriers
76	Muhamed firoz	Pvt agency
77	Zain farook	Pvt agency
78	Mr. sreedharan	Pvt agency
79	Olive travel and tours	Travel agency
80	Reflection Inc. the printers	Pvt agency
81	Fittronics	Pvt agency
82	Om shree phoojaya jewellwers	Jewelry
83	Rekha air travels	Travel agency
84	Dental clinic	Clinic
85	Hd digital strems ltd	Pvt agency
86	Communication point	Stationary
87	Jadhav international	Pvt agency
88	Plutos retail solution	Pvt agency
89	Gnext infotek	Pvt agency
90	Cm swami (advocate)	Consultancy
91	Galaxy educational services	Pvt agency
92	Pigeon courier services pvt ltd	Couriers
93	G k valve and co	Photo shop
94	Conception	Pvt agency
95	Abro agencies	Pvt agency
96	Shree Ganesh fast food	Eatery
97	Indian coffee worker's co-operative society ltd	Eatery
98	Floor deal	Pvt agency
99	Brick oven	Eatery
100	Animation souk	Gift shop
101	Qissakhawani	Eatery
102	Nz imigration	Travel agency
103	Indian holidays	Travel agency
104	The cose belle	Gift shop
105	Videsh consultancy	Pvt agency
106	Rasikh gems	Jewellery

107		Gayathri j Gopal	Pvt agency
108		Synergy public	Pvt agency
109		Ashok boutique	Textile
110		Crm consultancy	Pvt agency
111		Dtdc courier	Courier
112		Nagaraj advocate	Consultancy
113	Asha enclave	Times network	News
114	Amoeba complex	Amoeba	Gaming
115		20 feet high	Eatery
116	Daffodils		Residence
117	Ghar		Residence
118	Fabhier house		Vacant
119	Hotel shelton grand		Hotel
120	Associated printers pvt ltd.		Vacant
121	G+2 building		Vacant
122	Barton center		Commercial
123		Blossom	Books
124		Designer	Textile
125	Coconut groove		Eatery
126	Citi center	G k vale	Photo shop
127		Eat fit	Eatery
128		Guardian gnc	Food supplements
129		Tata cha	Eatery
130	SP towers	Vasudev adigas	Eatery
131		Wipro	Company
132		Toi	Company
133	SBI		Bank
134		Pitshop	Eatery
135		Raju pan	Eatery
136		Tony Sebastian associate	Consultancy
137	Parisara bhavan		Govt. office
138	Triumph tower	Desivedesi	Eatery
139	-	Chines corner	Eatery
140		Baskin robbins	Eatery
141		Donne biryani	Eatery
142		Register office	Govt. office
143	Prestige eureka	Egk& sons	Photo studio
144		Entertainment	Gift shop
145		Fairy food	Production company
146		Pizza hut	Eatery

147		Carnatic	Eatery
148		Spine hospitality pvt ltd.	Massage center
149	Pinnacle	Iqbal khan &co.	Pvt agency
150		Hum india	Textile
151	Bheema		Eatery
152		Mainland china	Eatery
153		Oh Calcutta	Eatery
154		Hapipola	Eatery
155	Hotel high gates	The white room	Eatery
156		Mandrain box	Eatery
157		Roomali	Eatery
158	#29th church street in		Hotel
159		Angrezi	Eatery
160		Rush	Eatery
161	Church gate building	Vodafone store	Service center
162		Glenand products	Pet shop
163		True images	Stationary
164		Modelling agencies	Modelling
165		Film institution	Institution
166	Hotel empire		Eatery
167	Kalpak arcade	Oye Amritsar	Eatery
168		The bundeko	Eatery
169	Cobalt	Church street social	Eatery
170		Numa	Co-work
171	Smally's resto cafe		Eatery
172		Venus game	Gaming
173	9	Glofab dry clean	Dry clean
174	Sama towers	Blow	Eatery
1/5		Six sigma	Pvt agency
1/0		Freeh belead acade	Eatery
1//	Ouiro station	Flesh baked goods	Cift shop
170	Comfort works		Cowork
1/9	Connort works	The Konken see food	Eatory
100		Ke des	Eatery
101	Santhosh jujce center	IXC Uas	Eatery
102	Shesha mahal restaurant		Fatery
105	Shesha manar restaurant	Idea works	Priv agency
185		Goobe's book republic	Books
186	Cais har	Goode's book republic	Fatary
187	Acme fitness		Fitness
10/	Actile Ituless		Filless
Apart from the above listed shops/offices/buildings and other establishments, Church Street is also home to few residents. Apartments like Ghar, Daffodils and Deauville are located on the street alongside few remaining bungalow type housing units. The details of the residential buildings are tabulated below in Table 4.

No.	Apartment Name	No. of flats	Parking Space Utilization
1	Deauville Apartments	23	Four-wheeler: 25 [Residents] + 6 [Visitors]
			Two-wheeler: 15
2	Ghar Apartments	13	Four-wheeler: 13
			[Additional Car Parking space for visitors]
			Two-wheeler: 5
3	Daffodils Apartments	4	Four-wheeler: 4
	-		[Additional Car Parking space for visitors]
			Two-wheeler: 2

Table 4: List of Apartments	at Church Street
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Deauville Apartments

Ghar Apartments



Daffodils Apartment

Fabhir house

Figure 13: Residential Establishments at Church Street

While Church Street is predominantly commercial in nature, buildings themselves and the street may be understood as mixed due to not only the presence of residences on the street but also because of how multi use each individual building is.

CHAPTER 5 CHURCH STREET – NMT AND MT USAGE

This chapter presents the findings of the assessment made on the following aspects.

1. PEDESTRIAN VOLUME COUNT

In order to understand the pedestrian use pattern and volume, a pedestrian volume count survey was carried out on Church Street. Video graphic method was deployed by installing cameras at various strategic locations.

The study revealed that the street has varying pedestrian use patterns. The presence of the Metro station exit at the mouth of Church Street at Brigade Road has resulted in more pedestrian usage over this segment compared to other segments. At crossroad locations, added pedestrian flow was found joining from parallel roads. Again, towards the end of Church Street (St. Marks Roadside), the pedestrian movements were considerably different to other segments. Considering the various use pattern, Church Street was divided into four segments to capture pedestrian use pattern in detail. Following are the four segments.

Table 5: Data Collection points - Locations 1,2,3 and 4



Location 1: Entry of Church Street



Location 2: Cross Road 1(Landmark Adigas)



Location 3: Cross Road 2 (Landmark Hotel Empire)

Location 4: Exit of Church Street

Four cameras were deployed, installing one at each segment. The study was performed for 9 days, including 5 weekdays and 2 successive weekends with a daily data capture cycle of 24 hours. The pedestrian movements, along and across the sidewalks, were captured at each of these locations and later the data was extracted and entered at every 15-minute time interval. The data is presented in the Annexure. The hourly volume count at each of these locations was analyzed in detailed and is summarized in the following sections.



A. LOCATION 1: ENTRY AT CHURCH STREET

Figure 14: Location 1 [Entry at Church Street]

Location 1 was considered as the entry to Church Street. Bi-directional Pedestrian movements between Church Street and MG Road as well as Opera Junction and Church Street was observed

and counted (inflow and outflow movements). The respective arm wise data is presented in the following table. Table 6-7 shows the hourly pedestrian inflow movement on weekdays and weekends. Similarly, hourly pedestrian outflow data is listed in table 8-9. The peak values observed are also highlighted.

	Day 1- (Mo	22/7/19 nday)	Day 2- (Tue	23/7/19 esday)	Day 3- (Wedr	24/7/19 lesday)	Day 4- (Thu	25/7/19 rsdav)	Day 5- (Fr	- 26/7/19 idav)
TIME	From	From	From	From	From	From	From	From	From	From
	MG	Opera	MG	Opera	MG	Opera	MG	Opera	MG	Opera
0:00	19	37	8	16	1	9	2	28	23	43
1:00	11	38	4	17	0	7	0	25	8	25
2:00	1	2	0	2	0	3	0	3	2	1
3:00	1	1	3	2	0	1	0	6	1	4
4:00	3	0	0	1	3	1	5	1	0	2
5:00	3	11	3	13	4	14	0	9	3	9
6:00	14	37	19	22	13	31	16	38	22	32
7:00	31	85	27	63	25	62	24	67	25	74
8:00	49	169	45	174	45	179	33	172	55	177
9:00	70	261	86	243	55	212	87	241	83	276
10:00	79	285	91	279	74	233	94	300	95	350
11:00	98	351	96	320	143	341	122	339	95	336
12:00	207	515	188	512	163	552	166	466	177	549
13:00	<mark>242</mark>	601	<mark>262</mark>	518	<mark>247</mark>	542	<mark>205</mark>	515	<mark>283</mark>	777
14:00	<mark>224</mark>	651	<mark>243</mark>	645	<mark>229</mark>	652	<mark>205</mark>	697	<mark>277</mark>	784
15:00	214	743	<mark>243</mark>	811	206	825	177	715	196	817
16:00	175	753	<mark>274</mark>	782	235	781	190	698	271	834
17:00	208	874	<mark>278</mark>	885	212	800	181	748	229	952
18:00	<mark>237</mark>	<mark>1216</mark>	<mark>269</mark>	<mark>1425</mark>	264	<mark>1121</mark>	<mark>231</mark>	<mark>1145</mark>	250	<mark>1303</mark>
19:00	197	<mark>1158</mark>	<mark>273</mark>	<mark>1254</mark>	<mark>293</mark>	<mark>1258</mark>	135	<mark>840</mark>	<mark>331</mark>	<mark>1376</mark>
20:00	171	657	209	813	259	819	152	741	261	<mark>1102</mark>
21:00	55	388	148	531	101	540	157	505	188	721
22:00	12	109	35	242	50	217	91	282	94	484
23:00	3	50	19	75	27	89	50	115	53	184
Sum	2324	8992	2823	9645	2649	9289	2323	8696	3022	11212
Total Inflow	11	316	12	468	11	938	11	019	14	234

Table 6: Pedestrian Inflow Volume Count at Location 1 on weekdays

Table 7: Pedestrian Inflow Volume Count at Location 1 on weekends

Time	Day 6- 2 (Satur	20/7/19 :day)	Day 7- 21/7/19 (Sunday)		Day 8- 2 (Satur	27/7/19 rday)	Day 9- 28/7/19 (Sunday)	
	From MG From Opera		From MG	From Opera	From MG	From Opera	From MG	From Opera
0:00	23	38	99	217	39	103	60	256
1:00	14	78	38	147	14	79	15	98
2:00	13	29	11	26	10	12	6	21
3:00	4	5	0	0	5	5	3	9
4:00	0	3	7	1	1	0	3	3

5:00	4	11	3	1	3	6	2	4
6:00	14	28	13	23	15	34	13	30
7:00	23	50	17	47	26	55	18	45
8:00	38	143	26	88	38	164	25	105
9:00	60	183	26	137	81	180	44	102
10:00	84	283	83	201	99	256	96	189
11:00	175	344	149	278	179	391	116	303
12:00	269	689	306	440	315	817	278	376
13:00	333	781	445	597	458	788	410	526
14:00	328	746	453	601	464	785	444	665
15:00	414	803	284	542	455	858	505	777
16:00	451	960	257	497	532	946	538	792
17:00	457	<mark>1059</mark>	395	636	543	<mark>1015</mark>	508	908
18:00	499	<mark>1429</mark>	<mark>480</mark>	<mark>1049</mark>	542	<mark>1164</mark>	<mark>598</mark>	<mark>996</mark>
19:00	<mark>526</mark>	<mark>1419</mark>	<mark>542</mark>	<mark>1201</mark>	<mark>552</mark>	<mark>1322</mark>	451	<mark>1162</mark>
20:00	<mark>532</mark>	<mark>1273</mark>	343	<mark>1070</mark>	<mark>556</mark>	<mark>1310</mark>	385	<mark>1025</mark>
21:00	375	<mark>995</mark>	281	638	400	<mark>1066</mark>	238	682
22:00	236	781	112	452	187	756	96	472
23:00	121	334	44	175	132	381	42	131
Sum	4993	12464	4414	9064	5646	12493	4894	9677
Total Inflow	174	57	13	478	181	39	14571	

Table 8: Pedestrian Outflow Volume Count at Location 1 on weekdays

TIME	Da 22/ (Mor	y 1- 7/19 ndav)	Day 2- 23/7/19 (Tuesday)		Da 24 (Wed	ay 3- /7/19 nesdav)	Da 25, (Thu	ay 4- /7/19 ursdav)	Day 5 – 26/7/19 (Friday)		
	Tow	ards	Towards		Toy	Towards		Towards		Towards	
	MG	Opera	MG	Opera	MG	Opera	MG	Opera	MG	Opera	
00:00	44	103	26	51	12	52	11	63	35	96	
01:00	25	53	5	22	0	19	5	20	14	41	
02:00	0	24	0	22	0	30	3	27	1	22	
03:00	1	14	0	13	0	8	4	17	0	28	
04:00	0	16	0	8	0	12	1	5	0	7	
05:00	1	6	3	7	1	11	7	12	2	8	
06:00	9	173	7	150	10	155	9	164	7	141	
07:00	22	342	14	289	8	285	8	288	8	324	
08:00	38	869	44	866	37	845	35	791	23	811	
09:00	99	<mark>1275</mark>	87	<mark>1246</mark>	56	<mark>1270</mark>	81	<mark>1232</mark>	77	<mark>1176</mark>	
10:00	139	<mark>832</mark>	113	<mark>829</mark>	156	<mark>768</mark>	141	<mark>820</mark>	83	<mark>790</mark>	
11:00	131	569	188	553	174	494	135	521	146	499	
12:00	238	446	214	420	212	425	223	419	180	472	
13:00	293	554	252	457	305	584	292	583	286	602	
14:00	252	532	285	506	283	509	326	537	314	489	
15:00	239	483	231	472	241	453	287	535	262	559	
16:00	282	535	288	565	314	514	<mark>300</mark>	565	304	562	

17:00	328	576	302	646	274	522	275	501	<mark>363</mark>	690
18:00	<mark>334</mark>	<mark>660</mark>	<mark>358</mark>	<mark>730</mark>	296	<mark>601</mark>	291	<mark>634</mark>	328	<mark>776</mark>
19:00	281	<mark>649</mark>	<mark>416</mark>	<mark>740</mark>	<mark>351</mark>	<mark>636</mark>	174	522	355	<mark>929</mark>
20:00	216	479	251	485	242	536	235	515	303	662
21:00	64	204	132	400	133	408	153	397	200	519
22:00	23	108	61	259	68	217	96	300	114	355
23:00	20	95	55	117	60	156	94	189	63	274
Total	3079	9597	3332	9853	3233	9510	3186	9657	3468	10832
Total Outflow	12	676	13	185	12	2743	12	843	14	300

Table 9: Pedestrian Outflow Volume Count at Location 1 on weekends

TIME	DAY 6 (SATU	- 20/7/19 JRDAY)	DAY 7 (SUN	'- 21/7/19 NDAY)	DAY 8 (SATU	8- 27/7/19 URDAY)	DAY 9- 28/7/19 (SUNDAY)		
	Tov	vards	Τον	wards	Точ	wards	To	wards	
	MG	Opera	MG	Opera	MG	Opera	MG	Opera	
00:00	40	45	124	276	83	203	93	290	
01:00	60	118	76	198	27	74	42	147	
02:00	24	40	14	49	1	22	20	36	
03:00	3	36	2	27	1	37	0	35	
04:00	2	24	8	22	1	20	2	22	
05:00	4	7	3	6	1	9	9	4	
06:00	11	73	8	12	20	85	17	13	
07:00	14	223	11	70	17	185	13	45	
08:00	38	569	9	135	32	531	25	166	
09:00	82 652		59	194	53	588	42	214	
10:00	119 511		70	260	102	488	100	247	
11:00	201	406	177	383	161	471	192	353	
12:00	387	530	329	566	315	556	308	498	
13:00	552	636	400	597	421	668	391	710	
14:00	461	729	494	699	390	804	458	768	
15:00	487	758	297	575	510	729	477	779	
16:00	666	735	448	559	559	868	601	904	
17:00	613	894	461	693	<mark>679</mark>	977	539	<mark>961</mark>	
18:00	<mark>682</mark>	1012	544	<mark>944</mark>	620	<mark>1064</mark>	670	<mark>1009</mark>	
19:00	639	<mark>1163</mark>	<mark>564</mark>	<mark>950</mark>	610	<mark>1021</mark>	<mark>700</mark>	849	
20:00	607	<mark>1143</mark>	479	799	599	977	478	842	
21:00	460	893	273	603	522	834	350	610	
22:00	356	595	146	357	216	647	182	371	
23:00	215	479	51	284	174	460	90	243	
TOTAL	6723	12271	5047	9258	6114	12318	5799	10116	
	18	994	14	1305	18	8432	15915		

Total		
Outflow		

Pedestrian movement was significantly higher at location 1 compared to the others. The pedestrian inflow volume count for 24 hours from Monday to Friday were 11316, 12468, 11938, 11019 and 14234. While on weekends, the volume increased to 17457, 18139 (two consecutive Saturdays) and 13478, 14571 (two consecutive Sundays). The pedestrian outflow, on weekdays was 12676, 13185, 12743, 12843 and 14300. While on weekends, the volume increased to 18994, 18432 (two consecutive Saturdays) and 14305, 15915 (two consecutive Sundays).

Across the week the pedestrian movement was observed to be higher on Friday, Saturday and Sunday. The study identified that a majority of pedestrians access the street from the Metro Station.

Since the MG Road metro station has access from both MG Road (Entry/Exit) and Church Street (Entry/Exit), commuters accessing the station especially from Brigade Road side (from Opera Junction) finds it most convenient to access the station from its Church Street Entry. Hence, this volume of commuters using the first segment of Church Street to access the station adds to the volume experienced here and the counts also reflect the same.

Both inflow and outflow pedestrian movements were also analyzed for a time period of 24-hours to identify the peak hour and the peak volume. The analysis has been segregated for MG Road and Opera Side as it generates different volumes of pedestrians. The active pedestrian hours for weekday and weekends with its respective volume is depicted in the graphs below.



Figure 15: Pedestrian Inflow Movement from MG Road on Weekdays



Figure 16: Pedestrian Inflow Movement from Opera Side on Weekdays



Figure 17: Pedestrian Inflow Movement from MG Road on Weekends



Figure 18: Pedestrian Inflow Movement from Opera Side on Weekends



Figure 19: Pedestrian Outflow Movement from MG on Weekdays



Figure 20: Pedestrian Outflow Movement from Opera Side on Weekdays



Figure 21: Pedestrian Outflow Movement from MG Roadside on Weekends



Figure 22: Pedestrian Outflow Movement from Opera Side on Weekends

The observations are summarized below:



The bi-directional pedestrian movements, adding both inflow and outflow was analyzed to assess the patterns that emerge across the total pedestrian movement at Location 1. The active hours and the day wise pedestrian volume variation is presented in the following charts.



Figure 23: Pedestrian Bidirectional Movement at Location 1 on Weekdays



Figure 24: Pedestrian Bidirectional Movement at Location 1 on Weekends

On most of the weekdays, a peak volume of over 2500 pedestrians/hour was experienced while the volume increased to 3000 pedestrians/hour on weekends. The pedestrian bidirectional movements at location 1 is summarized in the following image.



	BI-DIRECTIONAL MOVEMENTS (PEDESTRIANS PER HOUR)											
DAYS	S Day 1 Day 2 Day 3 Day 4 Day 5 Day 6 Day 7 Day 8 Day 9 Monday Tuesday Wednesday Thursday Friday Saturday Sunday Saturday Sunday											
Pedestrian Per Day	23992	25653	24681	23862	28534	36451	27783	36571	30486			
Peak Volume	2447 @ 6 PM	2782 @ 6 PM	2538 @ 7 PM	2301 @ 6 PM	2991 @ 7 PM	3747 @ 7 PM	3257 @ 7 PM	3442 @ 8 PM	3273 @ 6 PM			
Peak Hours	6 - 7 PM	6 - 7 PM	7 – 8 PM	6 - 7 PM	7 – 8 PM	7 - 8 PM	7 – 8 PM	8 – 9 PM	6 - 7 PM			

Figure 25: Summary of Pedestrian Bidirectional Movement at Location 1

The salient points are listed below.

- 1. Pedestrian volume at Location 1 varied from 23862 to 36571 in numbers per day.
- 2. The peak pedestrian volume was observed on Saturdays and Fridays
- 3. The peak hours observed was 6-8 PM on weekdays and 7-9 PM on weekends.
- 4. At peak hours, a pedestrian count of 3747 pedestrians/hour was noted.

B. LOCATION 2 [FIRST CROSS ROAD]



Figure 26: Location 2 [Landmark- Hotel Adigas]

Location 2 was located at a point 393m from location 1. The location has two crossroads, one leading to Rest house Cres Road and other one to MG Road. Bi-directional pedestrian movements were documented using videography in all possible directions. The data is presented in the following format - inflow movement at location 2 from Rest house and MG Road, outflow movements towards Rest house and MG Road and the through pedestrian movements, walking towards brigade and St. Marks. The respective arm wise representation is shown in the picture and the corresponding pedestrian count is listed in the following table. Table 8-9 lists the inflow volume count, while tables 10-11 shows outflow volume count and tables 12-13 presents the total pedestrian count over both weekdays and weekends. The pedestrian through movements observed at location 2 may have significant overlaps with volumes counted at location 1 since several pedestrians are walking across to a destination beyond location 2.

	Day 1- 22/7/19 (Monday) From		Day 2- 23/7/19 (Tuesday) From		Day 3- (Wed)	Day 3- 24/7/19 (Wednesday)		25/7/19 rsday)	Day 5- 26/7/19 (Friday)	
Time					From		From		From	
	Rest house Cres road	MG	Rest house Cres road	MG	Rest house Cres road	MG	Rest house Cres road	MG	Rest house Cres road	MG
00:00	6	30	5	16	5	25	14	18	7	6
01:00	7	7	1	6	0	7	3	15	1	13
02:00	0	2	0	4	2	7	0	3	3	6
03:00	1	1	0	0	0	2	0	0	0	2
04:00	1	0	0	1	0	0	1	1	0	1
05:00	2	8	1	9	2	0	0	2	8	6

Table 10: Pedestrian inflow Volume Count at Location 2 on Weekdays

Sum Total	1141 38	2681 22	1051 37	2727 78	1160 3	2401 561	1333 3	2626 959	1274 40	2792 66
23:00	6	21	17	31	21	25	12	18	20	68
22:00	5	25	9	74	18	44	14	52	25	101
21:00	27	50	25	70	29	71	32	67	51	122
20:00	73	119	49	148	52	96	76	107	58	178
19:00	74	172	48	165	79	175	78	170	65	213
18:00	81	<mark>255</mark>	77	<mark>258</mark>	88	<mark>219</mark>	101	194	76	<mark>227</mark>
17:00	92	226	67	185	80	194	100	238	101	194
16:00	86	225	70	201	54	188	86	169	88	211
15:00	98	199	93	167	89	184	109	216	70	180
14:00	132	262	123	228	165	196	157	244	149	213
13:00	152	<mark>339</mark>	<mark>162</mark>	311	<mark>172</mark>	320	211	<mark>392</mark>	178	313
12:00	72	182	87	206	95	178	86	216	107	179
11:00	69	187	42	256	54	165	89	171	73	202
10:00	54	153	40	162	54	137	59	126	70	158
09:00	52	106	32	136	44	98	53	115	51	106
08:00	42	74	32	55	30	45	35	56	38	55
07:00	6	24	31	28	22	21	11	22	24	28
06:00	3	14	40	10	5	4	6	14	11	10

Table 11: Pedestrian inflow Volume Count at Location 2 on weekends

	DAY 6- 20 (SATURI)/7/19 DAY)	DAY 7- 21 (SUNDA	/7/19 (Y)	DAY 8- 27 (SATURD	/7/19 AY)	DAY 9- 2 (SUND	8/7/19 AY)
Time	Fron	1	From		From		From	
	Rest house Cres road	MG						
00:00	6	26	28	67	7	20	21	98
01:00	3	30	18	25	2	31	6	47
02:00	0	4	0	7	2	8	2	15
03:00	2	0	0	3	2	2	0	2
04:00	0	3	0	0	1	1	0	2
05:00	3	2	1	4	5	5	3	3
06:00	2	7	5	17	10	16	7	17
07:00	12	16	6	33	20	30	19	44
08:00	25	32	13	43	23	39	23	42
09:00	43	105	22	58	31	85	32	56
10:00	34	129	39	73	46	122	19	98
11:00	49	159	40	56	50	102	38	78
12:00	124	174	25	110	93	111	42	<mark>188</mark>
13:00	1 <u>28</u>	<mark>326</mark>	54	<mark>186</mark>	128	<mark>248</mark>	81	163
14:00	101	198	52	174	95	197	<mark>89</mark>	129
15:00	70	173	48	86	76	177	64	143

16:00	73	194	21	86	65	154	57	132
17:00	82	180	51	134	<mark>140</mark>	159	62	147
18:00	<mark>141</mark>	184	<mark>72</mark>	<mark>183</mark>	78	<mark>162</mark>	76	<mark>185</mark>
19:00	<mark>91</mark>	133	<mark>72</mark>	<mark>160</mark>	100	<mark>153</mark>	65	<mark>188</mark>
20:00	97	115	<mark>77</mark>	117	68	119	84	134
21:00	97	63	38	94	30	111	45	105
22:00	53	57	24	54	35	86	28	67
23:00	29	47	26	49	21	108	18	38
Sum	1265	2357	732	1819	1128	2246	881	2121
Total inflow	3622		2551		3374		300	2

Table 12: Pedestrian Outflow at Location 2 on Weekdays

	Day 1- 22/7/19		Day 2-	23/7/19	Day 3-	- 24/7/19	Day 4-	25/7/19	Day 5-	26/7/19
	(Mor	nday)	(Tue	sday)	(Wed	nesday)	(Thu	rsday)	(Fri	day)
Time	Tow	ards	Tow	ards	Tov	vards	Tov	vards	Towards	
	Rest house Cres road	MG								
00:00	11	34	7	19	9	15	15	28	10	17
01:00	3	12	1	9	0	9	1	6	5	14
02:00	1	1	0	1	2	7	0	4	3	1
03:00	1	1	0	0	0	2	0	0	0	2
04:00	3	1	0	1	0	0	2	0	0	0
05:00	0	4	1	10	0	0	5	6	5	4
06:00	12	20	42	20	5	7	24	20	18	15
07:00	29	34	42	36	49	18	17	26	29	26
08:00	98	106	77	63	86	51	41	45	88	67
09:00	73	236	66	178	80	165	51	164	78	200
10:00	92	191	65	183	96	144	65	151	94	189
11:00	74	195	41	216	47	152	77	173	80	197
12:00	89	202	59	198	100	176	91	178	79	171
13:00	<mark>149</mark>	<mark>321</mark>	<mark>167</mark>	<mark>292</mark>	<mark>147</mark>	<mark>263</mark>	<mark>155</mark>	<mark>242</mark>	<mark>189</mark>	<mark>276</mark>
14:00	<mark>175</mark>	<mark>339</mark>	<mark>141</mark>	<mark>318</mark>	<mark>181</mark>	<mark>265</mark>	<mark>175</mark>	<mark>271</mark>	<mark>128</mark>	<mark>332</mark>
15:00	112	253	70	207	78	215	139	197	91	167
16:00	84	279	67	211	68	200	112	175	108	180
17:00	94	207	66	178	53	200	97	180	95	130
18:00	108	154	39	207	70	180	90	213	96	214
19:00	69	143	46	179	43	158	61	105	69	159
20:00	37	89	52	127	36	134	42	113	47	134
21:00	32	64	37	51	25	46	43	73	30	78
22:00	16	21	22	44	12	36	13	38	40	73
23:00	10	20	7	22	4	21	12	28	21	51
Sum	1372	2927	1115	2770	1191	2464	1329	2436	1403	2697

Total	4299	3885	3655	3765	4100
inflow		5005	5055	5705	4100

	DAY 6- 2 (SATUR	0/7/19 DAY)	DAY 7- 2 (SUND	AY)	DAY 8- 27 (SATURI	7/7/19 DAY)	DAY 9- (SUNI	28/7/19 DAY)
Time	Towa	rds	Towa	rds	Towar	ds	Towa	ards
	Rest house Cres road	MG	Rest house Cres road	MG	Rest house Cres road	MG	Rest house Cres road	MG
00:00	10	19	49	92	9	32	26	71
01:00	7	40	61	48	7	29	14	50
02:00	4	4	11	0	4	17	2	4
03:00	2	0	0	4	0	3	1	3
04:00	0	8	1	0	1	3	0	1
05:00	1	3	6	1	2	12	2	7
06:00	6	8	16	7	10	9	9	9
07:00	19	11	19	22	23	20	10	29
08:00	81	35	36	32	63	28	32	37
09:00	53	102	15	44	49	83	26	40
10:00	48	113	14	42	58	114	17	67
11:00	35	106	26	52	47	110	24	66
12:00	58	108	16	47	42	109	36	80
13:00	151	203	41	116	79	192	34	108
14:00	70	196	30	103	76	<mark>226</mark>	53	105
15:00	48	<mark>214</mark>	34	98	72	182	53	108
16:00	113	181	27	117	80	146	52	<mark>141</mark>
17:00	72	141	9	84	89	129	62	103
18:00	87	155	24	84	67	136	33	115
19:00	95	80	30	68	50	147	25	58
20:00	109	77	36	57	80	119	73	71
21:00	81	51	43	77	45	114	46	30
22:00	61	46	28	37	36	104	20	51
23:00	47	82	23	30	41	104	14	39
Sum	1258	1983	595	1262	1030	2168	664	1393
Total inflow	3241		185′	7	3198		205	57

Table 13: Pedestrian Outflow at Location 2 on weekends

Table 14: Pedestrian through movements Volume Count at Location 2 on weekdays

Time	Day 1- 22/7/19	Day 2- 23/7/19	Day 3- 24/7/19	Day 4- 25/7/19	Day 5- 26/7/19
	(Monday)	(Tuesday)	(Wednesday)	(Thursday)	(Friday)
	Towards	Towards	Towards	Towards	Towards

	St. Marks road	Brigad e	St. Marks road	Brigad e	St. Marks road	Brigade	St. Marks road	Brigad e	St. Marks road	Brigad e
00:00	29	119	14	44	12	42	40	82	46	74
01:00	42	51	3	15	2	17	16	30	14	24
02:00	3	25	2	22	3	29	0	11	0	27
03:00	1	14	0	12	2	19	0	30	3	16
04:00	2	16	0	11	8	10	2	19	1	5
05:00	10	4	2	7	4	9	3	13	7	3
06:00	27	25	33	11	23	8	44	24	17	22
07:00	157	42	163	28	162	27	168	35	172	36
08:00	377	70	379	67	389	59	418	65	396	79
09:00	<mark>557</mark>	93	<mark>591</mark>	76	<mark>581</mark>	114	<mark>590</mark>	63	<mark>571</mark>	90
10:00	456	108	493	107	473	100	485	121	480	144
11:00	247	133	236	112	305	172	265	129	238	208
12:00	373	210	306	220	423	256	262	219	356	113
13:00	<mark>578</mark>	371	<mark>510</mark>	483	<mark>588</mark>	516	519	427	<mark>647</mark>	263
14:00	481	371	488	460	468	548	<mark>553</mark>	455	544	319
15:00	285	382	339	489	316	472	271	428	386	389
16:00	302	482	330	414	258	394	231	405	329	400
17:00	303	527	273	613	295	474	210	453	259	503
18:00	268	<mark>671</mark>	272	<mark>769</mark>	330	620	206	<mark>590</mark>	323	654
19:00	312	616	393	708	343	<mark>671</mark>	243	573	409	<mark>685</mark>
20:00	279	387	336	547	406	478	212	329	447	404
21:00	116	122	272	319	260	287	146	203	356	281
22:00	28	105	133	217	172	196	146	196	335	319
23:00	33	57	69	96	203	96	120	148	203	190
Sum	5266	5001	5637	5847	5683	6026	5150	5048	6539	5248
Total inflow	10267		10267 11484 1		709	101	198	117	787	

Table 15: Pedestrian through movements Volume Count at Location 2 on weekends

Time	DAY 6- (SATUI	20/7/19 RDAY)	DAY 7- 2 (SUNDA	DAY 7- 21/7/19 (SUNDAY)		//7/19 DAY)	DAY 9- 28/7/19 (SUNDAY)	
Time	Towa	ards	Towards		Towards		Towards	
	St. Marks road	Brigade	St. Marks road	Brig ade	St. Marks road	Briga de	St. Marks road	Briga de
00:00	64	87	201	212	122	153	243	219
01:00	60	96	112	147	55	81	99	96
02:00	11	35	34	37	13	18	22	45
03:00	3	33	4	31	4	33	0	30
04:00	0	6	0	23	0	20	0	20
05:00	3	7	4	7	4	7	8	10
06:00	23	25	8	22	33	34	14	52

07:00	137	58	46	43	96	46	89	28
08:00	306	76	187	58	351	75	183	77
09:00	329	105	99	59	282	93	90	57
10:00	335	101	127	113	260	119	127	94
11:00	266	123	157	178	200	180	144	153
12:00	306	290	359	249	358	245	251	258
13:00	599	682	579	317	499	514	<mark>494</mark>	311
14:00	<mark>680</mark>	612	<mark>581</mark>	459	<mark>527</mark>	516	463	460
15:00	501	528	246	388	447	548	445	558
16:00	429	604	343	394	489	584	468	518
17:00	447	647	447	552	469	595	446	503
18:00	515	<mark>784</mark>	472	524	501	<mark>628</mark>	<mark>566</mark>	<mark>583</mark>
19:00	535	718	562	<mark>604</mark>	529	<mark>621</mark>	<mark>583</mark>	393
20:00	<mark>816</mark>	700	<mark>580</mark>	577	<mark>655</mark>	612	<mark>573</mark>	527
21:00	666	671	372	439	555	576	377	427
22:00	585	591	261	352	312	484	289	280
23:00	380	435	150	161	318	382	115	170
Sum	7996	8014	5931	5946	7079	7164	6089	5869
Total inflow	16010		1187	7	14243		1195	8

Pedestrian movements both inflow and outflow on crossroads appeared less in number at this location compared to location 1. The inflow volume count for 24 hours from Monday to Friday varied as 3822, 3778, 3561, 3959 and 4066. On weekends, the numbers observed were similar at 3622, 3374 (Saturdays) and 2551, 3002 (Sundays).

The outflow volume count for 24 hours from Monday to Friday varied as 4299, 3885, 3655, 3765 and 4100. On weekends, the numbers observed were similar as 3241, 3198 (Saturdays) and 1857,2057 (Sundays). Between the two crossroads' pedestrian movements were observed to be higher from MG road towards Church Street.

The following graphs show the pedestrian volume variations at the crossroad. Since the movements on MG road was significant, the analysis has been focused on the crossroad leading to MG road to identify the peak hour and peak pedestrian volume.



Figure 27: Pedestrian Inflow Movement from MG Roadside Crossroad





Figure 28: Pedestrian Outflow Movement from MG Roadside Crossroad

Figure 29: Pedestrian through Movement at Location 2 on Weekdays



Figure 30: Pedestrian through Movement at Location 2 on Weekends

The observations are summarized below:

Like location 1, location 2 was equally populated with heavy pedestrian movements. Among the cross roads, more pedestrian movement were observed from MG Road side.

Pedestrian movements on crossroad leading to MG road was active from 9.00 AM in the morning to 8.00 PM at night.

Peak hour was identified between 1.00 - 2.00 PM in the afternoon. This may be due to people leaving their offices to access nearby dining areas/restaurants for lunch. A similar rush was observed in the evening at 6.00 PM.

The graph below shows the variation in total pedestrian volume, adding all possible movements (inflow, outflow and through movements). Pedestrian active hours and the respective volume is shown in the following charts for both weekdays and weekends. The pedestrian volume at peak hours were observed to be more than 1800 pedestrians/hour on weekdays, while the volume was 1500 pedestrians/hour on weekends. Compared to location 1, the volume was lesser. A large number of pedestrians were accessing the metro station exit.



Figure 31: Pedestrian Bidirectional Movement at Location 2 on Weekdays



Figure 32: Pedestrian Bidirectional Movement at Location 2 on Weekends

The pedestrian movements at location 2 is summarized in the following image. The salient points are listed below.



Figure 33: Summary of Pedestrian Movement at Location 2

- 1. Pedestrian volume varied from 16285 to 22873 in numbers per day.
- 2. The peak pedestrian volume was observed on Saturdays and Fridays
- 3. The peak hour observed was 1-2 PM on weekdays as well as for Saturdays. On Sunday, the peak hour was 6-8 PM in the evening.
- 4. During peak hours, a pedestrian count of 2086 pedestrians/hour was noted.



C. LOCATION 3 [2ND CROSS ROAD]

Figure 34: Location 3 [Landmark Near to Hotel Empire]

Location 3 is located at a point 584m from the entry point. This location has two crossroads, one leading to SBI junction and other one to MG Road. Bi-directional pedestrian movements were documented using videography in all possible directions. The data is presented in the following format - inflow movement at location 3 from SBI junction and MG Road, outflow movement towards SBI junction and MG Road and the through pedestrian movement along Church Street walking towards either Brigade Road or St. Marks Road. The respective arm wise movement is represented in the image and the corresponding pedestrian count is listed in the following table. Table 16-17, 18-19 and 20-21 lists the pedestrian inflow, through movement and outflow volume count respectively.

TIME	DAY 1- 22/7/19 (MONDAY)		DAY 2- (TUES	23/7/19 SDAY)	DAY 3- (WEDNE	24/7/19 ESDAY)	DAY 4- (THUR	25/7/19 (SDAY)	DAY 5 (FRI	-26/7/19 DAY)
	From	From	From	From	From	From	From	From	From	From
	MG	SBI	MG	SBI	MG	SBI	MG	SBI	MG	SBI
00:00	72	170	24	70	4	116	52	104	60	121
01:00	65	165	12	92	4	144	31	147	57	81
02:00	19	110	2	71	8	100	12	113	38	60
03:00	2	38	6	21	4	30	35	41	15	25
04:00	10	10	0	21	3	9	16	5	11	3
05:00	2	3	3	4	1	8	4	7	12	3
06:00	12	13	8	19	6	18	17	16	16	14
07:00	17	27	12	37	17	33	27	26	13	19
08:00	59	108	40	97	42	119	6	13	86	103
09:00	62	76	55	94	55	107	144	95	90	85
10:00	96	107	86	163	87	125	129	34	129	92
11:00	126	95	132	173	110	123	164	53	164	149
12:00	121	143	125	215	158	196	167	97	167	186
13:00	<mark>287</mark>	<mark>394</mark>	196	447	271	382	176	87	<mark>362</mark>	<mark>359</mark>
14:00	257	222	196	289	233	<mark>494</mark>	222	237	314	278
15:00	195	198	165	268	165	356	177	277	293	266
16:00	156	275	134	225	144	306	124	217	255	254
17:00	177	262	168	287	181	250	92	244	<mark>346</mark>	265
18:00	212	284	<mark>224</mark>	<mark>385</mark>	206	<mark>367</mark>	165	<mark>336</mark>	<mark>385</mark>	<mark>365</mark>
19:00	157	246	158	341	<mark>246</mark>	<mark>363</mark>	50	246	<mark>326</mark>	305
20:00	138	141	108	239	135	226	48	200	181	141
21:00	61	84	64	213	140	173	46	181	140	187
22:00	37	70	25	185	93	166	66	145	178	211
23:00	37	98	12	156	67	134	72	156	108	164
TOTAL	2377	3339	1955	4112	2380	4345	2094	3108	3746	3736
Total Inflow	5716		60	67	672	25	52	02	74	82

Table 16: Pedestrian Inflow Volume Count at Location 3 on Weekdays

Table 17: Pedestrian Inflow Volume Count at Location 3 on Weekends

TIME	DAY 6- 20/7/19 (SATURDAY)		DAY 7- 21/7/19 (SUNDAY)		DAY 8- 27/7/19 (SATURDAY)		DAY 9- 28/7/19 (SUNDAY)	
	From	From	From	From	From	From	From	From
	MG	SBI	MG	SBI	MG	SBI	MG	SBI
00:00	108	194	151	183	134	174	159	289
01:00	171	232	147	347	104	233	136	245

02:00	58	161	34	210	8	172	32	93
03:00	14	56	11	84	10	80	11	66
04:00	5	2	4	10	9	30	2	10
05:00	10	2	2	2	3	5	3	4
06:00	16	7	10	12	16	18	11	10
07:00	40	22	25	27	19	35	27	23
08:00	38	63	34	41	46	82	42	55
09:00	80	42	36	47	106	62	39	46
10:00	99	60	85	56	102	117	68	54
11:00	106	81	106	53	118	92	98	48
12:00	209	113	159	90	146	160	142	65
13:00	508	225	182	155	183	<mark>388</mark>	167	123
14:00	428	262	256	159	200	294	146	226
15:00	370	279	144	184	220	286	<mark>214</mark>	<mark>252</mark>
16:00	389	226	221	160	185	338	185	174
17:00	351	297	<mark>276</mark>	195	219	220	183	181
18:00	463	285	218	221	275	318	170	148
19:00	<mark>562</mark>	216	200	193	225	335	137	128
20:00	553	287	179	206	296	333	149	233
21:00	445	<mark>299</mark>	152	<mark>246</mark>	<mark>331</mark>	265	116	199
22:00	405	254	102	208	226	268	109	183
23:00	318	274	73	199	123	172	50	197
TOTAL	5746	3939	2807	3288	3304	4477	2396	3052
Total Inflow	9685		60	95	77	81	54	48

Table 18: Pedestrian through Movements at Location 3 on Weekdays

TIM E	DAY 1 (MON	- 22/7/19 NDAY)	DAY 2 (TUE	- 23/7/19 SDAY)	DAY (WED	3- 24/7/19 NESDAY)	DAY 4 (THU	- 25/7/19 RSDAY)	DAY 5 (FR)	5 -26/7/19 IDAY)
	To St.	То	To St.	То	To St. To Brigade		To St.	То	To St.	То
	Marks	Brigade	Marks	Brigade	Marks	10 Brigade	Marks	Brigade	Marks	Brigade
00:00	43	29	19	15	22	22 36		40 11		49
01:00	64	21	7	17	9	28	19 13		42	33
02:00	9	7	2	3	3	7	18	7	13	4
03:00	1	0	0	2	0	1	13	1	4	8
04:00	6	6	0	0	1	4	3	6	10	4
05:00	11	0	5	8	7	11	7	8	5	5
06:00	7	17	16	2	15	8	14	22	17	8
07:00	91	27	88	31	80	29	40	33	93	39
08:00	<mark>261</mark>	43	<mark>225</mark>	41	<mark>265</mark>	50	23	6	252	57
09:00	259	87	174	77	203 30		<mark>452</mark>	109	<mark>252</mark>	64
10:00	215	90	107	67	183 87		168	113	168	113
11:00	135	96	61	62	127 132		168	113	111	104
12:00	149	113	41	123	170	141	255	212	152	105

13:00	207	156	207	165	245	321	73	55	206	207
14:00	247	153	139	176	232	288	280	194	222	232
15:00	95	152	184	163	146	220	183	161	175	206
16:00	187	116	139	138	126	178	156	148	146	190
17:00	170	166	111	250	101	219	171	199	123	235
18:00	171	<mark>222</mark>	183	<mark>331</mark>	108	<mark>324</mark>	148	<mark>262</mark>	112	<mark>445</mark>
19:00	116	<mark>216</mark>	177	<mark>430</mark>	138	<mark>483</mark>	144	<mark>246</mark>	98	<mark>541</mark>
20:00	128	136	201 329		147	315	142	174	97	364
21:00	44	45	132	228	73	156	140	158	126	173
22:00	28	54	48	142	27	86	76	87	119	237
23:00	46	23	34	58	35	43	82	41	71	123
TOTAL	2690	1975	2300 2858		2491	3251	2815	2379	2655	3546
Total Count	4665		51	158	5	5742	51	94	62	201

Table 19: Pedestrian through movements at Location 3 on Weekends

TIME	DAY 6- (SATU	- 20/7/19 (RDAY)	DAY 7- (SUN	- 21/7/19 DAY)	DAY 8- (SATU	27/7/19 RDAY)	DAY 9- (SUN)	28/7/19 DAY)
	To St. Marks	To Brigade	To St. Marks	To Brigade	To St. Marks	To Brigade	To St. Marks	To Brigade
00:00	57	30	50	111	42	34	37	35
01:00	95	50	67	109	38	40	59	78
02:00	33	12	37	40	20	10	29	15
03:00	9	5	1	5	3	4	6	1
04:00	2	6	0	0	1	2	0	7
05:00	4	3	7	3	1	5	2	3
06:00	12	12	8	7	31	25	8	6
07:00	91	52	49	38	65	34	65	22
08:00	<mark>231</mark>	64	143	41	246	58	135	48
09:00	164	103	56	67	141	91	64	71
10:00	109	109	79	105	91	88	73	80
11:00	130	104	64	107	102	96	66	93
12:00	47	156	83	183	162	183	84	200
13:00	66	<mark>395</mark>	98	<mark>244</mark>	227	<mark>365</mark>	126	221
14:00	92	305	116	199	<mark>284</mark>	246	153	249
15:00	108	225	69	107	189	186	129	167
16:00	68	236	68	146	186	220	109	177
17:00	65	270	91	186	144	250	107	<mark>296</mark>
18:00	95	350	139	184	166	255	186	263
19:00	113	371	<mark>159</mark>	247	258	289	<mark>241</mark>	259
20:00	95	220	144	200	262	232	198	222
21:00	68	136	106	146	211	157	110	135
22:00	54	158	57	76	139	181	84	78
23:00	43	107	46	76	82	84	21	76

TOTAL	185	51 3	479	1737	2627	3091	3135	2092		2802
Total Movemer	nt	5330		436	4	62	226		4894	
	Table	20: Ped	estrian	Outflow N	Aovemen	ts at Locat	ion 3 on V	Weekday	/S	
TIME	DAY 1 (MON	-22/7/19 NDAY)	DAY (TU	2- 23/7/19 ESDAY)	DAY 3 (WED)	8- 24/7/19 NESDAY)	DAY 4- (THUR	25/7/19 SDAY)	DAY 5 (FRI	-26/7/19 DAY)
	From MG	From SBI	Fron MG	n From SBI	From MG	From SBI	From MG	From SBI	From MG	From SBI
00:00	52	8	16	85	9	118	37	235	28	161
01:00	70	11	4	108	4	112	19	342	18	190
02:00	57	0	6	78	0	65	7	210	11	92
03:00	18	0	4	44	0	11	10	79	13	20
04:00	7	0	0	16	1	5	1	9	1	12
05:00	4	1	0	8	3	5	4	12	6	10
06:00	6	9	14	27	1	27	4	18	8	26
07:00	7	27	14	78	6	93	13	32	15	90
08:00	45	54	33	243	19	210	2	10	38	222
09:00	59	50	50	380	28	409	144	356	79	356
10:00	117	35	66	294	34	241	129	204	109	204
11:00	126	32	91	165	60	139	164	167	113	167
12:00	140	26	97	219	74	233	343	455	136	262
13:00	237	52	156	397	96	485	45	158	231	427
14:00	335	72	246	309	111	363	175	402	157	409
15:00	288	31	169	209	78	249	124	493	138	246
16:00	154	20	172	197	69	256	152	332	181	234
17:00	194	36	156	203	83	195	90	378	181	245
18:00	153	25	192	150	75	196	161	465	164	184
19:00	95	33	103	185	69	187	61	353	149	274
20:00	67	23	72	197	76	197	74	418	154	221
21:00	58	8	69	172	60	138	106	384	118	150
22:00	36	8	29	225	48	111	56	355	128	221
23:00	37	7	11	137	29	113	38	357	119	260
TOTAL	2362	568	1770	4126	1033	4158	1959	6224	2295	4683
Total outflow	29	930		5896	5	191	818	83	69	978

Table 21: Pedestrian Outflow Movements at Location 3 on Weekends

TIME	DAY 6- 20/7/19	DAY 7- 21/7/19	DAY 8- 27/7/19	DAY 9- 28/7/19
	(SATURDAY)	(SUNDAY)	(SATURDAY)	(SUNDAY)

	From							
	MG	SBI	MG	SBI	MG	SBI	MG	SBI
00:00	30	274	106	<mark>319</mark>	77	235	129	<mark>572</mark>
01:00	43	368	88	424	40	241	78	386
02:00	33	221	37	115	12	151	31	139
03:00	4	62	9	2	3	34	8	74
04:00	6	27	7	10	3	18	1	9
05:00	3	10	1	8	6	4	3	4
06:00	7	26	5	6	5	26	5	13
07:00	26	57	15	23	21	40	31	29
08:00	26	117	26	34	31	171	27	67
09:00	55	155	60	41	99	181	32	44
10:00	94	126	72	23	108	148	44	64
11:00	108	106	96	31	82	95	90	54
12:00	203	141	135	68	187	166	172	105
13:00	338	294	166	171	225	333	221	194
14:00	<mark>339</mark>	287	197	<mark>199</mark>	189	<mark>381</mark>	173	372
15:00	211	224	161	132	<mark>251</mark>	252	219	300
16:00	178	242	151	132	214	223	<mark>248</mark>	274
17:00	220	228	176	123	240	119	211	272
18:00	281	257	202	102	202	215	165	198
19:00	324	263	<mark>261</mark>	153	212	333	143	233
20:00	327	<mark>309</mark>	195	177	180	345	113	<mark>401</mark>
21:00	306	281	153	189	167	318	111	280
22:00	203	297	94	111	149	243	85	379
23:00	141	295	112	136	117	246	42	318
TOTAL	3506	4667	2525	2729	2820	4518	2382	4781
Total outflow	8	173	52	254	73	38	71	63

Compared to Location 2, the pedestrian inflow movements were more at location 3. The count for 24 hours from Monday to Friday varied as 5716, 6067, 6725, 5202 and 7482. On weekends, the numbers have increased to 9685, 7781 (two consecutive Saturdays) and 6095, 5448 (two consecutive Sundays).

The pedestrian volume counts for inflow, outflow and through movements are presented in the following chart.



Figure 35: Pedestrian Hourly Inflow Movement at Location 3



Figure 36: Pedestrian Hourly through Movement at Location 3





The observations are summarized below:



pedestrians/hour observed at 1.00 AM

The graph below shows the variation in total pedestrian volume, adding all possible movements (inflow, outflow and through movements). Pedestrian active hours and the respective volume is shown in the following charts for both weekdays and weekends. The pedestrians at peak hours

were observed to be more than 1500 pedestrians/hour on weekdays and the volume increased to 1600 pedestrians/hour on weekends.



Figure 38: Pedestrian Bidirectional Movement at Location 3 on Weekdays



Figure 39: Pedestrian Bidirectional Movement at Location 3 on Weekends

The pedestrian use pattern at location 3 is summarized in the following image. The salient points are listed below.



Figure 40: Summary of Pedestrian Movements at Location 3

- 1. Pedestrian volume varied from 13311 to 23188 in numbers per day.
- 2. The peak pedestrian volume was observed on Saturdays and Fridays
- 3. The peak hour observed was between 1-2 PM in the afternoon and 6-8 PM in the evening for weekdays and weekends.
- 4. At peak hours, a pedestrian count of 1849 pedestrians/hour was noted.

D. LOCATION 4 [EXIT OF CHURCH STREET]

Location 4 is located at the exit point which leads to St. Marks Road. Bi-directional pedestrian movements were documented using videography in all possible directions. The data is presented in the following format - inflow movement at location 4 from St. Mark's Road, Hard Rock Café Road and Anil Kumble Circle on MG Road, outflow movements towards St. Mark's Road, Hard Rock Café Road and Anil Kumble Circle on MG Road.



Figure 41: Location 4 [Exit point of Church Street]

The respective arm wise representation is shown in the image and the corresponding pedestrian count is listed in the following table. Table 22-23 lists the pedestrian inflow volume count and 24-25 shows the pedestrian outflow volume count.

Time	DAY (M	1- 22/ ONDA	7/19 (Y)	DAY (TU	2 - 23/ JESDA	7/19 (Y)	DAY (WEI	7 3- 24/ DNESE	7/19 DAY)	DAY (TH	(4- 25) URSD	/7/19 AY)	DA (1	Y 5 -26/ SRIDAY	'7/19 Y)
	. <u> </u>	r rom			F FOIII			From			F FOIII			ггош	
	St.Marks Road	Hard Rock Café Road	MG Road	St.Marks Road	Hard Rock Café Road	MG Road	St.Marks Road	Hard Rock Café Road	MG Road	St.Marks Road	Hard Rock Café Road	MG Road	St.Marks Road	Hard Rock Café Road	MG Road
00:00	6	2	8	0	0	1	6	0	1	5	0	10	12	3	52
01:00	8	0	2	2	0	3	7	0	0	0	0	0	10	0	20
02:00	0	0	7	0	0	0	0	0	0	0	0	0	0	0	3
03:00	0	0	0	1	0	0	0	0	1	0	0	0	0	2	2

Table 22: Pedestrian inflow Volume Count at Location 4 on weekdays

04:00	0	0	1	0	0	0	0	0	0	3	0	0	0	0	4
05:00	0	0	0	7	0	2	7	1	0	7	1	2	2	0	2
06:00	20	1	4	11	1	3	12	3	4	17	6	4	10	4	6
07:00	39	21	13	38	21	13	31	18	25	41	5	19	45	17	18
08:00	109	22	32	72	43	33	72	31	30	75	58	59	114	32	47
09:00	114	14	47	103	15	49	118	21	41	103	14	58	113	15	62
10:00	92	11	47	100	6	39	91	9	48	85	10	58	110	14	83
11:00	97	20	54	98	0	47	97	16	67	93	7	83	106	9	92
12:00	99	4	118	116	7	61	113	12	51	109	11	61	133	10	98
13:00	281	17	98	277	24	72	320	23	48	<mark>361</mark>	20	80	348	27	148
14:00	301	17	72	178	15	54	314	18	45	360	29	81	285	29	125
15:00	187	7	71	126	6	57	168	10	64	185	14	59	180	19	165
16:00	129	11	65	161	5	55	171	2	60	124	11	45	152	8	120
17:00	231	16	70	215	12	38	240	8	40	169	12	61	261	10	122
18:00	328	7	71	<mark>393</mark>	12	49	325	5	32	349	12	72	421	13	127
19:00	<mark>335</mark>	5	67	366	0	39	<mark>386</mark>	4	54	333	5	44	<mark>469</mark>	11	120
20:00	192	1	20	236	8	42	220	3	32	218	11	42	194	2	87
21:00	55	2	7	73	3	21	112	1	33	105	9	38	92	1	65
22:00	56	3	1	68	0	16	56	1	6	50	9	43	98	11	40
23:00	3	2	2	9	1	5	9	0	4	14	4	22	43	0	38
Sum	2682	183	877	2650	179	699	2875	186	686	2806	248	941	3198	237	1646
Total inflow	3742		3528			3747			<mark>3995</mark>			5081			

Table 23: Pedestrian inflow Volume Count at Location 4 on weekends

	DAY (SA	Y 6- 20 TUR	0/7/19 DAY)	DAY (SU	7- 21/7 UNDAY	7/ 19 č)	DAY (SAT	8- 27/7 T URD A	7/19 (Y)	DAY (SU	9- 28/7 JNDAY	7/19 7)
Time	From St. Marks road	From Hard rock café road	From MG Road	From St. Marks road	From Hard rock café road	From MG Road	From St. Marks road	From Hard rock café road	From MG Road	From St. Marks road	From Hard rock café road	From MG Road
00:00	15	0	11	36	0	30	11	2	14	26	8	18
01:00	13	0	9	18	0	15	3	0	9	4	4	20
02:00	2	0	4	0	0	7	0	0	5	2	7	0
03:00	0	0	1	0	0	1	3	0	4	0	0	0
04:00	3	0	1	0	0	0	0	0	0	4	0	1
05:00	4	0	0	0	0	1	3	0	4	1	0	0
06:00	8	2	8	11	3	2	21	0	4	10	1	3
07:00	49	21	17	35	4	18	44	13	13	37	6	13
08:00	83	39	31	54	6	15	122	41	58	48	17	20
09:00	104	13	38	96	9	33	142	7	37	80	5	19
10:00	102	8	38	115	2	36	119	7	56	99	10	21
11:00	191	9	58	102	12	36	213	14	39	130	13	35

12:00	144	1	98	130	15	79	173	11	81	<mark>226</mark>	8	35
13:00	340	10	151	205	20	148	<mark>393</mark>	18	57	187	30	57
14:00	223	31	157	<mark>263</mark>	20	125	260	15	50	159	43	32
15:00	166	6	109	142	17	165	160	10	82	146	7	51
16:00	201	6	111	131	8	43	215	12	46	183	21	40
17:00	200	1	113	155	13	107	218	8	67	181	21	50
18:00	265	7	120	152	6	103	294	23	66	180	13	50
19:00	<mark>368</mark>	2	161	214	12	130	353	12	91	203	16	78
20:00	234	3	84	121	12	59	185	11	55	154	3	54
21:00	114	1	60	102	0	25	141	5	44	51	1	24
22:00	119	0	62	60	7	28	143	8	43	52	0	11
23:00	69	4	30	24	3	36	55	3	32	24	1	14
Sum	3017	164	1472	2166	169	1242	3271	220	957	2187	235	646
Total inflow	4653				3577			4448			3068	

Table 24: Pedestrian outflow Volume Count at Location 4 on weekdays

	DAY 1- 22/7/19 (MONDAY)			DAY (T	7 2- 23/7 UESDA	//19 Y)	DA (WF	Y 3- 24/7 CDNESD	//19 AY)	DAY (TH	7 4- 25/ URSD	7/19 AY)	DAY (F	(5 -26/7/ (RIDAY)	/19
Time	To St.Marks road	To Hard rock café road	To MG Road	To St.Marks road	To Hard rock café road	To MG Road	To St.Marks road	To Hard rock café road	To MG Road	To St.Marks road	To Hard rock café	To MG Road	To St.Marks road	To Hard rock café road	To MG Road
00:00	20	0	7	18	2	1	8	1	3	19	2	2	26	3	15
01:00	10	3	2	2	2	2	2	0	1	11	1	3	10	4	7
02:00	1	3	4	0	0	0	0	0	0	0	1	0	6	4	0
03:00	0	0	0	1	0	1	0	0	0	0	0	0	0	3	0
04:00	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0
05:00	5	1	5	3	0	2	1	1	2	1	2	4	3	3	4
06:00	6	4	3	11	3	0	11	3	6	15	2	4	15	8	3
07:00	123	4	9	92	7	10	77	8	9	100	5	6	104	12	11
08:00	336	10	25	288	8	20	374	10	13	362	14	17	340	22	11
09:00	221	5	26	217	7	14	218	6	9	237	23	14	231	7	18
10:00	162	12	33	187	17	25	142	6	8	139	22	24	143	25	22
11:00	93	16	82	106	21	47	96	8	44	118	17	41	101	27	69
12:00	112	20	56	100	22	44	88	16	79	98	16	88	143	28	52
13:00	222	32	78	207	46	59	174	40	115	192	36	103	190	31	41
14:00	278	51	67	190	52	84	314	36	119	365	38	168	230	81	90
15:00	120	31	65	124	42	74	131	30	109	130	26	124	131	68	63
16:00	93	29	58	123	27	60	109	6	105	95	14	89	99	57	71
17:00	121	48	57	135	49	54	74	29	108	85	35	65	95	66	62
18:00	91	67	65	135	26	96	113	25	104	113	16	115	121	66	94
19:00	102	46	54	125	29	62	102	22	102	97	31	53	90	56	89
20:00	89	40	40	112	40	36	100	17	72	58	41	56	99	35	86
21:00	44	11	14	84	7	23	76	9	31	80	18	83	71	21	58
22:00	13	4	6	37	13	11	35	4	19	39	10	55	87	15	46

23:00	20	2	2	11	0	5	28	1	9	28	0	20	22	20	33
Sum	2282	439	758	2308	420	730	2273	278	1067	2382	370	1135	2357	665	945
Total inflow		3479			3458			<mark>3618</mark>			3887			<mark>3967</mark>	

Table 25: Pedestrian Outflow Volume Count at Location 4 on Weekends

Time	DAY 6- 20/7/19 (SATURDAY)			DAY 7- 21/7/19 (SUNDAY)			DAY 8- 27/7/19 (SATURDAY)			DAY 9- 28/7/19 (SUNDAY)		
	To St.Marks	To Hard rock café	To MG Road	To St.Marks	To Hard rock café	To MG Road	To St.Marks	To Hard rock café	To MG Road	To St.Marks	To Hard rock café	To MG Road
00:00	39	5	8	32	19	5	24	0	21	52	1	20
01:00	34	4	9	46	8	16	17	3	4	28	8	9
02:00	2	5	6	6	1	5	3	3	7	5	3	2
03:00	2	0	4	0	1	0	3	0	4	0	0	0
04:00	1	0	0	0	0	0	0	0	0	1	4	1
05:00	4	0	1	3	1	1	0	0	0	6	0	1
06:00	10	0	1	7	2	8	16	3	4	11	4	0
07:00	118	5	11	43	9	10	96	9	11	69	12	15
08:00	312	7	13	158	6	22	345	10	21	146	19	10
09:00	145	11	35	76	8	32	140	17	16	55	21	13
10:00	106	4	29	107	18	47	123	9	23	84	18	20
11:00	189	14	49	62	7	86	183	24	27	93	24	34
12:00	98	13	64	96	22	95	133	22	36	92	19	53
13:00	225	22	84	222	32	78	156	44	61	127	15	46
14:00	188	51	73	213	51	67	205	56	73	136	19	41
15:00	148	40	58	120	31	65	141	71	45	116	39	46
16:00	171	26	64	62	27	33	159	38	48	131	9	53
17:00	98	26	70	103	10	47	135	50	45	65	27	70
18:00	99	59	88	95	20	65	143	39	55	107	12	54
19:00	114	44	74	156	10	65	174	0	93	166	5	78
20:00	137	51	59	156	7	46	184	3	103	147	8	77
21:00	86	42	47	109	10	51	143	9	55	94	5	52
22:00	77	25	50	56	5	48	102	10	71	52	0	35
23:00	83	9	38	27	12	17	65	7	27	16	0	19
Sum	2486	463	935	1955	317	909	2690	427	850	1799	272	749
Total inflow	3884			3181			3967			2820		

At location 4, the pedestrian inflow movements were similar to location 2. The count for 24 hours from Monday to Friday was 3742,3528,3747,3995 and 5081. On weekends, the
volumes were 4653, 4448 (two consecutive Saturdays) and 3577, 3068 (two consecutive Sundays).

Inflow movements were visibly higher from St. Marks Road compared to MG road and Hard Rock Café Road.

The pedestrian hourly volume variation for both inflow and outflow movements are presented in the following charts.





Figure 42: Pedestrian Hourly Inflow Movement from St. Mark's Road



The observations are summarized below.

Location 4 was observed tp have less pedestrian movements compared to locations 1 and 3.
The inflow movement was more significant at noon times and at evenings. The peak hour was observed at 1.00 – 2.00 PM in the afternoon and 6-7 PM in the evening.
It is interesting to note that the inflow movement was more significant at morning and noon timings. The peak hour was observed at 8.00 AM in the morning and 2.00 PM in the noon.
The main users in the stretch were metro users accessing St. Marks road or pedestrians merging from crossroads moving towards St. Marks.

The graph below shows the variation in total pedestrian volume, adding all possible movements (inflow, outflow movements). Pedestrian active hours and the respective volume is shown in the following charts for both weekdays and weekends. The pedestrians at peak hours were observed to be more than 700 pedestrians/hour on weekdays and weekends.



Figure 44: Pedestrian Bi-directional Movement at Location 4 on Weekdays



Figure 45: Pedestrian Bi-directional Movement at Location 4 on Weekends

The pedestrian movements at location 4 is summarized in the following image. The salient points are listed below.



Figure 46: Summary of Pedestrian Movements at Location 4

- 1. Pedestrian volume varied from 5888 to 9048 per day.
- 2. The peak pedestrian volume was observed on Saturdays and Fridays
- 3. The peak hour observed was between 1-3 PM in the afternoon and 6-8 PM in the evening for weekdays and weekends.
- 4. At peak hours, a pedestrian count of 1041 pedestrians/hour was noted.

E. PEDESTRIAN USAGE SUMMARY

It is been clear from the above analysis that Church Street is used by a large number of pedestrians. The study has calculated the total volume of pedestrians per day. Following are the key observations that were made:

The pedestrian volume count adding all possible movements at each of the location (Min, Max at each location) varied between 23862 and 36571 at location 1, 16285 to 22873 at location 2, 13311 to 23188 at location 3 and 5888 to 9048 at location 4. At Location 1, pedestrian use was observed to be significantly more owing to the location of the metro station entry/exit. The numbers slowly reduced at succeeding locations 2, 3 and 4. The number of pedestrians joining Church Street from the two crossroads is also significant in numbers. Several pedestrians used there crossroads to move towards Rest House Cres road and MG Road. It is evident that the street does not have one predominant pedestrian use pattern across but each stretch is responsive to its spatial disposition and surrounding land use.

The overall pedestrian footfall of Church Street was arrived at by adding together various inflows from all possible entries. The figure below illustrates how total pedestrian footfall was calculated on a typical day. The peak inflow at all possible entries is marked at its respective arms and the total is summed as pedestrian footfall.



Figure 47: Pedestrian Footfall at Church Street [Pedestrians/day, Saturday]

The data presented in the figure corresponds to a highest pedestrian footfall as well, i.e. on a Saturday. The variation in pedestrian footfall on other days are listed in the following table.

	Location 1	Lo	cation 2	Loc	ation 3	Location 4	
DAYS	From Brigade	From MG	From Rest House Cres Road	From MG	From Museum Road	From St. Marks	TOTAL
Day 1 Monday (22-07-19)	11316	2681	1141	2377	3339	3742	24,596
Day 2 Tuesday (23-07-19)	12468	1051	2727	1955	4112	3528	25,841
Day 3 Wednesday (24-07-19)	11938	1160	2401	2380	4345	3747	25,971
Day 4 Thursday (25-07-19)	11019	1333	2626	2094	3108	3995	24,175
Day 5 Friday (26-07-19)	14234	1274	2792	3746	3736	5081	30,863
Day 6 Saturday (20-07-19)	17457	2357	1265	5746	3939	4707	35,417
Day 7 Sunday (21-07-19)	13478	1819	732	2807	3288	3577	25,701
Day 8 Saturday (27-07-19)	18139	1128	2246	3304	4477	4448	33,742
Day 9 Sunday (28-07-19)	14571	2121	881	2396	3052	3068	26,089

Table 26: Pedestrian Footfall at Church Street [Pedestrians/day]

Highest pedestrian footfall experienced was 35417 pedestrians/day on a Saturday. The minimum pedestrian footfall of 24175 was observed on Thursday.

It is seen that the street has more pedestrians footfall on Fridays and Saturdays compared to other days. It is important to also note that on Sundays, the street had equal footfall like any weekday (except Friday).

To identify the Peak Hours of pedestrian use, the hourly pedestrian footfall is analyzed. The table below lists the data and the chart shows the variation in volume. Peak hours are highlighted.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	350	140	167	233	327	421	811 504		935
01:00	303	137	169	221	215	550	755	475	575
02:00	141	79	120	131	113	271	295	217	178
03:00	44	33	38	82	51	82	99	111	91
04:00	25	23	16	32	21	17	22	42	25
05:00	29	42	37	32	45	36	14	34	20
06:00	118	133	96	134	125	92	96	134	102

Table 27: Hourly Pedestrian Footfall to Church Street

07:00	263	270	254	242	263	250	212	255	232
08:00	664	591	593	727	707	492	320	613	377
09:00	802	813	751	834	881	668	464	731	423
10:00	924	966	858	949	1101	837	690	690 924	
11:00	1097	1164	1116	1344	1226	1172	832	1198	859
12:00	1461	1517	1518	8 1159 1606 1821 1354 1907		1907	1360		
13:00	2411	2269	2325	1929	2795	2802	1992	2661	1744
14:00	2138	1971	2346	2232	2454	2474	2103	2360	1933
15:00	1912	1936	2067	1929	2186	2390	1612	2324	2159
16:00	1875	1907	1941	1664	2193	2611	1424	2493	2122
17:00	2156	2135	2005	1845	2480	2740	1962	2589	2241
18:00	2691	3092	2627	2605	3167	3393	2484	2922	2416
19:00	2411	2644	2858	1901	3216	3478	2724	3143	2428
20:00	1512	1852	1842	1595	2204	3178	2184	2933	2221
21:00	729	1148	1200	1140	1567	2449	1576	2393	1461
22:00	318	654	651	752	1242	1967	1047	1752	1018
23:00	222	325	376	463	678	1226	629	1027	515
Sum	24596	25841	25971	24175	30863	35417	25701	33742	26089



Figure 48: Hourly Pedestrian Footfall to Church Street and Peak Hours

Pedestrian movements were significant at 11.00 AM.

The peak hours were identified at two different time intervals. Between 1.00 - 2.00 PM in the afternoon time and 6.00 - 7.00 PM in the evening.

At noon peak hour, a pedestrian volume of 2795 pedestrians/hour (Friday), 2802 pedestrians/hour (Saturday) were observed. The volume increases to 3216 pedestrians/hour (Friday), 3478 pedestrians/hour (Saturday) during evening peak hours.

2. BICYCLE USAGE

The street by design has been made safer for not just pedestrians but also cyclists. The study aims to document the use of the street by bicyclists similar to its study of pedestrian footfall. Most of the bicyclists using the street was observed to be using the carriageway instead of the sidewalk. Private bicycle sharing operators like Yulu and Bounce have a presence on Church Street and their cycles are widely used. While shared bicycles are widely used several visitors also bring their own cycles. Though Church Street is one-way road, bicycles were see riding against the permitted direction of flow. The following figure depicts the allowable and restricted inflow movements at Church Street.



Figure 49: Allowable and restricted movements to Church Street

The inflow of bicycles is counted from all possible entries and is summed up to get total volume count at each location. The following table lists the bicycle inflow volume count at each of the location – Location 1, 2, 3 and 4 for 9 days for weekdays and weekends.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	1	0	1	1	0	0	1	1	1
01:00	1	0	0	0	1	0	1	0	0
02:00	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	0	0	0	0	2
04:00	0	0	0	0	0	0	0	0	0
05:00	1	0	2	2	5	3	0	7	3
06:00	9	10	11	10	9	8	9	6	12
07:00	19	22	17	18	25	14	12	17	16
08:00	16	22	27	33	26	26	15	29	33
09:00	16	18	14	17	18	19	18	18	17

Table 28: Bicycle Inflow Volume Count at Location 1

10:00	17	21	12	27	29	29	27	21	17
11:00	7	10	8	10	17	16	19	11	13
12:00	12	8	12	14	10	12	14	19	12
13:00	23	22	13	9	25	28	22	25	18
14:00	12	13	8	9	8	11	6	11	7
15:00	10	8	8	6	12	8	4	7	1
16:00	5	11	11	5	5	5	1	9	4
17:00	9	3	16	7	10	5	4	10	2
18:00	6	9	7	9	11	16	10	11	7
19:00	11	5	13	3	8	7	6	9	9
20:00	8	9	3	6	10	5	3	10	6
21:00	1	2	1	3	2	4	2	3	3
22:00	1	5	2	2	2	2	1	4	3
23:00	2	2	1	1	2	1	1	2	4
Sum	187	200	187	192	235	219	176	230	191

Table 29: Bicycle Inflow Volume Count at Location 2

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	0	0	0	1	1	0	1	1	0
01:00	11	0	0	12	1	0	12	7	13
02:00	0	0	0	0	0	1	0	0	0
03:00	0	0	0	0	0	13	0	0	1
04:00	0	0	0	1	0	0	0	0	1
05:00	4	1	1	2	2	3	1	1	4
06:00	11	8	5	10	6	7	9	6	3
07:00	19	13	6	10	15	15	12	19	11
08:00	7	8	15	6	6	6	7	8	3
09:00	17	9	3	12	11	10	6	10	6
10:00	25	20	9	26	26	29	26	29	32
11:00	20	10	11	12	7	15	9	9	6
12:00	13	10	6	13	7	10	8	9	7
13:00	11	10	8	18	15	22	17	22	19
14:00	10	6	7	7	11	10	9	13	15
15:00	16	6	4	9	8	10	3	6	3
16:00	5	3	14	5	3	0	2	2	4
17:00	9	1	8	6	1	5	0	3	1
18:00	15	6	16	6	8	13	11	6	12
19:00	9	3	4	8	2	11	8	8	4
20:00	5	1	5	3	2	4	2	3	0
21:00	3	1	6	0	0	6	0	2	0
22:00	0	0	0	0	1	3	1	2	1
23:00	2	1	0	0	1	3	2	2	1
Sum	212	117	128	167	134	196	146	168	147

Table 30: Bicycle Inflow Volum	me Count at Location 3
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	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	28/7/19				
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	1	4	1	8	1	1	1	2	1
01:00	1	0	1	19	6	0	1	2	2
02:00	4	0	0	2	1	2	1	0	0
03:00	0	0	0	0	0	0	0	0	0
04:00	0	0	0	2	0	0	0	0	0
05:00	3	2	2	1	2	1	4	2	4
06:00	10	6	4	19	13	9	6	5	11
07:00	10	18	9	20	11	15	5	9	9 10
08:00	8	8	9	6	12	15	10	13	7
09:00	5	9	5	0	5	12	9	4	7
10:00	14	8	6	0	5	20	9	9	6
11:00	2	3	6	0	4	8	5	7	5
12:00	8	9	7	0	3	10	3	4	5
13:00	6	3	0	0	8	4	5	7	9
14:00	4	9	6	7	9	1	7	2	9
15:00	15	12	8	14	13	9	6	8	7
16:00	11	9	8	8	6	2	2	11	3
17:00	7	0	6	6	3	4	1	4	3
18:00	7	5	3	7	1	2	6	9	11
19:00	5	14	4	1	3	3	4	2	6
20:00	1	4	2	3	3	2	1	3	3
21:00	3	1	1	1	7	1	1	1	0
22:00	2	1	0	0	0	2	0	2	3
23:00	1	1	1	4	2	1	3	0	4
Sum	128	126	89	128	118	124	90	106	116

Table 31: Bicycle Inflow Volume Count at Location 4

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	Day 4Day 5Day 6Day 7Day 8D $25/7/19$ $26/7/19$ $20/7/19$ $21/7/19$ $27/7/19$ 28 ThursdayFridaySaturdaySundaySaturdaySu8106211041000200000000021111231451315681314201215712829088376489124425729893105162014633017141810	28/7/19			
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	1	1	0	8	1	0	6	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	
01:00	0	0	0	1	0	4	1	0	2
02:00	0	0	0	0	2	0	0	0	0
03:00	0	0	0	0	0	0	0	0 0	
04:00	1	0	0	1	0	1	0	1	1
05:00	2	0	0 0 0 2	1	1	1	5		
06:00	4	0	1	1	2	3	1	4	4
07:00	9	1	6	5	13	15	6	8	7
08:00	16	7	13	13	14	20	12	15	9
09:00	3	4	7	7	12	8	2	9	6
10:00	5	3	5	0	8	8	3	7	2
11:00	4	2	8	6	4	8	9	12	6
12:00	4	3	7	4	4	25	7	29	6
13:00	6	4	15	8	9	3	10	5	14
14:00	8	3	19	16	20	14	6	3	3
15:00	14	5	17	30	17	14	18	10	9
16:00	8	5	14	3	3	6	3	4	0

17:00	3	0	6	3	5	5	3	9	4
18:00	12	1	4	1	11	4	2	5	6
19:00	6	26	15	5	9	9	4	10	7
20:00	2	8	6	3	5	5	3	6	6
21:00	0	3	3	1	2	2	0	4	0
22:00	0	1	4	1	2	4	3	4	10
23:00	4	5	4	9	7	4	5	20	10
Sum	112	82	154	126	152	163	105	168	119

The following table summarizes the total bicycle inflow volume count at Church Street for nine days. The bicycle volume count at Church Street was observed to be 639, 525, 558, 613, 639 (on weekdays), 702, 672 (on Saturdays) and 517, 573 (on Sundays).

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	3	5	2	18	3	1	9	6	4
01:00	13	0	1	32	8	4	15	9	17
02:00	4	0	0	2	3	3	1	0	1
03:00	0	0	0	0	0	13	0	0	3
04:00	1	0	0	4	0	1	0	1	2
05:00	10	3	5	5	11	8	6	11	16
06:00	34	24	21	40	30	27	25	21	30
07:00	57	54	38	53	64	59	35	53	53 44
08:00	47	45	64	58	58	67	44	65	52
09:00	41	40	29	36	46	49	35	41	36
10:00	61	52	32	53	68	86	65	66	57
11:00	33	25	33	28	32	47	42	39	30
12:00	37	30	32	31	24	57	32	61	30
13:00	46	39	36	35	57	57	54	59	60
14:00	34	31	40	39	48	36	28	29	34
15:00	55	31	37	59	50	41	31	31	20
16:00	29	28	47	21	17	13	8	26	11
17:00	28	4	36	22	19	19	8	26	10
18:00	40	21	30	23	31	35	29	31	36
19:00	31	48	36	17	22	30	22	29	26
20:00	16	22	16	15	20	16	9	22	15
21:00	7	7	11	5	11	13	3	10	3
22:00	3	7	6	3	5	11	5	12	17
23:00	9	9	6	14	12	9	11	24	19
Sum	639	525	558	613	639	702	517	672	573

Table 32: Total Bicycle Inflow Volume Count at Church Street

Bicyclists were on road using Church Street for their commute and had a significant presence between 6.00 AM and 8.00 PM. The peak hours varied from day to day but a pattern was observed in the morning on weekdays and Saturdays at 7.00, 8.00 and 10.00 AM. At 7.00 and 8.00 AM, a large section of the bicyclists were school/ college going students. The use pattern is consistent with the land use in the area as within a km of church street, there are over 5 large schools that are easily accessed through Church Street.

The 10.00 AM rush consisted more of men and women who are working. Several laborers and employees of local restaurants were seen commuting by cycle as well. Most of the dining places at Church Street provide service from 11.00 AM to 1.00 AM and a large section of their staff in the Food and Beverages industry commutes by bicycle.

3. MOTOR VEHICLE USAGE

Church Street is a one-way road and is mainly used as a connector road to access other nearby roads. From Church Street one can access St. Marks Road, MG Road and Museum Road easily. The vehicular movement on Church Street and neighboring roads have been represented in the following figure.



Figure 50: Traffic Movements in and around Church Street

This study has documented and analyzed the vehicular use pattern and volume. Two kinds of vehicular movements were documented in detail – first, volume of vehicles moving along Church Street i.e., traffic from all possible entries that are merging at Church Street and the second, volume of traffic travelling transversely to church street along the cross roads.

Among the motorized transport the street was mainly used by Two-wheelers, Cars and Auto rickshaws. Movements of LCV and HCV were restricted at active hours and hence the volume observed was less. The study has documented the inflow and outflow volume count of Two-wheelers, Cars and Auto rickshaws at all four survey locations.

Following section discusses inflow and outflow of vehicles at each location.

A. TWO-WHEELER

The following table lists two sets of volume counts – inflow movements and outflow movements at each of the four survey locations (1, 2, 3 and 4). Under each set two types of movements were captured – vehicles entering/leaving the location as per the allowed one way and vehicles entering/leaving violating the one-way movements. On Church Street several violations were noted with respect to the one-way movement. There was a visible lack of supervision and enforcement. The study documents the percentage of violations observed and the total volume count (that is the sum of inflow of allowed movements and inflow of all movements in violation).

			INFL	OW			OUTFLOW					
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	66	18	3	8	6			4	15	23	12	54
1:00	21	8	4	14	3			1	0	8	4	47
2:00	14	4	1	4	3			1	1	5	1	14
3:00	0	0	0	0	0			0	0	0	2	5
4:00	1	0	2	0	0			0	0	0	1	2
5:00	4	0	0	1	0			0	0	1	0	3
6:00	18	10	3	5	4			6	4	3	3	12
7:00	71	15	9	4	8	\sim	\sim	21	1	19	7	24
8:00	187	53	18	16	36	Ĺ	L	43	8	33	11	70
9:00	413	74	39	30	8	ME	ME	80	30	77	13	91
10:00	405	94	45	405	13	VEI	VEI	70	22	75	29	139
11:00	327	103	49	67	24	MO	МО	114	28	76	47	204
12:00	313	134	79	86	22	D	DN	105	26	102	84	276
13:00	331	198	63	114	26	TE	CTE	109	39	102	84	339
14:00	362	211	53	57	30	RIC	RIC	127	42	108	92	267
15:00	311	210	57	33	19	LSE	TSE	122	34	109	93	263
16:00	244	149	47	184	24	RI	RI	93	37	72	98	384
17:00	210	224	35	288	27			112	48	64	113	509
18:00	219	500	28	610	25			142	52	51	180	1136
19:00	200	247	42	420	25			124	43	75	148	757
20:00	123	105	21	184	11			63	19	39	41	363
21:00	69	60	17	67	9			17	26	30	31	157
22:00	32	13	7	14	1			6	10	16	14	64
23:00	16	17	3	10	1			11	8	13	16	68
Sum of	3957	2447	625	2268	325			1371	493	1101	1124	5248
allowed vehicles			962	22					93	37		
	157	605	206	297	348	2376	1081	1030	351	775	285	328

Table 33: Two-wheeler Volume Count at Church Street on Monday

Sum of vehicles violating the restriction	3989 (28.5%)	3850 (29.1%)
TOTAL	13611	13187

		1	INFL	OW			OUTFLOW						
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4	
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks	
0:00	16	5	2	9	3			3	4	1	7	24	
1:00	7	4	1	5	1			0	0	3	7	15	
2:00	3	1	0	4	0			0	0	0	3	5	
3:00	1	0	0	0	0			0	1	0	0	1	
4:00	3	0	0	1	0			0	0	2	0	3	
5:00	4	3	1	2	0			0	0	1	0	6	
6:00	15	11	2	5	3			4	5	5	3	7	
7:00	62	14	9	6	6	S	S	21	3	12	8	23	
8:00	203	56	17	25	14	LN	L	55	10	41	18	59	
9:00	391	69	38	30	10	ME	ME	60	24	74	13	85	
10:00	436	94	41	72	14	VE	VE	98	31	78	33	144	
11:00	416	115	56	122	25	MO	МО	102	43	108	61	245	
12:00	361	160	48	158	19	I Q	[D]	106	37	88	98	372	
13:00	335	168	57	105	26	CTE	CTE	118	27	88	91	336	
14:00	346	187	64	75	22	RIG	RIG	90	35	88	81	316	
15:00	320	193	51	138	22	ES1	EST	104	53	67	89	410	
16:00	267	159	34	196	20	R	R	98	33	68	83	413	
17:00	233	183	36	284	19			92	39	75	104	486	
18:00	196	315	39	561	19			115	47	79	128	1123	
19:00	174	252	33	419	27			124	44	66	126	913	
20:00	148	125	35	189	13			78	34	61	69	400	
21:00	121	75	18	63	12			31	35	41	39	205	
22:00	68	30	16	18	10			12	22	36	19	125	
23:00	40	22	7	21	8			8	15	24	12	79	
Sum of	4166	2241	605	2508	293			1319	542	1106	1092	5795	
vehicles	9813								98	54			
Sum of	172	532	196	387	326	2343	1125	907	362	783	340	242	
vehicles													
violating the	e 3956 (28%)								3759 (2	27.6%)			
TOTAL	12760								_12/	(13			

Table 34: Two-wheeler Volume Count at Church Street on Tuesday

			INFL	OW			OUTFLOW						
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4	
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks	
0:00	36	18	4	9	2			3	5	8	13	43	
1:00	11	2	1	4	0			0	0	4	7	18	
2:00	6	0	0	1	0			0	2	2	4	13	
3:00	1	3	1	0	0			0	0	0	0	6	
4:00	3	0	0	0	1			0	0	0	3	3	
5:00	5	1	1	1	1			0	1	1	0	3	
6:00	11	13	4	4	5			4	4	5	3	11	
7:00	63	15	11	13	6	s	S	17	2	15	5	26	
8:00	181	55	17	30	28	LN	ĽN	46	22	33	14	67	
9:00	449	79	32	32	11	ME	ME	74	28	90	10	90	
10:00	416	79	42	72	11	VE	VE	83	42	92	25	136	
11:00	371	130	48	69	19	ОМ	МО	114	42	102	59	204	
12:00	333	113	62	105	27	I UI	I D I	85	54	108	81	265	
13:00	348	179	50	140	20	CTE	CTE	84	53	102	112	304	
14:00	331	237	46	83	25	RIG	RIG	84	44	97	98	362	
15:00	326	221	59	135	15	EST	EST	119	38	90	129	384	
16:00	268	146	31	270	14	RI	RJ	88	42	82	96	436	
17:00	240	260	28	324	13			91	47	84	162	575	
18:00	242	388	42	576	27			102	62	76	162	1075	
19:00	178	230	32	575	20			115	38	75	130	817	
20:00	165	117	35	209	14			100	35	67	57	369	
21:00	118	86	26	80	12			67	23	54	40	246	
22:00	94	18	17	39	6			31	6	31	29	141	
23:00	72	16	10	21	8			5	5	25	16	89	
Sum of	4268	2406	599	2792	285			1312	595	1243	1255	5683	
vehicles			103	50					10)88			
Sum of	154	547	182	354	276	2452	1061	887	343	856	280	324	
vehicles													
violating the restriction		3	965 (2	7.6%)			3751 (27.1%)						
TOTAL			143	15					_13	339			

 Table 35: Two-wheeler Volume Count at Church Street on Wednesday

Table 36: Two-wheeler Volume Count at Church Street on Thursday

			INFL	OW					OUTF	LOW		
	L 1	\mathbf{L}	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	39	19	4	1	2	к Ц К Ц	л К К К	17	11	11	15	41

1:00	17	5	6	6	1			2	0	6	10	40
2:00	7	1	1	3	0			1	0	3	4	18
3:00	4	0	0	0	0			0	0	0	5	5
4:00	2	0	0	0	1			1	0	0	0	7
5:00	4	4	2	0	0			0	0	0	0	3
6:00	14	13	2	0	4			3	6	7	1	16
7:00	51	12	6	2	9			19	3	15	7	32
8:00	184	56	25	19	31			41	12	18	16	72
9:00	433	63	31	31	12			73	25	53	9	82
10:00	441	96	44	55	10			71	38	84	38	146
11:00	356	114	60	156	24			77	27	62	72	308
12:00	335	133	70	232	28			98	42	88	101	344
13:00	353	179	77	147	14			89	32	106	96	345
14:00	335	196	51	142	28			106	32	96	113	342
15:00	309	184	48	152	21			111	37	82	86	395
16:00	299	164	39	228	28			103	38	79	85	415
17:00	204	186	36	249	15			112	45	67	85	476
18:00	201	330	24	435	22			141	49	78	159	969
19:00	98	220	35	403	15			104	33	50	76	678
20:00	133	120	33	386	16			68	28	56	66	727
21:00	87	62	26	151	9			37	25	35	41	303
22:00	93	36	11	20	12			25	12	35	21	105
23:00	63	24	8	12	7			20	12	19	24	86
Sum of	4062	2217	639	2830	309			1319	507	1050	1130	5955
allowed			100	57					99	61		
Sum of	140	510	100	054	210	22.40						
vehicles							8 1004 1009 357 743 166 226					
violating the restriction		3	678 (2	(6.7%)			3505 (26.02%)					
TOTAL			137	35			13466					

Table 37: Two-wheeler Volume Count at Church Street on Friday

			INFL	ωW			OUTFLOW							
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4		
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks		
0:00	25	9	7	9	3			2	12	14	16	55		
1:00	15	7	6	3	4	ΟS	$\circ s$	1	2	7	4	31		
2:00	8	1	0	0	1	EL LA	IEI	1	1	4	6	14		
3:00	5	0	1	0	1	SIC	ME	1	1	1	1	4		
4:00	2	0	0	0	1	STI	STI	0	0	0	2	2		
5:00	4	5	3	2	0	RE MC	RE MC	1	0	3	1	3		
6:00	10	13	2	7	4			3	3	5	3	11		

7:00	65	20	6	12	11]		38	3	11	7	39
8:00	189	55	19	17	30			42	10	22	15	69
9:00	407	64	34	31	12			71	28	58	9	76
10:00	389	79	42	55	10			86	36	92	38	130
11:00	338	188	52	156	24			70	33	59	72	358
12:00	336	199	57	232	28			109	40	99	101	404
13:00	341	184	79	198	27			95	33	89	99	484
14:00	386	195	70	104	29			136	34	88	116	334
15:00	353	171	40	184	22			124	45	76	108	398
16:00	293	281	44	307	19			108	47	85	137	597
17:00	247	312	44	268	20			118	39	84	201	521
18:00	252	493	112	409	32			135	51	95	188	821
19:00	218	488	82	378	24			101	47	69	191	896
20:00	203	323	29	323	9			61	37	50	114	627
21:00	150	88	31	135	10			34	29	65	56	310
22:00	137	50	42	33	10			20	26	50	25	157
23:00	114	34	15	19	7			24	28	54	35	126
Sum of	4487	3259	817	2882	338			1381	585	1180	1545	6467
allowed vehicles			117	83					11	158		
Sum of	157	567	201	314	351	2389	1116	785	419	804	317	290
vehicles												
violating the	3979 (25.2%)						3731(25.05%)					
TOTAL			155	62					1/	200		
TOTAL			19/	02					140	202		

Table 38: Two-wheeler Volume Count at Church Street on Saturday

			INFL	LOW			OUTFLOW					
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	14	18	7	17	1			8	5	14] 17	76
1:00	24	13	7	11	3			1	5	12	22	58
2:00	14	5	4	6	0	\sim	~	2	6	6	6	19
3:00	1	4	1	2	2	LN	Ľ	0	0	2	2	15
4:00	2	0	1	1	0	ME	ME	0	0	0	0	3
5:00	3	1	0	2	1	VEI	VEI	0	1	0	0	3
6:00	7	8	2	3	4	40	40	1	3	4	1	9
7:00	37	13	8	18	3	D	Ĩ Q	6	3	9	10	23
8:00	137	32	16	14	27	TE	TE	36	14	32	8	55
9:00	310	59	24	22	11	RIC	RIC	57	14	60	17	68
10:00	293	82	35	44	16	EST	LSE	69	18	64	41	122
11:00	320	80	34	63	15	RF	RF	82	41	77	49	149
12:00	331	127	43	101	26			104	56	88	76	243
13:00	344	164	52	183	19]		81	53	93	102	319

14.00	206	172	17	200	40]		80	62	78	108	<i>A</i> 11	
14.00	270	172	+/	207	40	-		0)	02	76	100	+11	
15:00	283	189	39	219	18			94	47	71	94	481	
16:00	298	175	35	252	24			101	49	57	96	528	
17:00	278	242	34	277	27			93	45	65	121	552	
18:00	283	342	53	336	28			144	48	70	187	604	
19:00	291	232	58	292	14			104	43	60	109	512	
20:00	231	156	39	236	18			86	40	52	95	376	
21:00	194	100	28	92	8			51	33	60	74	286	
22:00	155	57	39	47	5			38	21	49	57	195	
23:00	150	38	14	26	9			28	35	39	53	122	
Sum of	4296	2309	620	2473	319			1275	642	1062	1345	5229	
allowed vehicles			100	17					95	53			
Sum of	168	581	190	306	309	1899	1016	701	352	604	405	220	
vehicles		I	'	I	Į	1		I	I	1	I	1	
violating the		3	3453 (2	25.6%)			3298 (26.2%)						
restriction													
TOTAL			134	70			12851						

			INFL	ωW					OUTF	LOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	115	38	24	24	8			22	19	32	37	97
1:00	69	36	14	26	8			8	5	24	27	96
2:00	31	9	2	8	3			7	3	8	16	39
3:00	15	4	2	0	1			0	1	4	5	22
4:00	1	0	1	0	0			0	0	1	2	2
5:00	3	1	1	1	1			1	0	2	0	3
6:00	13	12	2	3	2	IS	ΓS	4	5	4	6	11
7:00	21	8	4	5	6	EN	EN	2	6	2	8	21
8:00	46	18	10	9	6	EM	EM	12	4	7	6	33
9:00	80	19	7	16	10	ΙΛC	ΛC	22	12	18	15	35
10:00	122	39	19	24	12	Μ	M	23	7	30	16	78
11:00	175	41	7	34	14	ED	ED	40	21	27	29	83
12:00	190	42	16	39	12	ICI	ICI	46	29	31	30	210
13:00	200	78	28	50	13	TR	TR	43	30	53	32	339
14:00	226	66	24	40	19	RES	RES	46	44	63	44	267
15:00	107	44	14	32	4	I	Ι	28	23	34	33	263
16:00	99	42	22	38	9			29	16	30	26	118
17:00	161	58	20	55	8			44	28	29	39	157
18:00	190	51	26	48	13			38	26	39	45	179
19:00	193	69	34	62	12			37	25	35	55	199
20:00	191	70	44	39	9			45	36	68	50	188

21:00	125	60	35	43	10			43	23	60	42	175		
22:00	89	28	28	19	15			25	24	40	26	137		
23:00	75	20	18	26	10			18	19	31	20	99		
Sum of	2537	853	402	641	205			583	406	672	609	2851		
allowed vehicles			46,	38			5121							
Sum of	201	281	172	276	240	1602	930	391	184	298	218	289		
vehicles violating the restriction		2	2772 (3	7.4%)	I				2310 (3	1.08%)	'	-		
TOTAL			74	10					74	31				

Table 40: Two-wheeler Volume Count at Church Street on Saturday

			INFL	OW			OUTFLOW						
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4	
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks	
0:00	61	30	15	10	8			18	21	24	22	99	
1:00	53	14	3	12	13			5	17	13	6	60	
2:00	20	2	6	5	2			1	3	9	16	41	
3:00	8	1	1	1	2			2	0	1	4	10	
4:00	4	0	2	2	2			0	0	1	1	11	
5:00	7	3	4	3	0			0	3	3	0	7	
6:00	17	7	2	3	5			7	4	5	2	8	
7:00	33	13	8	12	8	\sim	~	7	6	9	6	24	
8:00	86	23	13	20	26	L	Ľ	25	6	27	3	58	
9:00	255	40	27	14	9	ME	ME	44	14	52	14	61	
10:00	274	70	30	49	8	VEI	VEI	59	26	54	20	130	
11:00	255	76	26	75	12	MO'	ΨŪ.	68	28	65	48	173	
12:00	281	119	46	78	18	DN	D	75	51	85	67	229	
13:00	331	128	49	117	20	TE	ET.	93	40	82	85	293	
14:00	291	158	35	129	25	RIC	RIC	91	39	87	83	348	
15:00	282	144	52	154	18	EST	TSE	98	54	60	102	350	
16:00	224	91	42	133	14	RI	RI	76	48	74	72	302	
17:00	258	127	30	181	16			82	59	52	107	361	
18:00	261	150	27	226	12			100	58	63	95	393	
19:00	199	143	29	184	18			60	43	67	96	363	
20:00	193	109	22	142	18			50	42	62	79	295	
21:00	172	94	38	88	10			45	52	68	65	237	
22:00	150	61	22	58	9			45	55	58	43	165	
23:00	131	27	21	42	4			37	43	26	24	108	
Sum of	3846	1630	550	1738	277			1088	712	1047	1060	4126	
allowed vehicles	8041								80	33			
	134	446	222	325	276	1872	643	588	295	702	383	218	

Sum of vehicles violating the restriction	3275 (28.9%)	2829 (26.04)
TOTAL	11316	10862

			INFL	OW			OUTFLOW						
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4	
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks	
0:00	78	33	22	29	12	RES	REST	36	16	33	38	138	
1:00	43	15	21	19	15	TRIC	RICT	12	14	17	23	87	
2:00	22	2	9	0	7	MOV	ED MOV	1	7	13	11	34	
3:00	8	0	0	5	1	EME	EME	0	0	0	5	23	
4:00	0	0	0	5	0	NTS	NTS	0	0	0	5	10	
5:00	6	2	0	1	0			0	0	1	2	6	
6:00	22	5	0	1	2			3	5	4	4	5	
7:00	43	11	5	6	4			5	9	4	8	26	
8:00	52	13	7	7	6			14	8	15	4	28	
9:00	74	31	13	9	8			23	11	14	9	53	
10:00	143	30	14	23	9			27	12	30	11	57	
11:00	151	45	21	29	12			28	26	34	15	90	
12:00	181	67	27	37	4			43	26	38	25	117	
13:00	231	62	23	43	10			45	36	51	50	149	
14:00	186	51	24	39	11			39	41	50	41	145	
15:00	147	65	25	29	11			31	34	33	48	124	
16:00	160	54	28	55	12			38	35	49	41	145	
17:00	142	44	14	41	5			42	29	20	32	124	
18:00	169	37	21	62	4			42	22	34	42	155	
19:00	204	58	38	53	5			49	35	42	53	175	
20:00	174	73	26	60	10			39	29	60	52	165	
21:00	171	65	37	29	16			28	24	59	50	182	
22:00	84	57	19	28	13			49	34	68	35	166	
23:00	67	20	12	25	4			26	26	22	23	97	
Sum of	2558	840	406	635	181			620	479	691	627	2301	
allowed vehicles			462	20					47	18			
Sum of	161	286	116	279	225	1206	632	418	181	290	259	249	
vehicles													
violating the		2	273 (3	2.9%)			2029 (30%)						
TOTAL_			68	93					_67	47			
TOTHE			- 00.						01				

Table 41: Two-wheeler Volume Count at Church Street on Sunday

Observations:

✤ Volume Count:

Two wheelers were observed to be more in number. On weekdays and Saturdays, the volume count was 13611, 13769, 14315, 13735, 15762 and 13470, 11316 (two successive Saturdays). On Sundays, the numbers were drastically lesser. The volume count observed on two successive Sundays were 7410 and 6893 respectively. The summary of two-wheeler volume at Church Street is tabulated below.

	Location 1	Lo	ocation 2	Lo	cation 3	Location 4	
DAYS	From Brigade	From MG	From Rest House Cres Road	From MG	From SBI Road	From St. Marks	TOTAL
Day 1 Monday (22-07-19)	4114	3052	831	2565	673	2376	13611
Day 2 Tuesday (23-07-19)	4338	2773	801	2895	619	2343	13769
Day 3 Wednesday (24-07-19)	4422	2953	781	3146	561	2452	14315
Day 4 Thursday (25-07-19)	4202	2736	838	3084	627	2248	13735
Day 5 Friday (26-07-19)	4644	3826	1018	3196	689	2389	15762
Day 6 Saturday (20-07-19)	4464	7354	810	2779	628	1899	13470
Day 7 Sunday (21-07-19)	2733	1134	574	917	445	1602	7410
Day 6 Saturday (27-07-19)	3980	2076	772	2063	553	1872	11316
Day 7 Sunday (28-07-19)	2719	1126	522	914	406	1206	6893

Table 42: Two-wheeler Volume Count at Church Street on Sunday

Peak Volume Count and Entry from Cross Road:

On Friday the volume was observed to be more at 15762 two wheelers. It was also observed that the inflow from crossroads- Museum Road and Rest House roads were substantially high. This also establishes that Church Street is used as a connector road and not necessarily as a destination. The following figure depicts the peak inflow at each crossroad and the total volume count.



Figure 51: Two-Wheeler Volume Count [Friday]

✤ Movement in Violation of one-way

Though Church Street is one way, motor vehicles violate the rule frequently. Most number of violations were committed by two wheelers. The following chart shows in comparison the total number of two-wheelers accessing the road and the number of violations for each day. For instance, on Monday there were 9975 two wheelers observed as inflow volume following one way and another 3989 vehicles also used the street but in violation of the one-way movement. The significant proportion of violations illustrate a lack of strict enforcement.



Two wheeler volume count and vioaltions to one way movement

Figure 52: Two-wheeler one-way violations

To identify the Peak Hours of Two-Wheeler movement, the hourly inflow of Two-Wheelers to Church Street at all possible entries in all four locations have been summed up. The table below lists the hourly volume count.

Time	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	170	96	125	131	140	137	331	216	280
01:00	105	41	61	86	83	148	313	186	195
02:00	53	17	16	40	30	68	116	93	101
03:00	8	4	8	13	13	22	42	30	41
04:00	8	10	12	13	5	11	13	21	19
05:00	26	28	25	25	28	25	24	30	26
06:00	80	74	86	71	78	64	80	71	68
07:00	228	231	230	194	249	176	102	162	124
08:00	672	605	664	657	673	455	153	362	155
09:00	955	920	1011	950	980	696	207	626	221
10:00	962	1021	944	981	872	763	309	656	326
11:00	893	1021	934	987	1037	795	380	665	373
12:00	943	1018	922	1041	1124	933	481	748	464
13:00	1048	998	1059	1033	1126	1021	621	852	516
14:00	1067	1009	1041	1058	1130	984	627	844	440
15:00	914	972	1016	956	1052	928	440	807	385
16:00	870	864	941	942	1155	954	336	672	424
17:00	950	942	1020	855	1031	981	400	754	331
18:00	1513	1317	1412	1148	1414	1156	441	838	418
19:00	1065	1060	1188	869	1298	1001	541	720	478
20:00	564	656	674	779	1010	809	493	614	490
21:00	304	425	451	458	534	558	409	549	462
22:00	120	262	270	257	394	422	297	445	316
23:00	93	178	205	191	306	363	254	355	240
Sum	13611	13769	14315	13735	15762	13470	7410	11316	6893

The peak hour was observed at two different time intervals between 1.00 - 2.00 PM in the afternoon and at 6.00 PM in the evening. On Sundays the peak hour in the evening slightly extended to 7.00 - 8.00 PM.

B. CAR

The following section tabulates the volume count of cars. Compared to two-wheelers the number of cars were less on Church Street.

			INFL	OW			OUTFLOW							
	L 1	L	2	L 3		L4	L1	L 2		L 3		L 4		
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks		
0:00	84	10	10	9	8	D S	O S	7	3	12	22	90		
1:00	54	4	2	5	10	IEI	IEI	6	2	6	9	60		
2:00	20	0	2	6	1	SIC	SIC	5	0	5	8	24		
3:00	6	1	0	2	0	STI	STI	2	0	1	1	6		
4:00	8	1	0	0	0	RE MC	RE MC	2	0	1	2	7		

Table 44: Car Volume Count at Church Street on Monday

5:00	6	1	0	1	0]		0	1	1	0	5
6:00	15	1	0	2	0			6	0	1	1	11
7:00	109	5	0	3	0			71	3	13	2	23
8:00	121	29	2	2	2	-		77	3	12	9	36
9:00	147	31	2	9	3	-		39	5	28	29	65
10:00	144	35	0	7	2	-		45	0	24	21	70
11:00	180	40	2	8	4	-		57	1	37	16	89
12:00	131	30	2	10	2	-		27	2	34	28	80
13:00	201	36	3	12	8	-		62	3	36	49	112
14:00	237	54	4	9	5			70	1	44	47	134
15:00	244	93	5	14	9			67	0	53	62	156
16:00	170	34	7	29	4			39	4	50	48	126
17:00	147	73	7	35	3			70	5	26	66	162
18:00	111	106	4	96	6	-		57	1	16	69	227
19:00	124	32	0	46	7			37	0	21	32	159
20:00	138	31	0	16	3			38	1	34	38	115
21:00	127	23	5	11	4			32	2	30	22	107
22:00	97	12	4	10	2			14	2	22	11	95
23:00	80	8	4	10	10			8	0	20	13	87
Sum of	2701	690	65	352	93			838	39	527	585	2046
allowed		I	39	01	I	1		I	40	35	I	1
vehicles Sum of	10	<i>(</i> 0	10			102	4.5			<u> </u>	1.40	
vehicles	13	68	12	12	15	103	45	77	0	609	148	22
violating the			223 (6	7%)			907(18%)					
restriction									JU /(.	1070)		
TOTAL			41	24					49	42		

Table 45: Car Volume Count at Church Street on Tuesday

			INFL	JOW			OUTFLOW							
	L 1	L	2	L 3		L4	L1	L	2	L	3	L 4		
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks		
0:00	16	7	6	5	11			3	5	4	12	57		
1:00	7	5	2	8	3	~	\sim	6	0	3	5	45		
2:00	3	1	2	4	1	Ĕ	Ĕ	0	0	2	3	17		
3:00	1	0	0	1	1	ME	ME	0	0	0	0	5		
4:00	3	1	0	0	0	VEI	VEI	0	0	0	0	2		
5:00	4	1	0	1	1	10,	10,	2	0	0	0	5		
6:00	15	2	0	1	1	DN	DN	12	0	2	2	7		
7:00	62	10	0	3	3	LE C	CTE	75	4	15	3	17		
8:00	203	31	1	3	2	RIC	RIC	76	2	18	9	45		
9:00	391	35	3	7	0	TSE	TSE	39	1	28	15	79		
10:00	436	45	1	12	7	RF	RE	51	2	36	29	70		
11:00	416	51	4	41	5			49	2	30	30	135		

12:00	361	50	3	27	6			58	1	27	42	129
13:00	335	46	4	19	9			72	1	32	67	130
14:00	346	67	2	12	9			79	2	34	43	142
15:00	320	100	1	20	10			75	1	52	80	162
16:00	267	48	0	34	7			52	1	34	56	146
17:00	233	56	8	40	9			53	0	44	50	168
18:00	196	53	1	123	5			57	0	30	46	209
19:00	174	55	1	138	6			43	4	36	42	252
20:00	148	33	1	27	5			34	1	39	30	148
21:00	121	11	0	18	3			25	3	24	22	111
22:00	68	13	2	12	2			21	0	22	13	114
23:00	40	16	9	11	5			7	3	11	16	99
Sum of	4166	737	51	567	111			889	33	523	615	2294
allowed vehicles			56.	32					43	54		
Sum of	5	62	9	7	17	1873	57	70	11	657	153	14
vehicles violating the restriction			1973 (25%)			962 (18%)					
TOTAL			76	05			5316					

Table 46: Car Volume Count at Church Street on Wednesday

			INFL	JOW			OUTFLOW							
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4		
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks		
0:00	52	5	11	9	7			6	8	10	13	57		
1:00	21	1	3	4	0			2	2	1	4	27		
2:00	8	3	1	3	2			0	0	1	4	17		
3:00	8	0	0	0	1			0	0	1	2	12		
4:00	4	3	0	0	2			0	0	0	1	6		
5:00	3	1	0	1	0	IS	TS	0	1	0	1	5		
6:00	19	2	0	1	1	EN	EN	10	0	4	0	7		
7:00	96	16	1	4	2	EM	EM	77	2	10	5	23		
8:00	130	39	0	6	3	NO NO	ΛΟ	74	3	18	9	61		
9:00	148	26	5	6	4	M	W	43	3	23	7	67		
10:00	164	35	1	20	3	ED	IED	35	1	46	16	89		
11:00	163	38	4	12	2	IC	ICI	46	0	22	23	89		
12:00	172	35	2	18	10	TR	TR	36	0	34	34	108		
13:00	240	58	5	21	11	SES	RES	59	0	60	64	124		
14:00	249	54	2	21	4		-	59	2	51	45	151		
15:00	195	99	2	37	7			75	6	45	89	152		
16:00	178	52	1	73	10			56	2	36	46	182		
17:00	187	82	3	93	6			38	4	35	82	205		
18:00	135	73	5	114	1]		62	2	47	55	215		

19:00	145	60	3	130	4]		61	2	32	54	221
20:00	130	33	3	50	5			49	0	23	28	153
21:00	144	12	0	16	3			38	4	27	20	105
22:00	97	13	1	14	5			34	1	29	23	112
23:00	90	6	0	13	6			6	0	24	24	85
Sum of	2778	746	53	666	99			866	43	579	649	2273
allowed vehicles			43	42		L			44	10		
allowed vehicles Sum of	7	46	43 8	42 17	7	934	35	75	44 2	10 672	127	13
allowed vehicles Sum of vehicles violating the restriction	7	46	434 8 1019 (42 17 18 %)	7	934	35	75	44 2 924 (1	10 672 7.3%)	127	13

Table 47: Car Volume Count at Church Street on Thursday

			INFL	OW					OUTF	FLOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	72	8	10	0	2			9	1	14	23	72
1:00	35	3	4	0	3			2	1	8	7	48
2:00	14	2	0	0	1			4	0	4	1	21
3:00	7	0	0	0	0			0	0	0	0	5
4:00	6	2	0	0	1			2	0	0	2	6
5:00	4	1	0	0	0			1	0	0	1	7
6:00	20	2	0	0	1			12	0	3	1	9
7:00	87	8	1	0	0	~	\sim	58	1	6	3	16
8:00	125	39	0	6	1	Ĕ	Ľ	79	1	20	13	44
9:00	147	40	2	15	2	ME	ME	41	1	30	8	62
10:00	176	37	6	14	6	VEI	VEI	38	0	35	22	75
11:00	181	43	5	56	6	MO	MO	53	1	33	52	107
12:00	176	47	3	43	14	G	- C	50	3	37	58	100
13:00	256	51	7	16	8	EL	CTE	66	2	42	58	107
14:00	230	71	1	16	7	RIC	RIC	70	1	41	70	149
15:00	254	72	1	20	13	LSE	LSE	68	0	56	59	167
16:00	188	42	5	40	11	RI	RI	48	1	45	40	142
17:00	163	53	4	28	7			56	1	37	66	171
18:00	160	79	0	55	8			63	2	39	77	188
19:00	161	63	3	82	9			40	0	31	49	203
20:00	159	25	3	72	13			31	0	36	55	178
21:00	144	17	1	58	14			18	2	21	38	171
22:00	131	10	2	12	5			23	7	31	25	116
23:00	120	17	6	12	14			15	8	33	16	122
Sum of	3016	732	64	545	146			847	33	602	744	2286
allowed vehicles			45	03					45	12		

Sum of	14	35	8	3	7	927	43	71	6	626	113	8
vehicles violating the		ç	94 (18	.08%)					867 (1	6.1%)		
restriction												
TOTAL			54	97					53	79		

Table 48: Car Volume Count at Church Street on Friday

Image: height index				INFL	OW					OUTH	LOW		
TIME Entry at Street From House (res From MG From SBI From MG From Street From MG To MG To MG To MG Marks 0:00 82 9 8 9 11 10 15 16 86 1:00 55 8 3 8 3 2 0 1 2 1 0 2 1 0 0 2 1 0 0 2 0 1 0 2 0 2 0		L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
0:00 82 9 8 9 11 1:00 55 8 3 8 3 2:00 15 4 4 5 2 3:00 8 3 0 2 0 4:00 7 0 0 0 0 5:00 6 2 1 0 0 6:00 20 1 0 2 0 7:00 85 10 0 2 0 8:00 128 45 1 7 3 9:00 156 35 0 15 2 10:00 167 52 1 14 6 9:00 166 35 0 15 2 11:00 173 68 1 56 6 9:00 183 70 1 43 14 11:00 23 74 3 17 13 13:00 23 59 1 18 15 16:00 213 86 2 65 16 17:00 162 147 9 67 15 19:00 152 1	TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
1:00 55 8 3 8 3 2:00 15 4 4 5 2 3:00 8 3 0 2 0 4:00 7 0 0 0 0 4:00 7 0 0 0 0 6:00 20 1 0 2 0 6:00 20 1 0 2 0 8:00 128 45 1 7 3 9:00 156 35 0 15 2 10:00 173 68 1 56 6 11:00 173 68 1 56 6 11:00 173 68 1 56 6 12:00 183 70 1 43 14 13:00 249 68 10 41 17 13:00 232 59 1 <th>0:00</th> <th>82</th> <th>9</th> <th>8</th> <th>9</th> <th>11</th> <th></th> <th></th> <th>7</th> <th>10</th> <th>15</th> <th>16</th> <th>86</th>	0:00	82	9	8	9	11			7	10	15	16	86
2:00 15 4 4 5 2 3:00 8 3 0 2 0 4:00 7 0 0 0 0 5:00 6 2 1 0 0 0 6:00 20 1 0 2 0 2 0 2 0 4 6:00 20 1 0 2 0 2 0 2 0 4 6:00 128 45 1 7 3 5 3 0 15 2 9:00 156 35 0 15 2 1 14 6 9:00 167 52 1 14 6 10 4 14 13:00 249 68 10 41 17 13:00 232 59 1 18 15 16:00 213 86 2 <th>1:00</th> <th>55</th> <th>8</th> <th>3</th> <th>8</th> <th>3</th> <th></th> <th></th> <th>4</th> <th>4</th> <th>8</th> <th>14</th> <th>50</th>	1:00	55	8	3	8	3			4	4	8	14	50
3:00 8 3 0 2 0 4:00 7 0 0 0 0 0 5:00 6 2 1 0 0 0 6:00 20 1 0 2 0 2 0 2 0 4 6:00 20 1 0 2 0 3 1 13 7:00 85 10 0 2 0 3 1 13 9:00 156 35 0 15 2 1 14 6 9:00 167 52 1 14 6 0 42 3 8 85 10:00 173 68 1 56 6 1 19 14 56 11 13:00 232 59 1 18 15 15 15 15 15 16 16 13 109 132 14' 9 67 162 62 2 33 74 244	2:00	15	4	4	5	2			2	1	2	5	28
4:00 7 0 0 0 0 5:00 6 2 1 0 0 6:00 20 1 0 2 0 7:00 85 10 0 2 0 8:00 128 45 1 7 3 9:00 156 35 0 15 2 10:00 167 52 1 14 6 11:00 173 68 1 56 6 12:00 183 70 1 43 14 13:00 249 68 10 41 17 13:00 232 59 1 18 15 16:00 213 86 2 65 16 19:00 152 147 9 67 15 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 <	3:00	8	3	0	2	0			1	0	0	3	12
5:00 6 2 1 0 0 6:00 20 1 0 2 0 7:00 85 10 0 2 0 8:00 128 45 1 7 3 9:00 156 35 0 15 2 9:00 166 35 0 15 2 9:00 167 52 1 14 6 9:00 183 70 1 43 14 11:00 173 68 1 56 6 12:00 183 70 1 43 14 13:00 249 68 10 41 17 13:00 232 59 1 18 15 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67	4:00	7	0	0	0	0			2	0	0	0	6
6:002010207:0085100208:00128451739:001563501529:0016752114611:0017368156612:00183701431414:00273743171313:002496810411715:00232591181516:00213862651619:0015214796715:00203111769518:00162131106348919:00152147967153451212620:0020183480933754819:001534512126662233651073121266873111195933687311119593365832:0015345107319.8%/Sum of veliclesviolating the restriction8731111959336586352057Sum of velicles8 <th>5:00</th> <th>6</th> <th>2</th> <th>1</th> <th>0</th> <th>0</th> <th></th> <th></th> <th>2</th> <th>0</th> <th>2</th> <th>0</th> <th>4</th>	5:00	6	2	1	0	0			2	0	2	0	4
7:0085100208:00128451739:0015635015210:0016752114611:0017368156612:00183701431413:002496810411713:00232591181516:00213862651619:001521479671519:001521479671520:0020183480921:00186375481622:00176294261323:00153451212653md allowed vehicles8731111959336586352057501073 (19.8%)5013651073 (19.8%)5013651073 (19.8%)	6:00	20	1	0	2	0			11	0	3	1	13
8:00 128 45 1 7 3 5 9:00 156 35 0 15 2 10:00 167 52 1 14 6 11:00 173 68 1 56 6 12:00 183 70 1 43 14 13:00 249 68 10 41 17 13:00 232 59 1 18 15 15:00 232 59 1 18 15 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 32:00 153 45	7:00	85	10	0	2	0	S	S	64	2	6	2	19
9:00 156 35 0 15 2 10:00 167 52 1 14 6 11:00 173 68 1 56 6 12:00 183 70 1 43 14 13:00 249 68 10 41 17 14:00 273 74 3 17 13 15:00 232 59 1 18 15 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 32:00 153 45 12 12 6 Sum of vehicles violating the restriction 8	8:00	128	45	1	7	3	NT	L	66	1	19	14	56
10:00 167 52 1 14 6 11:00 173 68 1 56 6 12:00 183 70 1 43 14 13:00 249 68 10 41 17 14:00 273 74 3 17 13 15:00 232 59 1 18 15 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 32:00 153 45 12 12 6 Sum of vehicles 3285 1177 87 669 180 927 57 630 975	9:00	156	35	0	15	2	ME	ME	40	2	33	8	85
11:0017368156612:00183701431413:002496810411714:00273743171315:00232591181516:00213862651617:00203111769518:001621311063819:001521479671520:0020183480921:00186375481622:00176294261330wed vehicles3285117787669180sum of vehicles8731111959336586352057Sum of vehicles8731111959336586352057Sum of vehicles8731111959336586352057Sum of vehicles1073 (19.8%)959336586352057TOTAI44711011959336586352057	10:00	167	52	1	14	6	VE	VE	56	0	42	22	101
12:0018370143147013:002496810411714:00273743171315:00232591181516:00213862651617:00203111769518:001621311063819:001521479671520:0020183480921:00186375481623:001762942613301778766918092757630301111195933658635205501073 (19.8%)59336586352057TOTA I44716326	11:00	173	68	1	56	6	OW	ОМ	42	3	32	52	149
13:00 249 68 10 41 17 FORE 14:00 273 74 3 17 13 15:00 232 59 1 18 15 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 31 7 46 79 222 31 7 46 79 222 31 7 46 79 222 32:00 153 45 12 12 6 31 7 669 180 927 57 630 975 2784 310ved 3285 117 <th>12:00</th> <th>183</th> <th>70</th> <th>1</th> <th>43</th> <th>14</th> <th>- G</th> <th>[[]</th> <th>50</th> <th>1</th> <th>31</th> <th>58</th> <th>151</th>	12:00	183	70	1	43	14	- G	[[]	50	1	31	58	151
14:00 273 74 3 17 13 product 15:00 232 59 1 18 15 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 3285 1177 87 669 180 48 91 208 310 153 45 12 12 6 48 14 14 14 14 131 11 11 959 33 65 8 635 205 7 310 153 45 12 12 6 5398 33 65 8 635 205 7	13:00	249	68	10	41	17	CTI	CTI	65	0	44	60	181
15:00 232 59 1 18 15 59 16:00 213 86 2 65 16 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 23:00 153 45 12 12 6 Sum of allowed vehicles 3285 1177 87 669 180 Sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 Sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 Sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 Sum of vehicles 1073 (19.8%) 1073 (19.8%) 1073 (19.8%) 1073 (19.8%) 1073 (19.8%) 1073 (19.8%) 10	14:00	273	74	3	17	13	RIC	RIC	86	0	44	74	160
16:00 213 86 2 65 16 ≃ 62 2 33 74 244 17:00 203 111 7 69 5 18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 23:00 153 45 12 12 66 65 8 635 147 23:00 153 45 12 12 66 9 927 57 630 975 2784 3llowed vehicles 8 73 11 11 959 33 65 8 635 205 7 sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 sum of vehicles 3 73 </th <th>15:00</th> <th>232</th> <th>59</th> <th>1</th> <th>18</th> <th>15</th> <th>ESJ</th> <th>ESJ</th> <th>79</th> <th>1</th> <th>46</th> <th>79</th> <th>162</th>	15:00	232	59	1	18	15	ESJ	ESJ	79	1	46	79	162
17:00203111769518:001621311063819:001521479671520:0020183480921:00186375481622:00176294261323:0015345121263un of allowed vehicles3285117787669180sum of vehicles3285117875un of vehicles8731111959336586352057sum of vehicles1073 (19.8%)54715471547154215471	16:00	213	86	2	65	16	R	R	62	2	33	74	244
18:00 162 131 10 63 8 19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 23:00 153 45 12 12 6 Sum of allowed vehicles 3285 1177 87 669 180 927 57 630 975 2784 3llowed vehicles 8 73 11 11 959 33 65 8 635 205 7 5un of vehicles violating the restriction 8 73 11 11 959 33 65 8 635 205 7 5un of vehicles violating the restriction 1073 (19.8%) 533 65 8 635 205 7 5un of vehicles violating the restriction 1073 (19.8%) 533 65 8 635 205 7 5un of vehicles violating the restr	17:00	203	111	7	69	5			75	2	31	109	172
19:00 152 147 9 67 15 20:00 201 83 4 80 9 21:00 186 37 5 48 16 22:00 176 29 4 26 13 23:00 153 45 12 12 6 Sum of allowed vehicles 3285 1177 87 669 180 Sum of vehicles violating the restriction 8 73 11 11 959 33 65 8 635 205 7	18:00	162	131	10	63	8			66	6	46	86	198
20:0020183480921:00186375481622:00176294261323:001534512126Sum of allowed vehicles3285117787669180Sum of vehicles3285117787669180Sum of vehicles8731111959336586352057Sum of vehicles8731111959336586352057TOTAL6471647164716426	19:00	152	147	9	67	15			39	1	48	91	208
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	20:00	201	83	4	80	9			31	7	46	79	222
22:00 176 29 4 26 13 23:00 153 45 12 12 6 19 3 37 50 147 23:00 153 45 12 12 6 22 5 40 43 142 Sum of allowed vehicles 3285 1177 87 669 180 C 927 57 630 975 2784 Sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 Violating the restriction IOTAI 6471	21:00	186	37	5	48	16			36	6	22	35	188
23:00 153 45 12 12 6 22 5 40 43 142 Sum of allowed vehicles 3285 1177 87 669 180 927 57 630 975 2784 Sum of vehicles violating the restriction 8 73 11 11 959 33 65 8 635 205 7 TOTAL	22:00	176	29	4	26	13			19	3	37	50	147
Sum of allowed vehicles 3285 1177 87 669 180 927 57 630 975 2784 Sum of vehicles 5398 5398 5398 537 5308 537 530 975 2784 Sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 violating the restriction 1073 (19.8%) 5 5 953 (15.06%) 5 5 5	23:00	153	45	12	12	6			22	5	40	43	142
anowed vehicles 5398 5398 Sum of vehicles violating the restriction 8 73 11 11 959 33 65 8 635 205 7 TOTAL 6471 6471 6326	Sum of	3285	1177	87	669	180			927	57	630	975	2784
Sum of vehicles 8 73 11 11 959 33 65 8 635 205 7 vehicles violating the restriction 1073 (19.8%) 953 (15.06%) 953 (15.06%) 6471	vehicles			53	98					53	73		
vehicles 1073 (19.8%) 953 (15.06%) TOTAL 6471 6326	Sum of	8	73	11	11	11	959	33	65	8	635	205	7
restriction 6471 6326	vehicles violating the		1	073 (1	9.8%)					953 (14	5.06%)		
TOTAL 6471 6326	restriction												
101AL 07/1 0540	TOTAL			64'	71					63	26		

 Table 49: Car Volume Count at Church Street on Saturday

TIME	INFLOW	OUTFLOW

	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	58	5	7	16	4			8	1	16	14	111
1:00	92	9	6	17	11			5	2	17	32	100
2:00	43	6	1	15	9			1	1	5	11	68
3:00	11	1	0	3	1			1	2	1	5	18
4:00	9	1	0	0	0			3	0	0	2	10
5:00	8	1	0	0	1			1	1	0	2	5
6:00	7	0	0	1	0			3	0	1	2	7
7:00	25	6	0	2	1	S	\sim	14	1	4	5	13
8:00	52	10	1	0	1	Ĺ	Ľ	18	1	5	3	23
9:00	97	11	2	6	7	ME	ME	21	1	23	11	53
10:00	115	44	0	9	5	VE	VEJ	41	0	19	16	65
11:00	155	27	3	13	7	MO	MO	41	1	39	24	87
12:00	196	58	3	24	6	Q	D	44	1	43	44	98
13:00	240	75	2	77	10	E	CTE	48	6	40	75	192
14:00	283	63	6	70	12	RIC	RIC	50	2	51	78	235
15:00	247	54	11	150	14	TSE	TSE	46	5	51	52	339
16:00	223	65	4	57	19	RI	RI	60	1	52	48	244
17:00	218	72	3	22	17			49	7	40	83	180
18:00	215	80	5	28	6			54	2	59	77	168
19:00	217	51	4	49	22			37	1	28	75	195
20:00	252	41	5	66	14			42	3	47	69	197
21:00	225	40	10	31	19			37	2	41	54	210
22:00	243	28	7	14	16			25	5	42	49	179
23:00	201	20	8	16	15			16	13	45	61	167
Sum of	3432	768	88	686	217			665	59	669	892	2964
allowed vehicles		I	51	91	I	1		1	52	49	I	1
Sum of	11	60	9	11	8	699	47	21	2	358	285	11
vehicles violating the			708 (1	3 30/					724 (12	2 1 2 0 ()		
restriction			170 (1	5.570)					724 (12	.1270)		
TOTAL			59	89					59	73		

Table 50: Car Volume Count at Church Street on Sunday

			INFL	OW					OUTF	LOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	173	23	0	3	2		И И И И И И И И И И И И И И И И И И И	16	1	27	45	146
1:00	148	19	0	15	8	STH	STH	12	2	26	39	143
2:00	71	5	0	10	6	G RE	A C R	2	2	6	30	86

3:00	17	7	0	2	2			3	2	4	4	29
4:00	17	1	0	2	0			2	0	1	3	15
5:00	4	3	0	0	0			1	0	1	1	5
6:00	4	2	0	1	0			2	0	1	0	10
7:00	14	1	0	1	2			4	0	4	2	8
8:00	34	5	0	1	1			10	0	4	6	15
9:00	57	8	0	1	8			13	0	13	17	25
10:00	74	17	0	7	5			28	0	17	7	50
11:00	106	14	1	8	13			26	1	26	22	59
12:00	195	28	0	8	15			37	0	44	35	102
13:00	248	31	3	17	12			40	2	57	43	112
14:00	248	31	6	22	13			42	3	47	51	134
15:00	207	21	10	30	9			29	2	48	62	156
16:00	179	29	8	14	13			45	2	50	34	161
17:00	41	24	5	17	10			28	2	44	37	150
18:00	189	23	2	12	14			19	3	52	40	134
19:00	226	21	4	16	10			27	2	60	33	140
20:00	224	22	0	13	19			26	2	63	33	153
21:00	160	18	4	25	15			21	4	33	41	154
22:00	129	18	6	21	6			20	4	42	25	124
23:00	111	11	4	17	5			10	2	30	17	112
Sum of	2876	382	53	263	188			463	36	700	627	2223
allowed			37	62					40	49		·
Sum of	17	27	7	16	3	768	35	23	3	300	218	12
vehicles	1/	41	1	10	5	/00	55	40	5	500	210	14
violating the	838 (18.21%)								591 (1	2.7%)		
TOTAL			16	00					16	<u>/0</u>		
TOTAL			- 40	00					- 40	40		

Table 51: Car Volume Count at Church Street on Saturday

	INFLOW								OUTF	LOW		
	L 1	\mathbf{L}	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	139	16	0	7	6	S	\sim	13	4	22	39	124
1:00	94	4	0	11	12	Ĩ	L	11	2	12	23	93
2:00	45	8	0	10	6	ME	ME	9	1	5	6	63
3:00	13	3	0	3	0	VEI	VEI	2	0	2	3	17
4:00	16	1	0	2	0	40'	40'	2	0	2	0	15
5:00	5	4	0	1	1	D	D	1	0	1	2	9
6:00	21	0	0	1	1	TE	TE	8	1	2	0	8
7:00	20	5	0	2	1	RIC	RIC	9	0	2	2	16
8:00	55	11	0	3	4	EST	TSE	34	0	7	3	26
9:00	81	13	1	6	1	RI	RI	18	0	15	6	34

10.00	07	10	1	0	C]		20	2	22	0	60
10:00	97	19	1	0	Z			28	2	LL	9	02
11:00	132	36	0	7	8			31	1	24	26	75
12:00	232	48	0	11	14			67	2	42	41	99
13:00	227	49	1	21	9			39	1	57	60	149
14:00	225	63	1	32	8			45	3	41	85	159
15:00	253	51	0	66	10			48	2	58	84	221
16:00	216	36	0	37	8			38	2	43	56	172
17:00	209	33	0	79	13			29	3	52	55	224
18:00	178	39	0	62	19			49	0	40	65	160
19:00	196	53	0	35	11			32	0	19	57	169
20:00	244	33	0	42	11			32	1	58	50	191
21:00	203	43	0	18	7			35	2	54	49	169
22:00	201	27	0	15	14			17	3	37	32	143
23:00	171	19	0	11	6			10	7	34	11	148
Sum of	3273	614	4	490	172			607	37	651	764	2546
allowed				-	1	I		1	46	05	1	1
vehicles			45.	53					TU	0.		
Sum of	4	26	9	9	5	756	27	29	4	357	259	10
vehicles			I	1	1	I		1	1		1	1
violating the			809 (9	0.6%)					686 (1	4.8%)		
restriction												
TOTAL			53	62					52	91		

Table 52: Car Volume Count at Church Street on Sunday

			INFL	OW					OUTH	FLOW		
	L 1	L	2	L	3	L4	L1	L	2	L	.3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	152	18	8	22	9			11	4	33	36	149
1:00	137	24	7	19	8			7	2	22	37	145
2:00	67	13	4	6	5			8	3	17	14	85
3:00	23	11	2	5	5			4	1	3	9	38
4:00	6	2	0	1	2			4	0	4	4	7
5:00	7	1	0	0	0			3	0	0	1	8
6:00	15	0	1	0	1	RES	REST	5	1	1	2	11
7:00	17	3	0	2	1	TRIC	RICT	8	0	5	2	8
8:00	37	2	2	2	0	TED MOV	ED MOV	21	0	4	2	10
9:00	55	11	2	6	2	EME	EME	23	2	6	14	24
10:00	70	10	0	3	4	NTS	NTS	19	1	16	6	40
11:00	110	15	2	7	10			25	0	20	14	55
12:00	188	19	2	9	13			30	2	33	34	100
13:00	241	31	5	12	12			34	3	76	43	100
14:00	222	20	2	14	12			35	0	60	44	126
15:00	188	22	1	27	9			32	1	48	54	166
16:00	180	21	5	14	8]		30	4	47	38	141

17:00	187	23	10	25	10			34	1	41	35	131
18:00	166	29	1	18	16			16	1	41	26	144
19:00	206	23	2	13	11			24	2	39	31	128
20:00	196	22	2	16	10			28	2	30	32	141
21:00	174	19	3	8	4			14	1	32	32	148
22:00	97	13	4	13	15			10	5	32	30	130
23:00	103	13	8	14	9			12	3	28	18	114
Sum of	2844	365	73	256	176			437	39	638	558	2149
allowed vehicles			37	14	I			I	38	21	I	I
				· ·						#1		
Sum of	14	18	9	12	9	632	27	22	3	307	242	16
Sum of vehicles violating the restriction	14	18	9 694 (1:	12 5.7%)	9	632	27	22	3 617 (1	307 3.9%)	242	16

Observations:

Volume Count:

Compared to two-wheelers, cars were observed less in number. On weekdays and Saturdays, the volume count was 4124, 7605, 5361, 5497, 6471 and 5362, 5989 (on two successive Saturdays).On Sundays, the numbers were drastically reduced. The volume count observed on two successive Sundays were 4600 and 4408 respectively. The summary of car volume at Church Street is listed in the following table.

	Location 1	Loc	cation 2	Loca	ation 3	Location 4	
DAYS	From Brigade	From MG	From Rest House Cres Road	From MG	From Museum Road	From St. Marks	TOTAL
Day 1 Monday (22-07-19)	2714	758	77	364	108	103	4124
Day 2 Tuesday (23-07-19)	4171	799	60	574	128	1873	7605
Day 3 Wednesday (24-07-19)	2785	792	61	683	106	934	5361
Day 4 Thursday (25-07-19)	3030	767	72	548	153	927	5497
Day 5 Friday (26-07-19)	3293	1250	98	680	191	959	6471
Day 6 Saturday (20-07-19)	3443	828	97	697	225	699	5989
Day 7 Sunday (21-07-19)	2893	409	60	279	191	768	4600
Day 6 Saturday (27-07-19)	3277	640	13	499	177	756	5362
Day 7 Sunday (28-07-19)	2858	383	82	268	185	632	4408

Table 53: Car Inflow Volume Count at Church Street

Peak Volume Count and Entry from Cross Road:

On Tuesday and Friday, the volume of cars was observed to be over 7605. Unlike two-wheelers, car inflow from the crossroads leading to Museum Road and Rest House roads were substantially less but the number of cars merging from MG road. At location 4, one can see many cars inflowing, in violation of the one way movement. These vehicles were mainly parked at the parking lots provided near to the exit of Church Street. Following figure depicts the peak inflow at each crossroad and total volume count of cars. The data corresponds to Tuesday.



Figure 53: Car Volume Count at Church Street on Tuesday

To identify the Peak Hours, the hourly inflow of cars to Church Street at possible entries in all four locations have been summed up. The table below lists the hourly car inflows. The peak hours were identified between 3.00 - 4.00 PM in the evening.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	127	94	105	120	148	127	251	206	260
01:00	81	64	44	60	104	171	268	161	239
02:00	35	33	25	25	39	94	120	90	118
03:00	15	5	13	12	17	25	42	30	58
04:00	18	9	13	13	11	13	28	20	16
05:00	8	12	8	10	10	15	11	17	16
06:00	24	50	34	41	35	15	10	30	21
07:00	124	305	248	206	206	49	25	39	27
08:00	162	438	260	271	289	89	52	98	63
09:00	211	587	253	270	290	160	94	137	98
10:00	212	596	291	313	287	226	131	161	110
11:00	251	615	294	339	359	247	171	228	167

Table 54: Hourly Variation of Car at Church Street

12:00	189	541	299	331	368	333	277	344	274
13:00	273	541	425	410	463	449	361	365	357
14:00	311	605	425	411	477	481	402	381	309
15:00	387	618	397	424	417	507	360	419	279
16:00	259	443	344	315	417	394	313	338	263
17:00	269	433	407	301	425	367	132	369	287
18:00	331	426	345	324	388	356	290	326	266
19:00	217	440	367	342	412	383	317	329	293
20:00	189	255	254	298	421	428	317	381	286
21:00	173	202	206	280	335	376	256	335	247
22:00	138	148	157	189	278	366	203	294	178
23:00	120	145	147	192	275	318	169	264	176
Sum	4124	7605	5361	5497	6471	5989	4600	5362	4408

C. AUTO RICKSHAW

The following section lists the volume count of Auto-Rickshaws. A good number of Autos were observed using Church Street. Several autos were found violating the one-way regulation. Following table lists the volume count for 5 weekdays and 2 weekends.

			INFL	OW					OUTF	LOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	12	4	21	4	11			1	4	15	7	18
1:00	10	3	23	10	13			2	4	14	7	29
2:00	1	0	3	2	1			0	0	2	0	5
3:00	1	0	0	0	0			0	0	0	2	2
4:00	0	0	0	0	4			0	0	0	0	4
5:00	0	0	0	1	1			0	0	1	0	1
6:00	0	1	2	0	2	IS	IS	0	0	1	0	3
7:00	0	7	1	3	0	EN	EN	0	0	2	1	7
8:00	0	17	5	8	9	EM	EM	1	0	8	12	17
9:00	0	26	10	8	8	IVC	IVC	2	0	16	6	32
10:00	0	26	8	2	6	W	M	1	0	15	9	31
11:00	0	29	13	6	2	ED	ED	1	0	17	11	19
12:00	0	22	21	12	11	ICI	ICI	1	0	12	14	30
13:00	1	28	16	5	5	TR	TR	0	1	25	13	24
14:00	1	49	21	8	10	RES	RES	1	0	17	23	39
15:00	1	59	15	6	6	ſ		0	0	21	23	46
16:00	0	14	11	18	10			0	0	11	13	31
17:00	0	48	14	15	4			0	0	20	22	34
18:00	0	85	20	44	11			1	1	26	43	76
19:00	0	22	21	17	4			1	1	15	8	29
20:00	1	19	24	9	11			0	1	17	12	22

Table 55: Auto-Rickshaw Volume Count at Church Street on Monday

21:00	5	14	31	3	7			0	0	21	12	26
22:00	23	9	24	11	12			2	0	16	11	38
23:00	11	3	15	4	6			2	0	6	6	7
Sum of	67	485	319	196	154			16	12	298	255	570
allowed vehicles		I	12	21	I	I			11	51	I	I
Sum of	12	22	44	27	36	521	55	46	8	293	132	112
vehicles violating the restriction		6	662 (35	5.15%)	'		646 (35.94%)					
TOTAL			18	83					17	97		

Table 56: Auto-Rickshaw Volume Count at Church Street on Tuesday

		INFLOW OUTFLOW										
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	7	3	7	5	6			1	3	8	2	12
1:00	14	2	18	5	8			0	2	6	6	22
2:00	1	3	2	4	5			0	0	2	3	9
3:00	1	0	0	0	2			0	0	0	1	3
4:00	0	0	0	1	0			0	0	0	1	1
5:00	0	0	0	0	0			0	0	0	0	0
6:00	0	0	3	0	2			0	0	0	0	2
7:00	0	3	2	3	3	S	S	0	0	1	1	6
8:00	0	12	3	12	2	Ĺ	Ê	0	0	5	7	24
9:00	0	28	13	13	1	ME	ME	2	1	14	6	35
10:00	0	29	4	28	8	VE	VE	2	0	15	6	47
11:00	1	19	10	26	10	МО	МО	1	0	13	16	47
12:00	0	32	17	28	6	I Qi	I Qi	0	0	16	22	46
13:00	0	25	12	9	11	CTE	CTE	2	0	9	16	25
14:00	0	29	12	4	10	RIG	RIG	0	0	9	21	28
15:00	1	74	22	14	10	EST	EST	1	0	13	43	50
16:00	0	24	22	25	10	R	RI	0	1	28	12	42
17:00	0	21	23	25	8			0	0	17	13	34
18:00	0	17	21	51	7			1	0	21	7	63
19:00	1	20	12	35	11			1	0	14	9	62
20:00	0	13	28	12	9			0	0	19	7	25
21:00	0	13	35	13	11			0	0	20	16	27
22:00	8	10	29	5	7			3	3	17	10	19
23:00	9	6	15	5	6			1	2	11	10	16
Sum of	43	383	310	323	153			15	12	258	235	645
vehicles			12	12			1165					

Sum of	9	22	24	27	40	486	35	45	20	240	150	89
vehicles violating the		6	608 (33	40%)					579 (33	R 19%)		
restriction			00 (55						577 (5.	,,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
TOTAL			182	20					17	44		

Table 57: Auto-Rickshaw Volume Count at Church Street on Wednesday

			INFL	OW			OUTFLOW					
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	7	1	11	2	3			0	0	4	10	8
1:00	3	0	1	4	0			0	1	0	2	9
2:00	0	0	1	1	0			0	0	0	0	1
3:00	1	0	0	0	1			0	0	1	0	1
4:00	0	0	1	1	0			0	0	0	1	2
5:00	0	0	0	0	0			0	0	0	0	1
6:00	0	0	1	0	1			0	1	0	0	2
7:00	1	4	2	1	1	\sim	\sim	1	0	1	1	6
8:00	0	15	4	9	8	Ľ	Ľ	0	0	2	6	21
9:00	0	15	12	5	9	ME	ME	2	0	16	6	22
10:00	1	32	5	15	15	VEI	VEI	3	0	12	20	35
11:00	0	17	14	14	12	MO	MO	0	0	11	11	38
12:00	0	23	14	14	11	G	Ĩ	0	2	17	12	36
13:00	1	27	20	9	15	ET	CTE	0	0	20	15	37
14:00	0	51	16	8	9	RIC	RIC	0	0	12	24	49
15:00	1	74	15	21	8	EST	ESE	1	0	16	46	59
16:00	0	29	11	35	12	RI	RI	1	0	17	16	54
17:00	0	38	19	45	6			0	0	13	25	66
18:00	0	38	17	51	6			0	0	21	23	75
19:00	0	20	27	46	4			0	0	22	18	59
20:00	2	19	33	13	11			0	0	34	7	28
21:00	1	7	34	6	13			4	0	17	8	30
22:00	12	2	38	6	6			4	0	20	9	17
23:00	11	0	17	4	8			2	0	12	11	16
Sum of	41	412	313	310	159			18	4	268	271	672
allowed vehicles		'	12.	35					12	33		
Sum of	8	34	22	16	30	470	32	36	11	258	120	86
vehicles												
violating the		5	580 (31	.95%)					543 (30).57%)		
TOTAL			18	15 _					17	76		

	INFLOW OUTFLOW											
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	10	4	25	4	1			10	4	7	7	14
1:00	5	4	11	6	4			0	1	9	4	13
2:00	1	0	1	2	1			0	0	3	4	7
3:00	0	1	0	1	2			0	0	0] 1	3
4:00	0	0	1	0	1			0	0	0	0	1
5:00	1	0	0	0	0			0	0	0	0	1
6:00	1	4	2	0	4	_	_	0	0	0	0	0
7:00	0	4	1	2	5	ION	NO	0	0	2	1	5
8:00	0	16	6	7	9	CTJ	CTJ	0	0	4	10	21
9:00	0	24	8	7	6	IRI	IRI	1	0	18	9	22
10:00	0	21	7	13	19	ES	ES	2	0	24	12	24
11:00	0	32	10	58	13	ЛR	ΟR	1	0	17	31	64
12:00	0	32	10	45	6	N T(N TC	1	0	10	35	38
13:00	0	37	26	17	6	IO	IO	0	0	16	26	34
14:00	0	47	18	11	6	AT	AT	0	0	24	27	38
15:00	0	41	17	19	13	JIC	llic	1	0	17	32	53
16:00	0	20	13	27	9	N.	Š	5	0	17	5	47
17:00	1	13	11	20	5			0	0	17	4	48
18:00	0	21	27	25	8			2	0	19	32	63
19:00	0	18	21	46	11			0	0	25	18	66
20:00	0	15	19	51	11			0	0	21	15	112
21:00	1	4	39	20	19			4	0	23	10	53
22:00	4	8	32	9	12			1	4	24	3	23
23:00	13	5	18	7	9			3	5	8	5	22
Sum of allowed	37	371	323	397	180			31	14	305	291	772
Sum of			13	0					14	13		
vehicles	15	36	28	28	26	480	45	39	11	277	131	86
violating the restriction			613 (3	1.9%)					589 (29	9.42%)		
TOTAL			19	21			2002					

 Table 58: Auto-Rickshaw Volume Count at Church Street on Thursday

Table 59: Auto-Rickshaw Volume Count at Church Street on Friday

TIME		INFL	JOW		OUTFLOW					
TIME	L 1	L 2	L 3	L4	L1	L 2	L 3	L 4		

	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	4	4	13	1	8			0	2	8	4	16
1:00	6	5	15	1	6			0	2	3	9	13
2:00	2	1	1	4	4			0	0	2	2	10
3:00	1	0	0	1	0			0	0	0	1	4
4:00	0	0	0	0	0			0	0	0	0	0
5:00	0	0	1	1	3			0	0	0	0	5
6:00	0	0	0	2	1			0	0	0	0	4
7:00	0	8	4	0	4	S	S	0	0	6	5	6
8:00	0	14	9	5	9	LN	L	4	0	10	12	15
9:00	0	29	8	7	6	ME	ME	2	0	20	9	26
10:00	0	27	12	13	19	VE	VE	1	0	18	12	39
11:00	1	59	12	58	13	ОМ	МО	2	0	19	31	100
12:00	1	48	10	45	6	D	I Q	1	0	9	35	74
13:00	2	43	17	19	12	CTE	CTE	0	0	16	27	60
14:00	0	38	19	8	18	RIC	RIC	0	0	12	21	47
15:00	0	45	9	12	8	ESE	ESI	0	0	11	22	45
16:00	1	54	14	45	9	R	RI	0	1	15	27	92
17:00	0	79	12	29	6			1	0	15	46	58
18:00	1	86	23	38	5			0	0	24	44	79
19:00	1	60	28	55	5			0	0	23	38	83
20:00	1	48	20	34	3			0	0	17	29	79
21:00	1	18	14	25	16			3	0	17	6	47
22:00	14	11	28	10	16			9	2	20	8	33
23:00	11	9	21	11	12			0	2	17	6	31
Sum of	47	686	290	424	189			23	9	282	394	966
allowed			16.	36					16	74		
Sum of	12	46	22	22	31	513	30	40	11	284	141	67
vehicles violating the	12	6	546 (28	3.30%)	31	515	50		582 (25	5.79%)	171	07
TOTAL			22	82			2256					

Table 60: Auto-Rickshaw Inflow Volume Count at Church Street on Saturday

TIME	INFLOW						OUTFLOW					
	L 1	L 2		L 3		L4	L1	L 2		L 3		L 4
	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	5	3	14	6	8	STRICTED	STRICTED VEMENTS	4	5	11	12	25
1:00	12	9	18	10	12			3	4	6	12	28
2:00	7	3	7	0	2			0	4	4	10	5
3:00	2	0	3	1	3			0	0	0	1	4
4:00	0	1	0	3	2	RE	RE MC	0	0	2	0	6
5:00	0	0	0	0	0			0	0	0	1	5
---------------	----------------	-----	-----	-----	-----	-----	--------------	----	----	-----	-----	-----
6:00	1	0	1	0	2			0	0	0	0	4
7:00	0	1	1	2	6			1	0	3	1	4
8:00	0	2	3	3	6			0	2	4	1	8
9:00	0	15	10	5	7			1	1	13	3	24
10:00	0	22	16	4	7			3	1	22	10	31
11:00	0	12	10	8	7			1	0	10	6	24
12:00	1	20	11	7	5			0	0	16	16	24
13:00	0	41	16	51	11			1	0	17	19	74
14:00	0	39	14	34	10			0	0	15	21	57
15:00	0	64	17	56	11			0	0	15	30	101
16:00	1	49	37	46	12			0	0	30	25	88
17:00	1	64	33	11	8			1	0	24	43	47
18:00	0	67	39	31	13			0	0	37	36	71
19:00	1	27	28	37	14			0	0	24	17	53
20:00	1	25	50	37	18			0	1	32	23	53
21:00	5	19	39	14	13			2	1	25	18	40
22:00	8	15	60	10	17			10	1	28	25	46
23:00	20	9	32	4	5			2	3	15	14	29
Sum of	65	507	459	380	199			29	23	353	344	851
allowed		I	16	10	1	1			16	00	I	
Sum of	11	50	22	10	27	169	12	22	10	100	105	77
vehicles	11	50	34	19	57	400	43	34	10	190	195	//
violating the	e 617 (27.70%)						555 (25.75%)					
restriction												
TOTAL			22	27					21	55		

Table 61: Auto-Rickshaw Inflow Volume Count at Church Street on Sunday

			INFL	OW					OUTF	LOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	15	10	38	10	17			4	7	9	16	35
1:00	18	10	24	21	16	70	70	3	3	9	9	43
2:00	17	4	17	9	17	Ľ	Ĺ	0	2	11	17	33
3:00	2	0	1	2	11	ME	ME	0	0	1	2	13
4:00	0	0	0	0	0	VEI	VEI	0	0	0	2	0
5:00	1	0	1	1	0	40	40	0	0	0	1	1
6:00	0	0	2	0	2	D	Q	0	0	0	1	0
7:00	1	1	1	1	3	EL.	EL.	1	0	0	2	3
8:00	0	2	4	0	2	RIC	RIC	0	0	3	3	8
9:00	0	11	9	2	6	EST	TSE	3	0	5	10	11
10:00	0	7	11	2	12	RI	RI	0	0	6	2	19
11:00	0	6	12	4	7			2	0	11	3	16

12:00	0	10	16	7	9			0	0	12	7	24
13:00	0	14	24	8	7			0	0	20	6	24
14:00	2	17	29	8	16			1	0	21	6	39
15:00	1	18	40	10	15			2	0	27	10	46
16:00	0	21	42	14	16			0	0	41	7	39
17:00	0	15	28	6	7			2	0	19	11	27
18:00	0	17	26	14	24			1	0	23	9	42
19:00	0	19	20	12	15			0	0	14	8	32
20:00	0	14	27	6	18			2	0	21	6	27
21:00	3	14	21	11	15			2	1	16	12	29
22:00	10	11	32	6	21			4	4	19	11	31
23:00	16	10	24	6	10			6	3	12	11	44
Sum of	86	231	449	160	266			33	20	300	172	586
allowed vehicles			11	92					11	11		
Sum of	7	34	40	25	32	450	49	22	12	180	173	153
vehicles violating the restriction	588 (33.03%)								5899 (3	4.64%)		
TOTAL		1780						1700				

Table 62: Auto-Rickshaw Volume Count at Church Street on Saturday

			INFL	OW					OUTF	LOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	8	5	21	8	9			5	3	10	11	22
1:00	27	9	26	16	20			1	6	20	11	42
2:00	3	4	16	5	3			0	2	12	4	15
3:00	0	0	2	4	1			0	0	2	0	8
4:00	2	0	0	1	2		70	0	0	1	0	2
5:00	1	0	0	1	2	L	EL.	0	1	1	0	4
6:00	0	0	1	2	2	MEJ	ME	0	0	0	0	3
7:00	1	2	2	1	1	VEI	VEI	0	0	1	2	4
8:00	0	4	4	1	8	40	40 V	0	0	3	3	12
9:00	0	6	8	2	7	DN	Q	2	0	9	2	19
10:00	0	13	14	2	12	TE	(TE	2	1	17	7	17
11:00	1	13	15	11	3	RIC	RIC	0	0	14	8	29
12:00	2	16	18	5	5	EST	LSE	1	0	14	15	17
13:00	0	25	24	9	10	RI	RI	3	0	20	16	37
14:00	2	43	15	34	6			1	0	19	23	58
15:00	0	44	20	37	11]		1	0	23	33	68
16:00	1	20	17	22	10			1	0	19	16	37
17:00	1	21	24	32	14]		0	0	19	17	44

18:00	1	17	42	20	13			0	0	35	15	44
19:00	0	25	35	13	19			0	0	31	20	36
20:00	0	19	55	18	18			2	0	35	24	46
21:00	1	19	53	10	11			8	2	33	28	30
22:00	8	12	57	15	17			3	0	23	10	52
23:00	9	14	54	9	13			14	7	7	1	46
Sum of	68	331	523	278	217			44	22	368	266	692
allowed vehicles		I	14	17	1	I		I	13	92	I	I
Sum of	134	53	33	22	39	503	28	30	15	235	207	59
vehicles violating the restriction		7	784 (35	5.62%)		·			574 (29	9.19%)		
TOTAL			22	01					19	66		

Table 63: Auto-Rickshaw Volume Count at Church Street on Sunday

			INFL	OW					OUTF	LOW		
	L 1	L	2	L	3	L4	L1	L	2	L	3	L 4
TIME	Entry at Church Street	From Rest House Cres	From MG	From SBI	From MG	From St Marks	To Brigade	To Rest House Cres	To MG	To SBI	To MG	To St. Marks
0:00	4	15	38	11	16			36	2	13	16	42
1:00	5	6	29	13	33			12	2	5	14	39
2:00	7	1	17	8	6			1	2	8	6	21
3:00	1	0	1	0	1			0	1	0	1	2
4:00	1	0	0	0	3			0	0	1	2	3
5:00	1	0	2	1	1			0	0	0	0	3
6:00	2	1	0	0	0			3	0	0	2	1
7:00	1	0	4	0	2	~	~	5	0	3	2	3
8:00	0	5	2	0	7	L	Ľ	14	0	3	2	9
9:00	0	11	7	6	5	ME	ME	23	0	5	8	17
10:00	0	11	7	3	14	VEI	VEI	27	0	13	7	16
11:00	0	9	14	6	12	40	40	28	0	7	3	24
12:00	0	4	6	5	6	D	D	43	0	6	5	15
13:00	0	16	18	11	6	CTE	CTE	45	0	21	9	18
14:00	0	18	17	4	6	RIC	RIC	39	0	16	7	15
15:00	0	9	14	14	14	LSE	ESE	31	0	20	7	28
16:00	0	9	15	6	4	RI	RI	38	1	13	5	18
17:00	0	12	22	15	8			42	0	15	12	31
18:00	1	11	29	7	8			42	0	20	5	18
19:00	0	12	34	16	19			49	0	13	12	40
20:00	0	16	31	6	3			39	1	26	8	23
21:00	3	5	24	8	11			28	1	15	6	25
22:00	5	11	27	6	10			49	2	20	9	28
23:00	5	7	17	9	6			26	0	11	13	28

Sum of	36	189	375	155	201			620	12	254	161	467
allowed vehicles			95	6					15	14		
Sum of vehicles	6	25	31	31	40	392	16	16	9	158	170	120
violating the restriction		5	525 (35	5.44%)					489 (24	.41%)		
TOTAL			148	81					20	03		

Observations:

Volume Count:

On weekdays and Saturdays, the volume count was 1883, 1820, 1815, 3767, 2282 and 2227, 2201 (two successive Saturdays). The volume count observed on two successive Sundays were 1780 and 1481 respectively. The summary is listed in the following table.

	Location 1	Lo	cation 2	Loc	ation 3	Location 4	
DAYS	From Brigade	From MG	From Rest House Cres Road	From MG	From Museum Road	From St. Marks	TOTAL
Day 1 Monday (22-07-19)	79	507	363	223	190	521	1883
Day 2 Tuesday (23-07-19)	52	405	334	350	193	486	1820
Day 3 Wednesday (24-07-19)	49	446	335	326	189	470	1815
Day 4 Thursday (25-07-19)	52	406	351	425	206	480	1921
Day 5 Friday (26-07-19)	59	732	312	446	220	513	2282
Day 6 Saturday (20-07-19)	76	557	491	399	236	468	2227
Day 7 Sunday (21-07-19)	93	265	489	185	298	450	1780
Day 6 Saturday (27-07-19)	202	384	556	300	256	503	2201
Day 7 Sunday (28-07-19)	42	214	406	186	241	392	1481

Table 64: Auto Inflow Volume Count at Church Street

Peak Volume Count and Entry from Cross Road:

On Friday, the volume of autos observed was highest at 2282. Auto inflow from crossroads from Museum Road and the Rest House Cres Road were substantially high. At location 4, one can see many Auto join in as an inflow violating the one way rule. Following figure depicts the peak inflow at each crossroad and total volume count of Auto. The data corresponds to Friday.



Figure 54: Auto Volume Count – Church Street

To identify the Peak Hours, the hourly inflow of Autos to Church Street at all possible entries across all four locations were summed up. The table below lists the hourly Auto inflows. Autos were observed to have higher demand during off-peak hours, i.e., from10.00 AM onwards.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/19	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	85	44	34	74	50	74	137	82	114
01:00	86	66	14	58	51	112	136	147	122
02:00	11	19	3	12	16	40	91	64	59
03:00	4	8	5	7	6	15	23	18	7
04:00	6	3	4	7	2	13	2	13	10
05:00	4	3	1	4	6	8	4	6	8
06:00	16	12	12	21	11	8	5	11	13
07:00	51	56	49	53	56	26	14	23	17
08:00	92	81	93	89	98	46	25	68	26
09:00	108	104	84	100	109	73	41	57	50
10:00	95	115	111	103	116	83	57	91	62
11:00	96	104	104	146	182	62	48	78	56
12:00	104	110	103	122	150	79	66	84	44
13:00	99	98	113	125	132	149	87	106	81
14:00	129	95	132	119	121	116	114	143	64
15:00	120	150	149	120	101	168	122	144	77
16:00	77	111	106	91	144	166	135	99	56
17:00	95	99	119	71	152	147	84	115	80
18:00	170	115	117	102	163	161	117	123	84
19:00	78	99	112	128	158	130	89	122	119
20:00	87	92	104	109	134	157	93	137	90

Table 65: Hourly Variation of Car at Church Street

21:00	93	94	88	110	108	138	87	148	74
22:00	116	86	92	98	117	158	113	166	99
23:00	61	56	66	97	99	98	90	156	69
Sum	1883	1820	1815	1921	2282	2227	1780	2201	1481

D. MOTOR VEHICLE USAGE SUMMARY

Motor vehicles were observed in significant volumes at Church Street. Following table lists the day wise summary of the number vehicles against the respective type of vehicle.

DAYS		VE	HICLE	S				
	Two- Wheeler [TW]	Auto	Car	Minibus [MB]	Bus [B]	Light Commerci al Vehicle [LCV]	Two/Three Axle Truck [TAT]	Total number of vehicles
Day 1 Monday (22-07-19)	13611	2227	1883	95	2	88	77	17983
Day 2 Tuesday (23-07-19)	13769	1845	1820	22	2	149	71	17678
Day 3 Wednesday (24-07-19)	14315	1820	1815	19	2	155	45	18171
Day 4 Thursday (25-07-19)	13735	1856	1966	23	2	144	46	17772
Day 5 Friday (26-07-19)	15762	2323	2282	18	1	179	81	20646
Day 6 Saturday (20-07-19)	13470	2266	2227	3	0	137	94	18197
Day 7 Sunday (21-07-19)	7410	1798	1780	5	0	101	39	11133
Day 8 Saturday (27-07-19)	11316	2110	2201	4	0	156	76	15863
Day 9 Sunday (28-07-19)	6893	1499	1481	4	0	87	33	9997

 Table 66: Summary of Motor Vehicle Usage at Church Street

On weekdays, except Friday the vehicle volume count was similar at 18000±500. However, a significantly higher volume of vehicle usage was observed on Friday. On weekends, the volume of vehicles were less. The highest volume of motorized vehicles was experienced on Friday with 20646 vehicles while the lowest volume was experienced on Sunday with 9997 vehicles.

Two wheelers were dominating street use from amongst the various categories of motorized vehicles. Usage of Car and autos were found almost equal in numbers. Although not large in number, goods vehicles were observed regularly to service the commercial activity the street supports. The following picture represents the percentage wise composition of various category of vehicles, on a Friday when maximum volume was experienced. It was observed that 76% of vehicles were two wheelers.



Figure 55: Composition of Vehicles, Friday

The vehicle volume was converted to PCU by adopting the equivalent PCU values by referring to Indo-HCM guidelines.

C No.	Vehicle Trme	Undivided	l Roads	Divided	Roads
5.NO.	venicie Type	Range	Median	Range	Median
	Motori	ized Traffic			
1	Two Wheeler (TW)	0.10 - 0.31	0.20	0.10 - 0.45	0.22
2	Auto rickshaw (Auto)	0.33 -2.65	0.73	0.38 - 2.11	0.90
3	Car (Small and Big Car)	1.00	1.00	1.00	1.00
4	Bus <i>(B)</i>	1.79 - 6.5	3.77	1.99 - 6.0	4.60
5	Mini Bus <i>(MB)</i>	1.36 - 3.11	1.80	1.62 - 4.10	2.07
6	Light Commercial Vehicle (LCV)	2.10 - 3.49	2.30	2.10 - 4.50	2.38
7	Two / Three Axle Truck (TAT)	2.70 - 4.81	3.70	2.70 - 7.50	3.90
8	Multi Axle Truck (MAT)	-	-	3.30 - 7.90	5.90
9	Tractor Trailer Combination	-	4.50	2.51 - 5.89	5.40
	Non Mote	orized Traffic			
10	Bicycle	0.34 - 0.50	0.39	0.30 - 0.80	0.42
11	Cycle Rickshaw	-	1.80	0.88 - 3.16	2.04

Table 5.2: Suggested PCU Values for Undivided and Divided Roads

'-' implies insufficient sample size

Figure 56: PCU Values for Urban Roads - Indo-HCM Guidelines

The vehicular flow (veh/hr) is converted to PCU/hr and the following table lists the data for the nine days.

		Veł	nicle/H	our							PCU	/Hour			
T :	TW	A 4 o	Car	М	р	LOV	TAT	TW	Auto	Car	MB	B	LCV	TAT	Total
Time	TimeTWAutoCarMBBLCVTAT						IAI	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr

Table 67: Total Vehicle Volume Count in PCU, Monday

00.00	170	01	05	10	0	2	1	24	66.42	05	21.6	0	()	27	217 (2
00:00	170	91	85	12	0	3	1	54	00.43	85	21.0	0	0.9	5.7	217.03
01:00	105	93	86	3	0	1	0	21	67.89	86	5.4	0	2.3	0	182.59
02:00	53	13	11	3	0	1	1	10.6	9.49	11	5.4	0	2.3	3.7	42.49
03:00	8	6	4	0	0	0	3	1.6	4.38	4	0	0	0	11.1	21.08
04:00	8	8	6	0	0	1	1	1.6	5.84	6	0	0	2.3	3.7	19.44
05:00	26	6	4	0	0	4	9	5.2	4.38	4	0	0	9.2	33.3	56.08
06:00	80	20	16	2	0	8	6	16	14.6	16	3.6	0	18.4	22.2	90.8
07:00	228	57	51	14	2	5	7	45.6	41.61	51	25.2	7.54	11.5	25.9	208.35
08:00	672	103	92	4	0	8	6	134.4	75.19	92	7.2	0	18.4	22.2	349.39
09:00	955	125	108	2	0	4	5	191	91.25	108	3.6	0	9.2	18.5	421.55
10:00	962	126	95	2	0	2	4	192.4	91.98	95	3.6	0	4.6	14.8	402.38
11:00	893	141	96	5	0	4	8	178.6	102.93	96	9	0	9.2	29.6	425.33
12:00	943	180	104	5	0	6	5	188.6	131.4	104	9	0	13.8	18.5	465.3
13:00	1048	146	99	3	0	6	1	209.6	106.58	99	5.4	0	13.8	3.7	438.08
14:00	1067	150	129	4	0	6	4	213.4	109.5	129	7.2	0	13.8	14.8	487.7
15:00	914	133	120	5	0	7	6	182.8	97.09	120	9	0	16.1	22.2	447.19
16:00	870	121	77	7	0	6	6	174	88.33	77	12.6	0	13.8	22.2	387.93
17:00	950	104	95	7	0	2	1	190	75.92	95	12.6	0	4.6	3.7	381.82
18:00	1513	124	170	4	0	3	1	302.6	90.52	170	7.2	0	6.9	3.7	580.92
19:00	1065	108	78	0	0	4	0	213	78.84	78	0	0	9.2	0	379.04
20:00	564	97	87	0	0	3	0	112.8	70.81	87	0	0	6.9	0	277.51
21:00	304	100	93	5	0	1	1	60.8	73	93	9	0	2.3	3.7	241.8
22:00	120	112	116	4	0	0	1	24	81.76	116	7.2	0	0	3.7	232.66
23:00	93	63	61	4	0	3	0	18.6	45.99	61	7.2	0	6.9	0	139.69

Table 68: Total Vehicle Volume Count in PCU, Tuesday

		Vel	nicle/H	our							PCU	/Hour			
Time	TW	Auto	Cor	MR	P	ICV	тат	TW	Auto	Car	MB	B	LCV	TAT	Total
Thile	1 **	Auto	Cal	NID	D	LUV	IAI	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr
00:00	96	44	44	0	0	2	0	19.2	32.12	44	0	0	4.6	0	99.92
01:00	41	67	66	0	0	0	5	8.2	48.91	66	0	0	0	18.5	141.61
02:00	17	20	19	0	0	1	2	3.4	14.6	19	0	0	2.3	7.4	46.7
03:00	4	8	8	0	0	0	2	0.8	5.84	8	0	0	0	7.4	22.04
04:00	10	3	3	0	0	3	4	2	2.19	3	0	0	6.9	14.8	28.89
05:00	28	4	3	0	0	3	7	5.6	2.92	3	0	0	6.9	25.9	44.32
06:00	74	15	12	0	0	2	9	14.8	10.95	12	0	0	4.6	33.3	75.65
07:00	231	57	56	11	1	9	5	46.2	41.61	56	19.8	3.77	20.7	18.5	206.58

08:00	605	83	81	5	1	8	9	121	60.59	81	9	3.77	18.4	33.3	327.06
09:00	920	107	104	0	0	8	2	184	78.11	104	0	0	18.4	7.4	391.91
10:00	1021	116	115	1	0	10	6	204.2	84.68	115	1.8	0	23	22.2	450.88
11:00	1021	107	104	1	0	7	1	204.2	78.11	104	1.8	0	16.1	3.7	407.91
12:00	1018	113	110	0	0	15	6	203.6	82.49	110	0	0	34.5	22.2	452.79
13:00	998	98	98	0	0	12	3	199.6	71.54	98	0	0	27.6	11.1	407.84
14:00	1009	96	95	0	0	6	2	201.8	70.08	95	0	0	13.8	7.4	388.08
15:00	972	151	150	3	0	14	0	194.4	110.23	150	5.4	0	32.2	0	492.23
16:00	864	111	111	0	0	10	2	172.8	81.03	111	0	0	23	7.4	395.23
17:00	942	99	99	1	0	12	2	188.4	72.27	99	1.8	0	27.6	7.4	396.47
18:00	1317	118	115	0	0	10	2	263.4	86.14	115	0	0	23	7.4	494.94
19:00	1060	100	99	0	0	8	1	212	73	99	0	0	18.4	3.7	406.1
20:00	656	92	92	0	0	4	1	131.2	67.16	92	0	0	9.2	3.7	303.26
21:00	425	94	94	0	0	1	0	85	68.62	94	0	0	2.3	0	249.92
22:00	262	86	86	0	0	4	0	52.4	62.78	86	0	0	9.2	0	210.38
23:00	178	56	56	0	0	0	0	35.6	40.88	56	0	0	0	0	132.48

Table 69: Total Vehicle Volume Count in PCU, Wednesday

		Vel	nicle/H	our							PCU	J /Hour			
Time	тw	Auto	Car	MB	B	LCV	тат	TW	Auto	Car	MB	В	LCV	TAT	Total
Time	1	nuto	Cai	MID	D	LUV	1/11	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr
00:00	125	55	34	0	0	0	1	25	40.15	34	0	0	0	3.7	102.85
01:00	61	29	14	0	0	1	1	12.2	21.17	14	0	0	2.3	3.7	53.37
02:00	16	3	3	0	0	2	1	3.2	2.19	3	0	0	4.6	3.7	16.69
03:00	8	6	5	0	0	3	5	1.6	4.38	5	0	0	6.9	18.5	36.38
04:00	12	5	4	0	0	6	0	2.4	3.65	4	0	0	13.8	0	23.85
05:00	25	2	1	0	0	6	5	5	1.46	1	0	0	13.8	18.5	39.76
06:00	86	17	12	0	0	10	5	17.2	12.41	12	0	0	23	18.5	83.11
07:00	230	51	49	15	2	9	5	46	37.23	49	27	7.54	20.7	18.5	205.97
08:00	664	99	93	2	0	10	2	132.8	72.27	93	3.6	0	23	7.4	332.07
09:00	1011	94	84	0	0	10	3	202.2	68.62	84	0	0	23	11.1	388.92
10:00	944	104	111	2	0	6	0	188.8	75.92	111	3.6	0	13.8	0	393.12
11:00	934	119	104	0	0	8	2	186.8	86.87	104	0	0	18.4	7.4	403.47
12:00	922	109	103	0	0	9	2	184.4	79.57	103	0	0	20.7	7.4	395.07
13:00	1059	130	113	0	0	6	0	211.8	94.9	113	0	0	13.8	0	433.5
14:00	1041	130	132	0	0	5	3	208.2	94.9	132	0	0	11.5	11.1	457.7
15:00	1016	124	149	0	0	12	1	203.2	90.52	149	0	0	27.6	3.7	474.02
16:00	941	106	106	0	0	14	1	188.2	77.38	106	0	0	32.2	3.7	407.48

17:00	1020	88	119	0	0	15	2	204	64.24	119	0	0	34.5	7.4	429.14
18:00	1412	108	117	0	0	11	1	282.4	78.84	117	0	0	25.3	3.7	507.24
19:00	1188	103	112	0	0	5	0	237.6	75.19	112	0	0	11.5	0	436.29
20:00	674	81	104	0	0	4	1	134.8	59.13	104	0	0	9.2	3.7	310.83
21:00	451	83	88	0	0	1	0	90.2	60.59	88	0	0	2.3	0	241.09
22:00	270	100	92	0	0	0	2	54	73	92	0	0	0	7.4	226.4
23:00	205	74	66	0	0	2	2	41	54.02	66	0	0	4.6	7.4	173.02

Table 70: Total Vehicle Volume Count in PCU, Thursday

		Vel	nicle/H	our							PCU	/Hour			
			~		_			TW	Auto	Car	MB	В	LCV	TAT	Total
Time	TW	Auto	Car	MB	В	LCV	ТАТ	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr
00:00	131	60	74	0	0	0	2	26.2	43.8	74	0	0	0	7.4	151.4
01:00	86	48	58	0	0	1	1	17.2	35.04	58	0	0	2.3	3.7	116.24
02:00	40	11	12	0	0	2	1	8	8.03	12	0	0	4.6	3.7	36.33
03:00	13	6	7	0	0	1	4	2.6	4.38	7	0	0	2.3	14.8	31.08
04:00	13	8	7	0	0	2	3	2.6	5.84	7	0	0	4.6	11.1	31.14
05:00	25	4	4	0	0	6	3	5	2.92	4	0	0	13.8	11.1	36.82
06:00	71	21	21	0	0	6	4	14.2	15.33	21	0	0	13.8	14.8	79.13
07:00	194	56	53	11	2	11	5	38.8	40.88	53	19.8	7.54	25.3	18.5	203.82
08:00	657	91	89	7	0	8	3	131.4	66.43	89	12.6	0	18.4	11.1	328.93
09:00	950	100	100	1	0	8	1	190	73	100	1.8	0	18.4	3.7	386.9
10:00	981	105	103	1	0	5	1	196.2	76.65	103	1.8	0	11.5	3.7	392.85
11:00	987	148	146	0	0	7	4	197.4	108.04	146	0	0	16.1	14.8	482.34
12:00	1041	125	122	0	0	11	1	208.2	91.25	122	0	0	25.3	3.7	450.45
13:00	1033	125	125	1	0	7	1	206.6	91.25	125	1.8	0	16.1	3.7	444.45
14:00	1058	121	119	1	0	7	0	211.6	88.33	119	1.8	0	16.1	0	436.83
15:00	956	122	120	0	0	15	3	191.2	89.06	120	0	0	34.5	11.1	445.86
16:00	942	91	91	0	0	10	2	188.4	66.43	91	0	0	23	7.4	376.23
17:00	855	76	71	0	0	13	3	171	55.48	71	0	0	29.9	11.1	338.48
18:00	1148	103	102	0	0	10	3	229.6	75.19	102	0	0	23	11.1	440.89
19:00	869	129	128	0	0	7	0	173.8	94.17	128	0	0	16.1	0	412.07
20:00	779	109	109	1	0	4	0	155.8	79.57	109	1.8	0	9.2	0	355.37
21:00	458	96	110	0	0	1	0	91.6	70.08	110	0	0	2.3	0	273.98
22:00	257	44	98	0	0	1	0	51.4	32.12	98	0	0	2.3	0	183.82
23:00	191	57	97	0	0	1	1	38.2	41.61	97	0	0	2.3	3.7	182.81

		Vel	nicle/H	our							PCU	/Hour			
Time	тw	Auto	Car	MR	R	ICV	тат	TW	Auto	Car	MB	B	LCV	TAT	Total
1 mie	1 **	Auto	Cai	WID	D	LUV	IAI	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr
00:00	140	50	50	0	0	1	2	28	36.5	50	0	0	2.3	7.4	124.2
01:00	83	51	51	0	0	1	4	16.6	37.23	51	0	0	2.3	14.8	121.93
02:00	30	16	16	0	0	3	4	6	11.68	16	0	0	6.9	14.8	55.38
03:00	13	6	6	0	0	2	3	2.6	4.38	6	0	0	4.6	11.1	28.68
04:00	5	2	2	0	0	5	5	1	1.46	2	0	0	11.5	18.5	34.46
05:00	28	7	6	0	0	1	5	5.6	5.11	6	0	0	2.3	18.5	37.51
06:00	78	15	11	0	0	4	4	15.6	10.95	11	0	0	9.2	14.8	61.55
07:00	249	58	56	13	0	11	8	49.8	42.34	56	23.4	0	25.3	29.6	226.44
08:00	673	100	98	3	1	10	7	134.6	73	98	5.4	3.77	23	25.9	363.67
09:00	980	109	109	0	0	8	2	196	79.57	109	0	0	18.4	7.4	410.37
10:00	872	116	116	1	0	7	2	174.4	84.68	116	1.8	0	16.1	7.4	400.38
11:00	1037	183	182	1	0	11	6	207.4	133.59	182	1.8	0	25.3	22.2	572.29
12:00	1124	159	150	0	0	14	5	224.8	116.07	150	0	0	32.2	18.5	541.57
13:00	1126	133	132	0	0	11	3	225.2	97.09	132	0	0	25.3	11.1	490.69
14:00	1130	123	121	0	0	8	3	226	89.79	121	0	0	18.4	11.1	466.29
15:00	1052	103	101	0	0	7	3	210.4	75.19	101	0	0	16.1	11.1	413.79
16:00	1155	145	144	0	0	16	2	231	105.85	144	0	0	36.8	7.4	525.05
17:00	1031	155	152	0	0	12	5	206.2	113.15	152	0	0	27.6	18.5	517.45
18:00	1414	169	163	0	0	22	4	282.8	123.37	163	0	0	50.6	14.8	634.57
19:00	1298	161	158	0	0	11	3	259.6	117.53	158	0	0	25.3	11.1	571.53
20:00	1010	135	134	0	0	8	1	202	98.55	134	0	0	18.4	3.7	456.65
21:00	534	110	108	0	0	2	0	106.8	80.3	108	0	0	4.6	0	299.7
22:00	394	118	117	0	0	3	0	78.8	86.14	117	0	0	6.9	0	288.84
23:00	306	99	99	0	0	1	0	61.2	72.27	99	0	0	2.3	0	234.77

Table 71: Total Vehicle Volume Count in PCU, Friday

Table 72: Total Vehicle Volume Count in PCU, Saturday

		Vel	nicle/H	our							PCU	/Hour			
Time	TW	Auto	Car	MB	B	LCV	TAT	TW 0.2	Auto 0.73	Car 1	MB 1.8	B 3.77	LCV 2.3	TAT 3.7	Total PCU/hr
00:00	137	74	74	0	0	0	1	27.4	54.02	74	0	0	0	3.7	159.12
01:00	148	112	112	0	0	2	3	29.6	81.76	112	0	0	4.6	11.1	239.06
02:00	68	42	40	0	0	2	4	13.6	30.66	40	0	0	4.6	14.8	103.66
03:00	22	15	15	0	0	0	6	4.4	10.95	15	0	0	0	22.2	52.55
04:00	11	13	13	0	0	2	4	2.2	9.49	13	0	0	4.6	14.8	44.09

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05:00	25	8	8	1	0	1	5	5	5.84	8	1.8	0	2.3	18.5	41.44
06:00	64	12	8	0	0	6	12	12.8	8.76	8	0	0	13.8	44.4	87.76
07:00	176	27	26	0	0	6	3	35.2	19.71	26	0	0	13.8	11.1	105.81
08:00	455	50	46	0	0	9	4	91	36.5	46	0	0	20.7	14.8	209
09:00	696	75	73	0	0	7	6	139.2	54.75	73	0	0	16.1	22.2	305.25
10:00	763	86	83	0	0	7	10	152.6	62.78	83	0	0	16.1	37	351.48
11:00	795	62	62	0	0	10	6	159	45.26	62	0	0	23	22.2	311.46
12:00	933	83	79	1	0	12	6	186.6	60.59	79	1.8	0	27.6	22.2	377.79
13:00	1021	152	149	0	0	9	1	204.2	110.96	149	0	0	20.7	3.7	488.56
14:00	984	121	116	1	0	8	2	196.8	88.33	116	1.8	0	18.4	7.4	428.73
15:00	928	169	168	0	0	10	2	185.6	123.37	168	0	0	23	7.4	507.37
16:00	954	169	166	0	0	8	1	190.8	123.37	166	0	0	18.4	3.7	502.27
17:00	981	149	147	0	0	11	5	196.2	108.77	147	0	0	25.3	18.5	495.77
18:00	1156	164	161	0	0	9	5	231.2	119.72	161	0	0	20.7	18.5	551.12
19:00	1001	132	130	0	0	7	3	200.2	96.36	130	0	0	16.1	11.1	453.76
20:00	809	157	157	0	0	4	5	161.8	114.61	157	0	0	9.2	18.5	461.11
21:00	558	138	138	0	0	6	0	111.6	100.74	138	0	0	13.8	0	364.14
22:00	422	158	158	0	0	1	0	84.4	115.34	158	0	0	2.3	0	360.04
23:00	363	98	98	0	0	0	0	72.6	71.54	98	0	0	0	0	242.14

Table 73: Total Vehicle Volume Count in PCU, Sunday

		Vel	hicle/H	our							PCU	/Hour			
Time	TW	Auto	Car	MB	B	LCV	TAT	TW 0.2	Auto 0.73	Car 1	MB 1.8	B 3.77	LCV 2.3	TAT 3.7	Total PCU/hr
00:00	331	137	137	0	0	0	0	66.2	100.01	137	0	0	0	0	303.21
01:00	313	136	136	0	0	5	0	62.6	99.28	136	0	0	11.5	0	309.38
02:00	116	92	91	0	0	2	3	23.2	67.16	91	0	0	4.6	11.1	197.06
03:00	42	23	23	0	0	0	3	8.4	16.79	23	0	0	0	11.1	59.29
04:00	13	2	2	0	0	3	5	2.6	1.46	2	0	0	6.9	18.5	31.46
05:00	24	4	4	1	0	6	5	4.8	2.92	4	1.8	0	13.8	18.5	45.82
06:00	80	7	5	0	0	5	1	16	5.11	5	0	0	11.5	3.7	41.31
07:00	102	15	14	0	0	6	3	20.4	10.95	14	0	0	13.8	11.1	70.25
08:00	153	27	25	0	0	7	3	30.6	19.71	25	0	0	16.1	11.1	102.51
09:00	207	44	41	0	0	7	0	41.4	32.12	41	0	0	16.1	0	130.62
10:00	309	57	57	1	0	5	0	61.8	41.61	57	1.8	0	11.5	0	173.71
11:00	380	50	48	0	0	6	2	76	36.5	48	0	0	13.8	7.4	181.7
12:00	481	69	66	0	0	3	1	96.2	50.37	66	0	0	6.9	3.7	223.17

13:00	621	88	87	0	0	7	4	124.2	64.24	87	0	0	16.1	14.8	306.34
14:00	627	115	114	0	0	8	1	125.4	83.95	114	0	0	18.4	3.7	345.45
15:00	440	122	122	0	0	5	0	88	89.06	122	0	0	11.5	0	310.56
16:00	336	135	135	0	0	2	1	67.2	98.55	135	0	0	4.6	3.7	309.05
17:00	400	84	84	1	0	9	4	80	61.32	84	1.8	0	20.7	14.8	262.62
18:00	441	119	117	0	0	5	1	88.2	86.87	117	0	0	11.5	3.7	307.27
19:00	541	89	89	0	0	6	1	108.2	64.97	89	0	0	13.8	3.7	279.67
20:00	493	93	93	0	0	4	0	98.6	67.89	93	0	0	9.2	0	268.69
21:00	409	87	87	1	0	0	0	81.8	63.51	87	1.8	0	0	0	234.11
22:00	297	113	113	0	0	0	0	59.4	82.49	113	0	0	0	0	254.89
23:00	254	90	90	1	0	0	1	50.8	65.7	90	1.8	0	0	3.7	212

Table 74: Total Vehicle Volume Count in PCU, Saturday

	Vehicle/Hour							PCU/Hour							
Time	TW	Auto	Car	MB	В	LCV	ТАТ	TW	Auto	Car	MB	B	LCV	TAT	Total
							-	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr
00:00	216	74	82	0	0	2	3	43.2	54.02	82	0	0	4.6	11.1	194.92
01:00	186	137	147	0	0	2	0	37.2	100.01	147	0	0	4.6	0	288.81
02:00	93	49	64	1	0	4	3	18.6	35.77	64	1.8	0	9.2	11.1	140.47
03:00	30	16	18	0	0	1	7	6	11.68	18	0	0	2.3	25.9	63.88
04:00	21	10	13	0	0	3	1	4.2	7.3	13	0	0	6.9	3.7	35.1
05:00	30	5	6	0	0	3	8	6	3.65	6	0	0	6.9	29.6	52.15
06:00	71	9	11	0	0	8	4	14.2	6.57	11	0	0	18.4	14.8	64.97
07:00	162	25	23	1	0	6	9	32.4	18.25	23	1.8	0	13.8	33.3	122.55
08:00	362	69	68	0	0	14	4	72.4	50.37	68	0	0	32.2	14.8	237.77
09:00	626	54	57	0	0	6	6	125.2	39.42	57	0	0	13.8	22.2	257.62
10:00	656	85	91	1	0	10	1	131.2	62.05	91	1.8	0	23	3.7	312.75
11:00	665	77	78	0	0	12	5	133	56.21	78	0	0	27.6	18.5	313.31
12:00	748	78	84	0	0	9	1	149.6	56.94	84	0	0	20.7	3.7	314.94
13:00	852	104	106	0	0	14	1	170.4	75.92	106	0	0	32.2	3.7	388.22
14:00	844	142	143	1	0	7	2	168.8	103.66	143	1.8	0	16.1	7.4	440.76
15:00	807	141	144	0	0	10	2	161.4	102.93	144	0	0	23	7.4	438.73
16:00	672	96	99	0	0	8	5	134.4	70.08	99	0	0	18.4	18.5	340.38
17:00	754	113	115	0	0	16	4	150.8	82.49	115	0	0	36.8	14.8	399.89
18:00	838	120	123	0	0	12	2	167.6	87.6	123	0	0	27.6	7.4	413.2
19:00	720	121	122	0	0	5	3	144	88.33	122	0	0	11.5	11.1	376.93

20:00	614	136	137	0	0	1	3	122.8	99.28	137	0	0	2.3	11.1	372.48
21:00	549	146	148	0	0	0	1	109.8	106.58	148	0	0	0	3.7	368.08
22:00	445	154	166	0	0	2	1	89	112.42	166	0	0	4.6	3.7	375.72
23:00	355	149	156	0	0	1	0	71	108.77	156	0	0	2.3	0	338.07

Table 75: Total Vehicle Volume Count in PCU, Sunday

	Vehicle/Hour							PCU/Hour							
								TW	Auto	Car	MB	В	LCV	ТАТ	Total
Time	TW	Auto	Car	MB	B	LCV	TAT	0.2	0.73	1	1.8	3.77	2.3	3.7	PCU/hr
00:00	280	114	114	0	0	0	0	56	83.22	114	0	0	0	0	253.22
01:00	195	122	122	0	0	3	4	39	89.06	122	0	0	6.9	14.8	271.76
02:00	101	59	59	0	0	1	1	20.2	43.07	59	0	0	2.3	3.7	128.27
03:00	41	7	7	0	0	3	6	8.2	5.11	7	0	0	6.9	22.2	49.41
04:00	19	10	10	0	0	3	4	3.8	7.3	10	0	0	6.9	14.8	42.8
05:00	26	9	8	0	0	2	2	5.2	6.57	8	0	0	4.6	7.4	31.77
06:00	68	14	13	0	0	3	4	13.6	10.22	13	0	0	6.9	14.8	58.52
07:00	124	18	17	0	0	5	3	24.8	13.14	17	0	0	11.5	11.1	77.54
08:00	155	28	26	0	0	9	0	31	20.44	26	0	0	20.7	0	98.14
09:00	221	54	50	0	0	14	0	44.2	39.42	50	0	0	32.2	0	165.82
10:00	326	65	62	0	0	6	3	65.2	47.45	62	0	0	13.8	11.1	199.55
11:00	373	56	56	0	0	10	2	74.6	40.88	56	0	0	23	7.4	201.88
12:00	464	44	44	0	0	3	0	92.8	32.12	44	0	0	6.9	0	175.82
13:00	516	81	81	0	0	2	0	103.2	59.13	81	0	0	4.6	0	247.93
14:00	440	64	64	2	0	3	1	88	46.72	64	3.6	0	6.9	3.7	212.92
15:00	385	77	77	2	0	7	0	77	56.21	77	3.6	0	16.1	0	229.91
16:00	424	58	56	0	0	3	2	84.8	42.34	56	0	0	6.9	7.4	197.44
17:00	331	82	80	0	0	3	1	66.2	59.86	80	0	0	6.9	3.7	216.66
18:00	418	84	84	0	0	1	0	83.6	61.32	84	0	0	2.3	0	231.22
19:00	478	119	119	0	0	4	0	95.6	86.87	119	0	0	9.2	0	310.67
20:00	490	90	90	0	0	2	0	98	65.7	90	0	0	4.6	0	258.3
21:00	462	74	74	0	0	0	0	92.4	54.02	74	0	0	0	0	220.42
22:00	316	100	99	0	0	0	0	63.2	73	99	0	0	0	0	235.2
23:00	240	70	69	0	0	0	0	48	51.1	69	0	0	0	0	168.1

The summary of Motor vehicle usage is listed in the following table. The hourly vehicle variation is summarized in the figure that follows.

Day		VEH	ICLES					SUM
	TW	Auto	Car	MB	B	LCV	TAT	
Day 1 Monday (22-07-19)	2722.2	1625.71	1883	171	7.54	202.4	284.9	6896.75
Day 2 Tuesday (23-07-19)	2753.8	1346.85	1820	39.6	7.54	342.7	262.7	6573.19
Day 3 Wednesday (24-07-19)	2863	1328.6	1815	34.2	7.54	356.5	166.5	6571.34
Day 4 Thursday (25-07-19)	2747	1354.88	1966	41.4	7.54	331.2	170.2	6618.22
Day 5 Friday (26-07-19)	3152.4	1695.79	2282	32.4	3.77	411.7	299.7	7877.76
Day 6 Saturday (20-07-19)	2694	1654.18	2227	5.4	0	315.1	347.8	7243.48
Day 7 Sunday (21-07-19)	1482	1312.54	1780	9	0	232.3	144.3	4960.14
Day 8 Saturday (27-07-19)	2263.2	1540.3	2201	7.2	0	358.8	281.2	6651.7
Day 9 Sunday (28-07-19)	1378.6	1094.27	1481	7.2	0	200.1	122.1	4283.27

Table 76: Total Inflow Vehicle Volume Count in PCU at Church Street



Figure 57: Hourly Vehicle Volume in PCU/Hr

The vehicle movements were significant from a time period of 8.00 AM till 1.00 AM in the midnight

<u>The vehicular volume was more on weekdays. The highest vehicular volume reported on Friday,</u> <u>7877.76 PCU/Hr</u>

On weekends, the volume was observed substantially less on Sundays.

It was more of two wheelers compared to cars and autos.

The peak hours were identified at two different time intervals as 11.00 AM at noon time and 6.00 PM at evening

The next section describes the number of vehicles using the street as a thoroughfare. The through movements were documented at cross road 1, that connects Rest house Cres Road to MG road and at cross road 2 that connects Museum Road to MG Road and the data is summarised in the following table.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/1 9	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	10.05	3.46	8.53	9.39	8.99	11.99	20.56	17.95	20.5
01:00	3.2	2.26	4.3	6.49	6.06	6.39	7.26	5.92	8.19
02:00	2.53	0.2	1	2.06	0	0.6	7.95	0.6	3.43
03:00	0.93	0.2	0	0	0	1	2.5	2.5	1.4
04:00	0.2	1	0	3.7	2	0.2	0.6	1.13	1.2
05:00	2.9	0.6	0.4	2.13	1.4	1.4	1.4	3.5	4.03
06:00	7.42	8.96	6.49	5.79	5.72	5.99	3.19	2.93	1.73
07:00	19.94	27.46	21.68	23.11	23.55	13.94	2.53	11.18	3.46
08:00	40	36.93	35.54	46.91	39.4	19.5	8.79	26.18	8.11
09:00	51.56	30.11	37.9	59.03	37.36	26	10.39	22.44	13.26
10:00	26.12	23.66	31.28	35.58	27.7	31.08	17.11	25.81	17.99
11:00	35.01	26.88	36.44	46.04	54.79	41.22	19.96	36.36	19.75
12:00	30.78	34.52	26.22	34.72	53.09	42.77	18.92	27.77	20.99
13:00	45.04	36.41	36.22	42.15	45.09	45.93	18.06	28.23	22.99
14:00	61.11	49.59	44.22	49.92	58.47	42.3	27.11	42.51	21.05
15:00	52.02	52.49	60.57	53.7	53.6	46.16	25.25	51.63	17.33
16:00	41.45	36.95	33.12	39.85	62.59	56.05	23.78	32.05	16.38
17:00	51.29	37.32	40.25	29.91	62.41	57.86	20.79	39.58	26.31
18:00	68.63	43.66	63.09	49.39	73.64	56.48	23.39	41.64	27.64
19:00	45.98	43.65	38.58	42.14	79	43.37	27.73	38.31	25.58
20:00	28.17	26.39	34.82	34.52	74.73	43.65	19.72	35.41	24.17
21:00	24.79	17.52	23.65	21.85	32.05	36.11	18.04	29.23	15.73
22:00	16.04	15.25	9.19	0	19.71	28.15	17.72	19.19	18.69
23:00	9.12	7.32	5.8	0	16.43	18.78	15.77	14.7	14.5

Table 77: Through movement of vehicles, PCU/hr at Cross road 1 [Cres Road- MG]

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Time	22/7/19	23/7/19	24/7/19	25/7/19	26/7/1 9	20/7/19	21/7/19	27/7/19	28/7/19
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Saturday	Sunday
00:00	34.95	12.25	24.04	9.39	32.96	38.21	50.33	52.52	20.5
01:00	35.33	11.23	18.91	6.49	24.96	31.48	53.57	45.69	8.19
02:00	19.85	7.03	7.46	2.06	4.73	20.57	29.25	28.55	3.43
03:00	7.83	7.69	2	0	5.9	4.33	13.77	15.86	1.4
04:00	7.03	4.16	2.86	3.7	2.66	17.02	10.21	4.43	1.2
05:00	13.39	7.86	7.03	2.13	8.46	14.06	3.39	20.36	4.03
06:00	18.2	18.67	21.5	5.79	26.1	15.61	16.55	21.83	1.73
07:00	73.77	73.82	96.78	23.11	70.03	21.17	14.24	31.07	3.46
08:00	74.48	74.51	86.35	46.91	79.42	39.2	13.98	51.69	8.11
09:00	142.05	153.09	140.26	59.03	148.9	90.68	29.08	61.51	13.26
10:00	183.16	201.41	145.82	35.58	194.2	128.25	54.39	91.6	17.99
11:00	140.32	201.5	129.34	46.04	221.31	142	70.94	115.39	19.75
12:00	143.23	208.66	155.48	34.72	225.6	194.52	105.47	100.27	20.99
13:00	145.43	139.02	172.19	42.15	207.64	305.68	132.34	117.27	22.99
14:00	111.64	115.84	111.81	49.92	123.07	253.43	126.76	146.9	21.05
15:00	90.56	147.83	172.88	53.7	155.42	315.41	163.93	193.59	17.33
16:00	163.64	185.09	325.23	39.85	223.3	204.9	125.38	222.69	16.38
17:00	220.81	208.39	374.8	29.91	279.71	178.9	120.7	285.72	26.31
18:00	296.79	354.11	321.62	49.39	232.62	229.03	123.41	232.92	27.64
19:00	193.39	212.94	349.45	42.14	288.27	240.62	94.69	169.7	25.58
20:00	119.54	135.39	139.62	34.52	289.51	239.49	93.23	165.97	24.17
21:00	74.1	80.86	94.91	21.85	117.89	150.1	100.94	140.73	15.73
22:00	58	62.89	61.51	0	80.08	93.14	57.71	81.93	18.69
23:00	46.1	40.7	37.3	0	66.91	60.83	47.05	48.62	14.5

Table 78: Through movement of vehicles, PCU/hr at Cross road 2 [Museum Road- MG]

Table 79: Summary of vehicular movement at crossroads, PCU/day

	Cross r	oad 1	Cross 1	road 2	
DAYS	Through movements	Merging with Church Street	Through movements	Merging with Church Street	TOTAL
Day 1 Monday (22-07- 19)	674.28	2109.36	2413.59	1299.42	6496.65
Day 2 Tuesday (23-07- 19)	562.79	2051.97	2664.94	1686.17	6965.87
Day 3 Wednesday (24-07-19)	599.29	2081.72	2999.15	1805.29	7485.45
Day 4 Thursday (25- 07-19)	638.38	2031.29	638.38	1806.26	5114.31
Day 5 Friday (26-07-19)	837.78	3050.13	<mark>3109.65</mark>	2051.51	<mark>9049.07</mark>
Day 6 Saturday (20- 07-19)	<mark>676.92</mark>	2367.12	<mark>3028.63</mark>	2008.41	<mark>8081.08</mark>

Day 7 Sunday (21-07-19)	358.52	1256.18	1651.31	976.94	4242.95
Day 8 Saturday (27-07-19)	556.75	1975.82	2446.81	1522.1	6501.48
Day 9 Sunday (28-07-19)	354.41	1187.67	354.41	890.01	2786.5

The usage of Church Street as a link or connecting road by public is significant. From Cres road and Museum road, many vehicles merges with Church Street and use Church Street to commute to MG Road and beyond. This through traffic volume was observed to be more on crossroad 2 and the usage was more on Fridays and Saturdays.

CHAPTER 5 ASSESSMENT OF NEWLY LAID INFRASTRUCTURE

The newly laid infrastructure was assessed in the following manner:



1. CAPACITY AND LEVEL OF SERVICE [LOS] ANALYSIS

In general, the term 'capacity' and 'LOS' has a close relationship. Capacity refers to the quantitative measure of road section and LOS represents the qualitative measure of the road section. The traffic performance of a road is generally expressed in terms of LOS. It is a quality measure describing the operational conditions within a traffic stream, generally in terms of service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience.

For a given road facility, capacity can be constant whereas actual flow will be a varying parameter depending on the time of the day. The objective of LOS is to relate the traffic service quality to a given flow rate of traffic. Universally, LOS is a lettering scheme ranging from A to F. LOS A represents the highest quality of service where motorists can travel at their desired speeds and LOS F represents congested flow where traffic demand exceeds capacity.

Indo-HCM guidelines⁶ describes methodology to calculate LoS of urban roads. The following figure summarizes the methodology to calculate the roadway capacity and the related LoS level.

⁶ Indian Highway Capacity Manual [Indo-HCM] 2017, CSIR- Central Road Research Institute, New Delhi.



Figure 58: Methodology for the determination of Capacity and LOS of Urban Roads - Indo HCM

One can opt for either dynamic method or stream equivalency method depending on the data availability. The present study has referred to Method 1, where PCU values were taken from the reference value provided in the guidelines. From the traffic studies conducted, it is observed that the traffic volume was more on Fridays. For LoS analysis, the traffic volume data corresponding to Friday is hence considered. The composition of vehicles and their flow in veh/hr is tabulated in the following figure. The flow is then converted to PCU/hr.

	PCU/Hour										
Time	TW 0.2	Auto 0.73	Car 1	MB 1.8	B 3.77	LCV 2.3	TAT 3.7	Total PCU/hr			
00:00	28	31.39	148	16.2	0	2.3	0	225.89			
01:00	16.6	28.47	104	14.4	0	2.3	0	165.77			
02:00	6	10.22	39	7.2	0	6.9	0	69.32			
03:00	2.6	2.19	17	7.2	0	4.6	0	33.59			
04:00	1	1.46	11	0	0	11.5	0	24.96			
05:00	5.6	4.38	10	3.6	0	2.3	0	25.88			
06:00	15.6	10.22	35	1.8	0	9.2	0	71.82			
07:00	49.8	42.34	206	41.4	0	25.3	3.7	368.54			
08:00	134.6	73	289	99	3.77	23	0	622.37			
09:00	196	79.57	290	97.2	0	18.4	0	681.17			
10:00	174.4	84.68	287	113.4	0	16.1	0	675.58			
11:00	207.4	132.13	359	124.2	0	25.3	7.4	855.43			

Table 80: Vehicular Flow at Church Street on Friday, PCU/Hr

12:00	224.8	115.34	368	133.2	0	32.2	7.4	880.94
13:00	225.2	95.63	463	136.8	0	25.3	0	945.93
14:00	226	89.79	477	142.2	0	18.4	7.4	960.79
15:00	210.4	75.19	417	113.4	0	16.1	3.7	835.79
16:00	231	105.12	417	158.4	0	36.8	0	948.32
17:00	206.2	112.42	425	208.8	0	27.6	3.7	983.72
18:00	282.8	121.91	388	239.4	0	50.6	7.4	1090.11
19:00	259.6	116.8	412	268.2	0	25.3	0	1081.9
20:00	202	97.82	421	149.4	0	18.4	0	888.62
21:00	106.8	79.57	335	72	0	4.6	0	597.97
22:00	78.8	75.92	278	54	0	6.9	0	493.62
23:00	61.2	64.24	275	81	0	2.3	0	483.74

The capacity values for the urban road base sections are listed in the following figure. The suggested capacity of Two-lane undivided roads is 2400 PCUs/hour.

Table 5.4: Capacity and Recommended Design Service Volume of Base Sections of Urban Roads

S. No.	Typology of the Road	Capacity (PCUs/hr)	Lane Capacity (PCUs/hr)	Design Service Volume <i>(PCUs/hr)</i>	
1	Two-lane Undivided	2400	1200	1680	
2	Four-lane Divided	5400 <i>(2700)</i>	1350	3780 (1890)	
3	Six-lane Divided	8400 (4200)	1400	5880 <i>(2940)</i>	
4	Eight-lane Divided	13600 (6800)	1700	9520 <i>(4760)</i>	
5	Ten-lane Divided	20000 (10000)	2000	14000 <i>(7000)</i>	

Note: The values in parenthesis / brackets represent PCUs per hour per direction'

Figure 59: Capacity and Recommended Design Service Volume of Base Sections of Urban Roads - Indo HCM

Based on the road geometry, the capacity value must be adjusted by applying adjustment factors conforming to the site conditions. At Church Street both on street parking and vehicle entry/exit from access point reduces the capacity of the road. Following pictures illustrates the same. The on-street parking and vehicle entry/exit at access points reduces the carriageway width for users.



The following tables were referred for adjustment factors. Low condition factors were considered for on -street parking and at access points.

S. No.	Level of friction	Intensity in terms of segment length occupied %	Percentage reduction	On-street Parking Adjustment factor
1	Low	< 25	30	0.70
2	Medium	25 - 50	35	0.65
3	Severe	> 50	60	0.40

Table 5.9: On-street Parking Adjustment Factors based on Length of Road Occupation

S.No.	Level of Friction	Total Vehicle Entry and Exit per hour	Percentage reduction	Adjustment Factor
1	Low	< 200	10	0.90
2	Medium	200 - 500	20	0.80
3	High	> 500	30	0.70

Figure 60: Adjustment Factors for Capacity of Urban Roads - Indo HCM

The capacity will be reduced as $= 2400 \times 0.7 \times 0.9 = 1512$ PCUs/hour.

The V/C ratio is calculated and the LoS is identified at each hour referring to the following table. Table 5.6: LOS of Two lane Undivided Urban Roads based on

	Stream speed, V/C Ratio and FFS						
_	Level of Service	Volume/Capacity Ratio	Percentage of Free Flow Speed				
	LOS A	<u>≤</u> 0.35	<u>></u> 89				
	LOS B	0.36 - 0.55	88 - 55				
	LOS C	0.56 - 0.70	54 - 21				
_	LOS D	0.71 - 0.85	20 - 12				
	LOS E	0.86 - 1.00	11 - 6				
	LOS F	> 1.00	< 6				

Figure 61: LOS of Two lane Undivided Urban Roads based on Stream speed, V/C Ratio - Indo $\rm HCM$

The following table lists the V/C ratio calculation and the identified LoS values. It is observed that the present level of service varies from LoS A and D.

Time	Volume (PCUs/hr)	V/C Ratio	LOS
00:00	225.89	0.15	А
01:00	165.77	0.11	А
02:00	69.32	0.05	А
03:00	33.59	0.02	А
04:00	24.96	0.02	А
05:00	25.88	0.02	А
06:00	71.82	0.05	А
07:00	368.54	0.24	А
08:00	622.37	0.41	В
09:00	681.17	0.45	В
10:00	675.58	0.45	В
11:00	855.43	0.57	С
12:00	880.94	0.58	С
13:00	945.93	0.63	С
14:00	960.79	0.64	С
15:00	835.79	0.55	В
16:00	948.32	0.63	С
17:00	983.72	0.65	С
18:00	1090.11	0.72	D
19:00	1081.9	0.72	D
20:00	888.62	0.59	С

Table 81: Calculation of V/C ratio and LoS

21:00	597.97	0.40	В
22:00	493.62	0.33	А
23:00	483.74	0.32	А

LoS A and B indicates a zone with stable traffic flow where drivers have reasonable freedom to select their desired speed and maneuver within the traffic stream. The level of comfort and convenience is good and the presence of other vehicles in the traffic stream will not affect individual behavior.

LoS C indicates a zone which marks the beginning of the range of flow in which the operation of individual drivers starts getting affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others and maneuvering within the traffic stream requires vigilance on the part of the user. The general level of comfort and convenience starts declining at this level.

LoS D represents the limit of stable flow, with conditions approaching unstable flow. Due to high density, the drivers are severely restricted in their freedom to select d desired speed and maneuver within the traffic stream. The general level of comfort and convenience is poor. Small increase in traffic flow will usually cause operational problems at this level.

The Church Street is active from a time period of 8.00 AM in the morning till 10.00 PM at night. The LoS during these active working hours varies from B to C. At peak hours, typically at 6-7 PM the LoS further declines to D. This is mainly due to the space constraint with respect to carriageway width. For a good traffic flow, the infrastructure should be at LoS C or above.

To increase the capacity of the road segment, the on-street parking must be strictly controlled. The existing parking bays that are not functional now should be utilized to manage the vehicle parking on road. The shift of vehicles getting parked on road to the respective parking lots will free up the entire carriageway for the movement of vehicles and, hence increasing the effective capacity.

2. SPEED OF MOTOR VEHICLES

Church Street has been revamped under Tender SURE guidelines where the prime focus was placed on pedestrians. The cobble stones laid on the carriageway not only brings an aesthetic quality to the street but also acts as a traffic calming measure by reducing the travel speed of motorized vehicles. The study undertook a Spot Speed study to understand the speed of moving vehicles, mainly two wheelers and cars. Spot Speed studies are used to determine the speed distribution of a traffic stream at a specific location.

A Radar Speed Gun is used to detect the vehicle speed. The data was collected at the mid-block location of the road with a straight and levelled section. The study was performed on a weekday between 2.00 and 3.00 PM in the afternoon. Speed samples were collected for 109 cars and 102 two wheelers. The data is tabulated below.

Two-Wheeler				Four-Wheeler			
Sample	Speed	Sample	Speed	Sample	Speed	Sample	Speed
Id	(Kmph)	Id	(Kmph)	Id	(Kmph)	Id	(Kmph)
1	9	51	23	1	11	55	24
2	12	52	23	2	12	56	24
3	12	53	23	3	14	57	24
4	12	54	23	4	14	58	24
5	13	55	24	5	15	59	25
6	14	56	24	6	15	60	25
7	14	57	24	7	16	61	25
8	14	58	24	8	16	62	25
9	15	59	25	9	16	63	25
10	15	60	25	10	16	64	25
11	15	61	25	11	16	65	26
12	15	62	25	12	16	66	26
13	15	63	25	13	16	67	26
14	16	64	25	14	16	68	26
15	16	65	25	15	16	69	26
16	16	66	26	16	16	70	27
17	16	67	26	17	17	71	27
18	16	68	26	18	17	72	27
19	16	69	27	19	17	73	27
20	16	70	27	20	18	74	27
21	16	71	27	21	18	75	27
22	18	72	27	22	18	76	27
23	18	73	27	23	18	77	27
24	18	74	27	24	18	78	28
25	18	75	27	25	19	79	28
26	18	76	28	26	19	80	28
27	18	77	28	27	20	81	28
28	19	78	28	28	20	82	28
29	19	79	28	29	21	83	28
30	19	80	28	30	21	84	28
31	20	81	28	31	21	85	29
32	20	82	28	32	21	86	29
33	20	83	29	33	21	87	30
34	20	84	29	34	21	88	30
35	20	85	29	35	21	89	31
36	20	86	29	36	21	90	31
37	21	87	29	37	22	91	31

Table 82: Spot Speed Studies – Data Collection

38	21	88	31	38	22	92	31
39	21	89	31	39	22	93	31
40	21	90	31	40	22	94	31
41	21	91	31	41	22	95	31
42	21	92	32	42	22	96	32
43	22	93	32	43	22	97	32
44	22	94	32	44	22	98	32
45	22	95	34	45	22	99	32
46	22	96	34	46	23	100	33
47	22	97	35	47	23	101	33
48	22	98	35	48	23	102	35
49	23	99	36	49	23	103	35
50	23	100	37	50	23	104	35
		101	38	51	24	105	35
		102	43	52	24	106	35
				53	24	107	35
				54	24	108	36
						109	37

The above data was analyzed to understand the speed distribution of the traffic stream and a speedfrequency distribution curve was plotted. The 85th percentile speed is identified from the plot. The 85th percentile is the speed at which 85% of the observed vehicles are traveling at or below. This percentile is used in evaluating/recommending posted speed limits based on the assumption that 85% of the drivers are traveling at a speed they perceive to be safe. The step wise analysis is as below:

- Prepare frequency distribution curve
- Select number of speed classes
- The mid value for each class is used as a speed value for that class frequency distribution curve (speed mid qualities versus frequency distribution curve).
- Cumulative distribution (maximum breaking points of speed classes versus frequency distribution curve is plotted

The following table gives the frequency distribution of cars and two-wheelers. The Cumulative frequency curve is plotted for both cars and two-wheelers and the 85th percentile speed is identified.

Speed group [Kmph]		M:JJI.	Observed	Demonstrate	Cumulative
Lower limit	Upper Limit	speed	frequency in group	frequency	Percentage frequency
10	12	11	1	0.9%	0.9%

Table 83: Frequency distribution of Cars

12	14	13	1	0.9%	1.8%
14	16	15	4	3.7%	5.5%
16	18	17	13	11.9%	17.4%
18	20	19	7	6.4%	23.9%
20	22	21	10	9.2%	33.0%
22	24	23	14	12.8%	45.9%
24	26	25	14	12.8%	58.7%
26	28	27	13	11.9%	70.6%
28	30	29	9	8.3%	78.9%
30	32	31	9	8.3%	87.2%
32	34	33	6	5.5%	92.7%
34	36	35	6	5.5%	98.2%
36	38	37	2	1.8%	100.0%
38	40	39	0	0.0%	100.0%
40	42	41	0	0.0%	100.0%

Table 84: Frequency distribution of Two wheelers

Speed group [Kmph]		Middle	Observed	Percentage	Cumulative Boreentage
Lower limit	Upper Limit	speed	in group	frequency	frequency
8	10	9	1	1.0%	1.0%
10	12	11	0	0.0%	1.0%
12	14	13	4	3.9%	4.9%
14	16	15	8	7.8%	12.7%
16	18	17	8	7.8%	20.6%
18	20	19	9	8.8%	29.4%
20	22	21	12	11.8%	41.2%
22	24	23	12	11.8%	52.9%
24	26	25	11	10.8%	63.7%
26	28	27	10	9.8%	73.5%
28	30	29	12	11.8%	85.3%
30	32	31	4	3.9%	89.2%
32	34	33	3	2.9%	92.2%
34	36	35	4	3.9%	96.1%
36	38	37	2	2.0%	98.0%
38	40	39	1	1.0%	99.0%
40	42	41	0	0.0%	99.0%
42	44	43	1	1.0%	100.0%

The 85th percentile speeds for both Car and Two wheelers are plotted below.



Cumulative distribution curve of Car



Cumulative distribution curve of Two-Wheeler

Figure 62: Cumulative frequency curve for Cars & Two-Wheeler

The 85th percentile speed was observed for cars and two-wheeler as 32 KMPH and 30 KMPH respectively. The vehicle acquires this speed when infrastructure is at LoS B or C. The speed would further increase at LoS A but would declines at peak hours, i.e., when LoS is at D.

In its assessment the study observes that, the speed should be further reduced considering the high pedestrian movements in the area. A strict speed limit enforcement should be carried out to ensure that pedestrian-vehicle conflicts are eliminated making the street safer for walking.

3. PEDESTRIAN SIDEWALK - PEDESTRIAN LEVEL OF SERVICE (PLOS) AND WALKABILITY INDEX (WI) ANALYSIS

A. PEDESTRIAN LEVEL OF SERVICE (PLOS)

The present study assesses the pedestrian sidewalk through quantitively and qualitatively. The quantitative method measures the pedestrian characteristics on footpath and quantifies the footpath performance by its Pedestrian Level of Service (PLoS).

Pedestrian Level of Service (PLOS) is defined based on fundamental pedestrian flow parameters. The pedestrian characteristics of Church Street are determined as the first step to calculate the PLOS. The pedestrian volume was documented through videography during peak hours. A pedestrian grid of was identified on the sidewalk for recording. The pedestrian volume data was documented between 12:00 PM and 3:00 PM. The data pertaining to pedestrian speed, flow, and density was later extracted from the video recording. A snapshot of the pedestrian grid used for documentation on Church Street is shown in the figure.



Figure 63: Pedestrian Gird - 21.5 * 2.7 m

The volume observed at the location was high between 2.00 - 3.00 PM. Hence the pedestrian characteristics was assessed for this time period. The details are listed below.

Time	Pedestrian Volume (p)
12:00-1:00PM	302
1:00-2:00 PM	554
2:00-3:00 PM	592

Pedestrian speed

Pedestrian speed is the average pedestrian walking speed (m/s). The speed data is extracted as follows:

• A random pedestrian about to enter the grid is selected and was monitored through the entire grid length. The entry and exit time of the pedestrian in the grid is noted. The walking time is calculated by subtracting grid entry time from the time of exit. The walking speed is then calculated by dividing the grid length by the walking time. The speed of random pedestrians taken at different intervals of time is recorded and is listed in the following table.

SAMPL E ID	ENTRY TIME	EXIT TIME	DIFF IN TIME (SEC)	SPEED (M/SEC)
TIME PE	RIOD: 2:00 1	PM to 3:00 P	M (from St. M	larks road)
1	14:00:00	14:00:08	8	2.69
2	14:00:00	14:00:08	8	2.69
3	14:00:39	14:00:48	9	2.39
4	14:00:39	14:00:48	9	2.39
5	14:01:41	14:01:51	10	2.15
6	14:02:13	14:02:23	10	2.15
7	14:02:25	14:02:31	6	3.58
8	14:02:33	14:02:45	12	1.79
9	14:02:35	14:02:45	10	2.15
10	14:02:47	14:02:57	10	2.15
11	14:03:08	14:03:17	9	2.39
12	14:03:08	14:03:17	9	2.39
13	14:03:18	14:03:25	7	3.07
14	14:04:21	14:04:29	8	2.69
15	14:04:31	14:04:41	10	2.15
16	14:05:16	14:05:25	9	2.39
17	14:05:20	14:05:28	8	2.69
18	14:05:21	14:05:29	8	2.69
19	14:05:21	14:05:29	8	2.69
20	14:05:22	14:05:30	8	2.69
21	14:05:23	14:05:33	10	2.15
22	14:05:23	14:05:33	10	2.15
23	14:05:23	14:05:33	10	2.15
24	14:05:23	14:05:39	16	1.34
25	14:06:12	14:06:21	9	2.39

Table 86: Pedestrian Speed Data Extracted from Videography Volume Count

1	1 1		1	1
26	14:06:13	14:06:22	9	2.39
27	14:06:13	14:06:22	9	2.39
28	14:06:20	14:06:29	9	2.39
29	14:06:21	14:06:30	9	2.39
30	14:06:36	14:06:45	9	2.39
31	14:06:36	14:06:47	11	1.95
32	14:06:36	14:06:47	11	1.95
33	14:06:53	14:07:04	11	1.95
34	14:07:10	14:07:20	10	2.15
35	14:07:16	14:07:29	13	1.65
36	14:07:23	14:07:31	8	2.69
37	14:07:34	14:07:41	7	3.07
38	14:08:41	14:08:51	10	2.15
39	14:08:58	14:09:08	10	2.15
40	14:08:58	14:09:08	10	2.15
41	14:09:13	14:09:21	8	2.69
42	14:09:13	14:09:21	8	2.69
43	14:09:37	14:09:46	9	2.39
44	14:09:38	14:09:46	8	2.69
45	14:09:45	14:09:59	14	1.54
46	14:09:45	14:09:59	14	1.54
47	14:09:52	14:10:02	10	2.15
48	14:10:31	14:10:41	10	2.15
49	14:10:59	14:11:10	11	1.95
50	14:10:59	14:11:10	11	1.95
51	14:10:59	14:11:10	11	1.95
52	14:12:23	14:12:33	10	2.15
53	14:12:23	14:12:33	10	2.15
54	14:12:46	14:12:57	11	1.95
55	14:12:46	14:12:57	11	1.95
56	14:13:08	14:13:16	8	2.69
57	14:13:30	14:13:51	21	1.02
58	14:13:34	14:13:53	19	1.13
59	14:14:00	14:14:09	9	2.39
60	14:14:27	14:14:34	7	3.07
61	14:14:56	14:15:05	9	2.39
62	14:15:05	14:15:14	9	2.39
63	14:15:18	14:15:33	15	1.43
64	14:15:30	14:15:41	11	1.95
65	14:15:30	14:15:41	11	1.95
66	14:16:15	14:16:26	11	1.95

67	14.16.10	14.16.28	0	2 30
68	14.10.17 14.16.44	14.10.20	10	2.57
69	14.16.44	14.16.54	10	2.15
70	14:16:53	14.10.94 14.17.01	8	2.13
70	14:16:53	14:17:03	10	2.07
72	14:10:35	14:17:00	10	5 38
73	14.17.00 14.17.12	14.17.10	16	1.34
73	14.17.12 14.17.12	14.17.28	16	1.34
75	14.17.12 14.17.14	14.17.20	10	1.54
76	14.17.14 14.17.14	14.17.29	15	1.43
70	14.17.14 14.17.20	14.17.29	13	1.45
78	14.17.30 14.17.30	14.17.43	13	1.05
70	14.17.30 14.17.35	14.17.43	15	1.03
80	14.17.33 14.17.27	14.17.50	13	1.45
00 01	14.17.27	14.17.50	13	1.03
<u>81</u> 92	14:17:37	14:17:50	13	1.05
82	14:17:37	14:17:50	13	1.65
83	14:17:38	14:17:51	13	1.65
84	14:17:39	14:17:51	12	1.79
85	14:17:39	14:17:51	12	1.79
86	14:17:39	14:17:51	12	1.79
8/	14:17:48	14:17:59		1.95
88	14:17:49	14:18:00	11	1.95
89	14:17:52	14:18:03	11	1.95
90	14:17:56	14:18:12	16	1.34
91	14:17:56	14:18:12	16	1.34
92	14:18:00	14:18:15	15	1.43
93	14:18:00	14:18:15	15	1.43
94	14:18:00	14:18:16	16	1.34
95	14:18:05	14:18:16	11	1.95
96	14:18:05	14:18:16	11	1.95
97	14:18:41	14:18:50	9	2.39
98	14:19:31	14:19:41	10	2.15
99	14:21:04	14:21:15	11	1.95
100	14:21:06	14:21:17	11	1.95
101	14:21:06	14:21:18	12	1.79
102	14:21:22	14:21:29	7	3.07
103	14:22:08	14:22:20	12	1.79
104	14:22:08	14:22:20	12	1.79
105	14:22:28	14:22:36	8	2.69
106	14:22:55	14:23:05	10	2.15
107	14:22:55	14:23:05	10	2.15

108	14:23:26	14:23:34	8	2.69
109	14:23:27	14:23:36	9	2.39
110	14:23:33	14:23:43	10	2.15
111	14:23:45	14:23:54	9	2.39
112	14:25:04	14:25:13	9	2.39
113	14:25:05	14:25:13	8	2.69
114	14:25:25	14:25:38	13	1.65
115	14:26:00	14:26:12	12	1.79
116	14:26:01	14:26:12	11	1.95
117	14:26:11	14:26:21	10	2.15
118	14:26:11	14:26:21	10	2.15
119	14:26:19	14:26:32	13	1.65
120	14:26:22	14:26:32	10	2.15
121	14:26:28	14:26:37	9	2.39
122	14:26:45	14:27:02	17	1.26
123	14:26:45	14:27:02	17	1.26
124	14:27:14	14:27:23	9	2.39
125	14:29:08	14:29:18	10	2.15
126	14:29:22	14:29:30	8	2.69
127	14:29:22	14:29:30	8	2.69
128	14:29:47	14:29:54	7	3.07
129	14:29:55	14:30:03	8	2.69
130	14:30:11	14:30:20	9	2.39
131	14:30:42	14:30:55	13	1.65
132	14:31:07	14:31:17	10	2.15
133	14:31:09	14:31:18	9	2.39
134	14:31:11	14:31:20	9	2.39
135	14:31:11	14:31:20	9	2.39
136	14:31:13	14:31:23	10	2.15
137	14:31:31	14:31:39	8	2.69
138	14:31:50	14:32:07	17	1.26
139	14:31:50	14:32:07	17	1.26
140	14:31:50	14:32:07	17	1.26
141	14:31:53	14:32:09	16	1.34
142	14:32:12	14:32:20	8	2.69
143	14:32:39	14:32:49	10	2.15
144	14:32:53	14:33:02	9	2.39
145	14:32:56	14:33:04	8	2.69
146	14:32:58	14:33:07	9	2.39
147	14:33:09	14:33:19	10	2.15

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148	14:33:22	14:33:38	16	1.34
149	14:33:23	14:33:38	15	1.43
150	14:33:58	14:34:07	9	2.39
151	14:34:17	14:34:28	11	1.95
152	14:34:27	14:34:37	10	2.15
153	14:34:27	14:34:37	10	2.15
154	14:34:30	14:34:40	10	2.15
155	14:34:30	14:34:40	10	2.15
156	14:34:40	14:34:48	8	2.69
157	14:35:12	14:35:23	11	1.95
158	14:35:24	14:35:34	10	2.15
159	14:35:24	14:35:34	10	2.15
160	14:34:35	14:34:48	13	1.65
161	14:36:06	14:36:18	12	1.79
162	14:36:06	14:36:18	12	1.79
163	14:36:22	14:36:33	11	1.95
164	14:36:22	14:36:33	11	1.95
165	14:37:49	14:38:00	11	1.95
166	14:37:49	14:38:00	11	1.95
167	14:37:49	14:38:05	16	1.34
168	14:37:49	14:38:05	16	1.34
169	14:38:12	14:38:25	13	1.65
170	14:38:12	14:38:25	13	1.65
171	14:38:12	14:38:25	13	1.65
172	14:38:49	14:38:58	9	2.39
173	14:38:49	14:38:58	9	2.39
174	14:39:12	14:39:22	10	2.15
175	14:39:12	14:39:22	10	2.15
176	14:39:59	14:40:12	13	1.65
177	14:40:21	14:40:29	8	2.69
178	14:40:21	14:40:29	8	2.69
179	14:40:39	14:40:49	10	2.15
180	14:40:42	14:40:50	8	2.69
181	14:41:01	14:42:12	11	1.95
182	14:41:01	14:42:12	11	1.95
183	14:41:32	14:41:49	17	1.26
184	14:41:32	14:41:49	17	1.26
185	14:42:31	14:42:42	11	1.95
186	14:42:51	14:43:03	12	1.79
187	14:42:51	14:43:03	12	1.79

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188	14:42:51	14:43:03	12	1.79
189	14:43:19	14:43:33	14	1.54
190	14:43:19	14:43:33	14	1.54
191	14:43:22	.14:43:35	13	1.65
192	14:43:41	14:43:51	10	2.15
193	14:43:41	14:43:51	10	2.15
194	14:44:37	14:44:46	9	2.39
195	14:44:38	14:44:46	8	2.69
196	14:44:44	14:44:53	9	2.39
197	14:45:36	14:45:45	9	2.39
198	14:45:59	14:46:06	7	3.07
199	14:46:10	14:46:18	8	2.69
200	14:46:32	14:46:44	12	1.79
201	14:46:32	14:46:44	12	1.79
202	14:46:37	14:46:46	9	2.39
203	14:46:37	14:46:46	9	2.39
204	14:46:37	14:46:46	9	2.39
205	14:47:02	14:47:13	11	1.95
206	14:47:02	14:47:13	11	1.95
207	14:47:02	14:47:13	11	1.95
208	14:47:10	14:47:18	8	2.69
209	14:47:19	14:47:29	10	2.15
210	14:47:37	14:47:45	8	2.69
211	14:47:47	14:47:58	11	1.95
212	14:48:12	14:48:25	13	1.65
213	14:48:12	14:48:25	13	1.65
214	14:48:17	14:48:30	13	1.65
215	14:48:32	14:48:39	7	3.07
216	14:49:16	14:49:27	11	1.95
217	14:49:16	14:49:27	11	1.95
218	14:49:18	14:49:29	11	1.95
219	14:49:18	14:49:29	11	1.95
220	14:49:20	14:49:30	10	2.15
221	14:49:20	14:49:30	10	2.15
222	14:49:35	14:49:45	10	2.15
223	14:49:43	14:49:52	9	2.39
224	14:49:43	14:49:52	9	2.39
225	14:52:10	14:52:18	8	2.69
226	14:52:10	14:52:18	8	2.69
227	14:52:27	14:52:38	11	1.95

		1		
228	14:52:27	14:52:38	11	1.95
229	14:52:48	14:52:57	9	2.39
230	14:52:54	14:52:59	5	4.30
231	14:53:15	14:53:28	13	1.65
232	14:53:17	14:53:28	11	1.95
233	14:53:17	14:53:28	11	1.95
234	14:53:22	14:53:31	9	2.39
235	14:53:22	14:53:31	9	2.39
236	14:53:31	14:53:42	11	1.95
237	14:53:32	14:53:43	11	1.95
238	14:53:32	14:53:43	11	1.95
239	14:54:06	14:54:14	8	2.69
240	14:54:06	14:54:14	8	2.69
241	14:54:16	14:54:26	10	2.15
242	14:54:48	14:54:57	9	2.39
243	14:54:56	14:55:05	9	2.39
244	14:55:09	14:55:21	12	1.79
245	14:55:35	14:55:49	14	1.54
246	14:55:35	14:55:50	15	1.43
247	14:55:35	14:55:50	15	1.43
248	14:55:37	14:55:51	14	1.54
249	14:55:39	14:55:51	12	1.79
250	14:55:39	14:55:51	12	1.79
251	14:55:39	14:55:52	13	1.65
252	14:55:39	14:55:52	13	1.65
253	14:55:53	14:56:03	10	2.15
254	14:57:47	14:57:58	11	1.95
255	14:57:54	14:58:06	12	1.79
256	14:57:55	14:58:07	12	1.79
257	14:57:55	14:58:07	12	1.79
258	14:57:57	14:58:09	12	1.79
259	14:57:57	14:58:09	12	1.79
260	14:58:00	14:58:12	12	1.79
261	14:58:00	14:58:12	12	1.79
262	14:58:12	14:58:20	8	2.69
263	14:58:40	14:58:50	10	2.15
264	14:58:40	14:58:50	10	2.15
265	14:58:47	14:58:56	9	2.39
266	14:59:09	14:59:18	9	2.39
267	14:59:22	14:59:33	11	1.95
268	14:59:22	14:59:33	11	1.95
---------	-------------	------------	---------------	-----------
269	14:59:24	14:59:31 7		3.07
TIME PH	ERIOD: 2:00	PM to 3:00	PM (from brig	ade road)
1	14:00:10	14:00:17	7	3.07
2	14:00:23	14:00:32	9	2.39
3	14:00:27	14:00:37	10	2.15
4	14:00:32	14:00:43	11	1.95
5	14:00:32	14:00:43	11	1.95
6	14:00:50	14:00:57	7	3.07
7	14:01:08	14:01:16	8	2.69
8	14:01:38	14:01:46	8	2.69
9	14:01:41	14:01:49	8	2.69
10	14:01:48	14:01:56	8	2.69
11	14:01:52	14:01:58	6	3.58
12	14:01:58	14:02:11	13	1.65
13	14:02:07	14:02:17	10	2.15
14	14:02:10	14:02:18	8	2.69
15	14:02:10	14:02:18	8	2.69
16	14:02:14	14:02:22	8	2.69
17	14:02:15	14:02:23	8	2.69
18	14:02:16	14:02:25	9	2.39
19	14:02:19	14:02:26	7	3.07
20	14:02:19	14:02:26	7	3.07
21	14:02:20	14:02:27	7	3.07
22	14:02:20	14:02:28	8	2.69
23	14:02:22	14:02:30	8	2.69
24	14:02:27	14:02:38	11	1.95
25	14:02:27	14:02:38	11	1.95
26	14:02:31	14:02:39	8	2.69
27	14:02:33	14:08:40	7	3.07
28	14:02:56	14:03:06	10	2.15
29	14:02:56	14:03:06	10	2.15
30	14:03:28	14:03:37	9	2.39
31	14:03:56	14:04:03	7	3.07
32	14:04:01	14:04:08	7	3.07
33	14:04:03	14:04:15	12	1.79
34	14:04:04	14:04:14	10	2.15
35	14:04:19	14:04:27	8	2.69
36	14:04:37	14:04:49	12	1.79
37	14:04:41	14:04:51	10	2.15
38	14:04:50	14:04:56	6	3.58

20	14.04.50	140456		2 50
39	14:04:50	14:04:56	6	3.58
40	14:04:56	14:05:07	11	1.95
41	14:04:58	14:05:10	12	1.79
42	14:05:05	14:05:18	13	1.65
43	14:05:05	14:05:18	13	1.65
44	14:05:06	14:05:20	14	1.54
45	14:05:06	14:05:20	14	1.54
46	14:05:37	14:05:53	16	1.34
47	14:05:42	14:05:53	11	1.95
48	14:05:42	14:05:53	11	1.95
49	14:06:13	14:06:23	10	2.15
50	14:06:41	14:06:52	11	1.95
51	14:06:41	14:06:52	11	1.95
52	14:07:20	14:07:30	10	2.15
53	14:07:50	14:08:04	14	1.54
54	14:08:30	14:08:40	10	2.15
55	14:08:30	14:08:40	10	2.15
56	14:08:33	14:08:43	10	2.15
57	14:08:33	14:08:43	10	2.15
58	14:08:44	14:08:51	7	3.07
59	14:09:12	14:09:23	11	1.95
60	14:09:12	14:09:23	11	1.95
61	14:09:25	14:09:35	10	2.15
62	14:09:27	14:09:35	8	2.69
63	14:09:38	14:09:47	9	2.39
64	14:09:50	14:10:01	11	1.95
65	14:09:50	14:10:01	11	1.95
66	14:09:53	14:10:04	11	1.95
67	14:10:25	14:10:34	9	2.39
68	14:10:25	14:10:34	9	2.39
69	14:10:34	14:10:41	7	3.07
70	14:10:34	14:10:50	16	1.34
71	14:10:34	14:10:50	16	1.34
72	14:11:44	14:11:55	11	1.95
73	14:11:44	14:11:55	11	1.95
74	14:11:44	14:11:55	11	1.95
75	14:11:50	14:12:02	12	1.79
76	14:11:50	14:12:02	12	1.79
77	14:12:26	14:12:38	12	1.79
78	14:12:29	14:12:41	12	1.79
79	14:12:29	14:12:41	12	1.79

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80	14:12:29	14:12:43	14	1.54
81	14:12:31	14:12:43	12	1.79
82	14:12:33	14:12:43	10	2.15
83	14:12:33	14:12:46	13	1.65
84	14:12:35	14:12:46	11	1.95
85	14:12:36	14:12:48	12	1.79
86	14:12:40	14:12:48	8	2.69
87	14:12:40	14:12:48	8	2.69
88	14:12:46	14:12:56	10	2.15
89	14:12:46	14:12:56	10	2.15
90	14:13:05	14:13:19	14	1.54
91	14:13:20	14:13:30	10	2.15
92	14:13:20	14:13:30	10	2.15
93	14:13:44	14:13:54	10	2.15
94	14:13:44	14:13:54	10	2.15
95	14:13:44	14:13:58	14	1.54
96	14:13:44	14:13:59	15	1.43
97	14:13:48	14:14:00	12	1.79
98	14:13:48	14:14:00	12	1.79
99	14:13:48	14:14:02	14	1.54
100	14:14:05	14:15:02	57	0.38
101	14:14:05	14:15:02	57	0.38
102	14:14:44	14:14:58	14	1.54
103	14:15:08	14:15:16	8	2.69
104	14:15:19	14:15:29	10	2.15
105	14:15:19	14:15:29	10	2.15
106	14:15:47	14:15:56	9	2.39
107	14:15:52	14:15:59	7	3.07
108	14:16:16	14:16:26	10	2.15
109	14:17:00	14:17:16	16	1.34
110	14:17:00	14:17:16	16	1.34
111	14:17:06	14:17:18	12	1.79
112	14:17:06	14:17:18	12	1.79
113	14:17:21	14:17:32	11	1.95
114	14:17:21	14:17:32	11	1.95
115	14:18:07	14:18:28	21	1.02
116	14:18:07	14:18:28	21	1.02
117	14:18:12	14:19:00	48	0.45
118	14:18:15	14:18:29	14	1.54
119	14:18:15	14:18:29	14	1.54
120	14:18:16	14:18:29	13	1.65

		1		
121	14:18:20	14:18:31	11	1.95
122	14:18:20	14:18:31	11	1.95
123	14:18:21	14:18:31	10	2.15
124	14:18:21	14:18:31	10	2.15
125	14:18:36	14:18:57	21	1.02
126	14:18:45	14:18:57	12	1.79
127	14:18:45	14:18:57	12	1.79
128	14:19:28	14:19:39	11	1.95
129	14:19:28	14:19:39	11	1.95
130	14:20:02	14:20:11	9	2.39
131	14:20:33	14:20:43	10	2.15
132	14:20:59	14:21:08	9	2.39
133	14:21:04	14:21:16	12	1.79
134	14:21:12	14:21:16	4	5.38
135	14:21:15	14:21:21	6	3.58
136	14:21:15	14:21:23	8	2.69
137	14:21:15	14:21:23	8	2.69
138	14:21:39	14:23:02	23	0.93
139	14:21:39	14:21:47	8	2.69
140	14:22:09	14:22:18	9	2.39
141	14:22:37	14:22:46	9	2.39
142	14:22:37	14:22:46	9	2.39
143	14:23:32	14:23:41	9	2.39
144	14:24:10	14:24:18	8	2.69
145	14:24:37	14:24:47	10	2.15
146	14:24:37	14:24:47	10	2.15
147	14:24:37	14:24:47	10	2.15
148	14:25:14	14:25:24	10	2.15
149	14:25:16	14:25:26	10	2.15
150	14:26:50	14:27:04	14	1.54
151	14:26:51	14:27:04	13	1.65
152	14:26:51	14:27:04	13	1.65
153	14:26:53	14:27:06	13	1.65
154	14:26:53	14:27:06	13	1.65
155	14:26:56	14:27:09	13	1.65
156	14:26:56	14:27:09	13	1.65
157	14:26:59	14:27:10	11	1.95
158	14:27:28	14:27:36	8	2.69
159	14:27:32	14:27:42	10	2.15
160	14:27:32	14:27:42	10	2.15

161	14:27:33	14:27:43	10	2.15
162	14:27:33	14:27:43	10	2.15
163	14:27:41	14:27:50	9	2.39
164	14:27:51	14:28:00	9	2.39
165	14:28:25	14:28:36	11	1.95
166	14:28:25	14:28:36	11	1.95
167	14:28:39	14:28:49	10	2.15
168	14:28:39	14:28:49	10	2.15
169	14:28:45	14:28:55	10	2.15
170	14:28:45	14:28:55	10	2.15
171	14:30:20	14:30:30	10	2.15
172	14:30:20	14:30:30	10	2.15
173	14:30:36	14:30:46	10	2.15
174	14:30:37	14:30:46	9	2.39
175	14:30:41	14:30:49	8	2.69
176	14:30:42	14:30:51	9	2.39
177	14:30:42	14:30:51	9	2.39
178	14:30:43	14:30:53	10	2.15
179	14:30:43	14:30:53	10	2.15
180	14:30:52	14:31:00	8	2.69
181	14:31:10	14:31:21	11	1.95
182	14:31:51	14:32:01	10	2.15
183	14:31:51	14:32:01	10	2.15
184	14:31:51	14:32:01	10	2.15
185	14:31:53	14:32:02	9	2.39
186	14:31:53	14:32:02	9	2.39
187	14:32:02	14:32:10	8	2.69
188	14:32:02	14:32:10	8	2.69
189	14:32:17	14:32:26	9	2.39
190	14:32:17	14:32:26	9	2.39
191	14:33:08	14:33:19	11	1.95
192	14:33:09	14:33:20	11	1.95
193	14:33:09	14:33:20	11	1.95
194	14:33:10	14:33:21	11	1.95
195	14:33:14	14:33:26	12	1.79
196	14:33:14	14:33:26	12	1.79
197	14:33:34	14:33:44	10	2.15
198	14:33:34	14:33:44	10	2.15
199	14:33:34	14:33:44	10	2.15
200	14:33:43	14:33:56	13	1.65

201	14:33:43	14:33:56	13	1.65
202	14:33:43	14:33:56	13	1.65
203	14:34:01	14:34:09	8	2.69
204	14:34:01	14:34:09	8	2.69
205	14:34:05	14:34:15	10	2.15
206	14:34:05	14:34:15	10	2.15
207	14:34:26	14:34:36	10	2.15
208	14:34:26	14:34:37	11	1.95
209	14:34:31	14:34:41	10	2.15
210	14:34:35	14:34:43	8	2.69
211	14:34:43	14:34:55	12	1.79
212	14:34:43	14:34:55	12	1.79
213	14:34:49	14:34:58	9	2.39
214	14:34:38	14:34:47	9	2.39
215	14:34:38	14:34:47	9	2.39
216	14:36:04	14:36:31	27	0.80
217	14:36:32	14:36:43	11	1.95
218	14:36:37	14:36:47	10	2.15
219	14:36:37	14:36:47	10	2.15
220	14:36:37	14:36:47	10	2.15
221	14:37:11	14:37:20	9	2.39
222	14:37:11	14:37:20	9	2.39
223	14:37:16	14:37:26	10	2.15
224	14:37:24	14:37:33	9	2.39
225	14:37:24	14:37:33	9	2.39
226	14:37:55	14:38:07	12	1.79
227	14:37:55	14:38:07	12	1.79
228	14:38:34	14:38:40	6	3.58
229	14:39:07	14:39:30	23	0.93
230	14:39:07	14:39:31	24	0.90
231	14:39:37	14:39:54	17	1.26
232	14:39:37	14:39:54	17	1.26
233	14:39:39	14:39:55	16	1.34
234	14:39:39	14:39:55	16	1.34
235	14:39:47	14:39:57	10	2.15
236	14:39:47	14:39:57	10	2.15
237	14:40:26	14:40:37	11	1.95
238	14:40:26	14:40:37	11	1.95
239	14:40:26	14:40:37	11	1.95
240	14:40:28	14:40:39	11	1.95

241	14:40:36	14:40:43	7	3.07
242	14:40:40	14:40:50	10	2.15
243	14:41:04	14:41:14	10	2.15
244	14:41:12	14:41:23	11	1.95
245	14:41:30	14:41:39	9	2.39
246	14:41:41	14:41:50	9	2.39
247	14:42:33	14:42:44	11	1.95
248	14:42:33	14:42:44	11	1.95
249	14:43:37	14:43:46	9	2.39
250	14:43:37	14:43:46	9	2.39
251	14:43:04	14:43:12	8	2.69
252	14:43:04	14:43:18	14	1.54
253	14:43:06	14:43:20	14	1.54
254	14:43:06	14:43:20	14	1.54
255	14:43:35	14:43:45	10	2.15
256	14:43:46	14:44:00	14	1.54
257	14:43:46	14:44:00	14	1.54
258	14:43:46	14:44:00	14	1.54
259	14:44:07	14:44:17	10	2.15
260	14:44:11	14:44:21	10	2.15
261	14:44:14	14:44:25	11	1.95
262	14:44:16	14:44:27	11	1.95
263	14:44:16	14:44:29	13	1.65
264	14:44:40	14:44:52	12	1.79
265	14:44:40	14:44:52	12	1.79
266	14:44:55	14:45:08	13	1.65
267	14:44:58	14:45:08	10	2.15
268	14:44:58	14:45:08	10	2.15
269	14:45:02	14:45:14	12	1.79
270	14:45:49	14:45:59	10	2.15
271	14:45:51	14:46:00	9	2.39
272	14:46:13	14:46:23	10	2.15
273	14:46:13	14:46:23	10	2.15
274	14:47:04	14:47:12	8	2.69
275	14:47:22	14:47:31	9	2.39
276	14:47:46	14:47:57	11	1.95
277	14:47:55	14:48:02	7	3.07
278	14:47:56	14:48:06	10	2.15
279	14:47:56	14:48:06	10	2.15
280	14:47:58	14:48:08	10	2.15

281	14:47:58	14:48:08	10	2.15
282	14:48:41	14:48:50	9	2.39
283	14:48:47	14:48:55	8	2.69
284	14:49:10	14:49:21	11	1.95
285	14:49:10	14:49:22	12	1.79
286	14:49:13	14:49:24	11	1.95
287	14:49:13	14:49:24	11	1.95
288	14:49:20	14:49:30	10	2.15
289	14:49:20	14:49:30	10	2.15
290	14:50:19	14:50:27	8	2.69
291	14:51:17	14:51:33	16	1.34
292	14:51:17	14:51:33	16	1.34
293	14:57:38	14:57:46	8	2.69
294	14:53:08	14:53:17	9	2.39
295	14:53:08	14:53:17	9	2.39
296	14:53:09	14:53:19	10	2.15
297	14:53:09	14:53:19	10	2.15
298	14:53:33	14:53:39	6	3.58
299	14:53:41	14:53:51	10	2.15
300	14:53:41	14:53:51	10	2.15
301	14:53:46	14:53:55	9	2.39
302	14:53:46	14:53:55	9	2.39
303	14:53:52	14:54:04	12	1.79
304	14:53:52	14:54:04	12	1.79
305	14:53:54	14:54:03	9	2.39
306	14:53:57	14:54:06	9	2.39
307	14:53:57	14:54:06	9	2.39
308	14:55:08	14:55:16	8	2.69
309	14:55:55	14:56:05	10	2.15
310	14:56:05	14:56:15	10	2.15
311	14:56:05	14:56:15	10	2.15
312	14:56:06	14:56:16	10	2.15
313	14:56:06	14:56:16	10	2.15
314	14:56:10	14:56:19	9	2.39
315	14:56:10	14:56:19	9	2.39
316	14:57:04	14:57:14	10	2.15
317	14:57:30	14:57:42	12	1.79
318	14:57:41	14:57:53	12	1.79
319	14:58:19	14:58:26	7	3.07
320	14:58:57	14:59:05	8	2.69

321	14:58:58	14:59:05	7	3.07
322	14:58:58	14:59:08	10	2.15
323	14:58:58	14:59:08	10	2.15

Pedestrian Space and Density

The Pedestrian Space is the average area provided for each pedestrian in a footpath whereas the density is the average number of pedestrians per unit of area within a footpath. The pedestrian space and density follow an inverse relationship. The pedestrian density data is extracted as follows:

• Density of the area is obtained by counting the total number of pedestrians in the pedestrian grid and dividing it by the area of the pedestrian grid. This is calculated by selecting a random pedestrian in the middle of the pedestrian grid and counting the other pedestrians within the grid. The counted number of pedestrians divided by the grid area gives the pedestrian density. Inverse of the pedestrian density is taken as the pedestrian space.

Pedestrian Flow Rate

• Pedestrian flow rate is the number of pedestrians passing a point per unit time, expressed as pedestrians per hour. The word 'point' refers to a line of sight across the width of a walkway perpendicular to the pedestrian path.

The following table lists the pedestrian characteristics derived for a time period of one hour between 2.00 - 3.00 PM. The traffic volume was observed to be high between 2.00-2.12 and 2.30 - 2.45 PM intervals. The corresponding flow and flow rate id is indicated.

Time	Pedestrian Volume (p)	Effective footpath width (m)	Flow (p/m)	Flow Rate (p/m/Min)
2:00-2:15 PM	163.0	2.7	60.37	4.02
2:15-2:30 PM	136.0	2.7	50.37	3.36
2:30-2:45 PM	165.0	2.7	61.11	4.07
2:45-3:00 PM	128.0	2.7	47.41	3.16

Table	87:	Pedestrian	Characteristics

This study referred Indo-HCM guidelines for deriving the PLoS level. The LOS are defined starting from LOS A to LOS F for each land use in Indian context (refer table below). The range of flow values corresponding to each LoS level for various land use is listed in the guidelines.

			_		(in ped/min/m)
LOS	Commercial	Institutional	Terminal	Recreational	Residential
А	≤ 13	≤ 13	≤ 15	≤ 12	≤ 16
В	> 13-19	> 13 - 19	> 15 - 26	> 12 - 20	> 16 - 23
С	> 19-30	> 19 - 27	> 26 - 32	> 20 - 32	> 23 - 34
D	> 30-47	> 27 - 36	> 32 - 68	> 32 - 54	> 34 - 47
Е	> 41-69	> 36 - 42	> 68 - 78	> 54 - 91	> 47 - 59
F	Variable	Variable	Variable	Variable	Variable

 Table 88: Pedestrian Level of Service [PLoS] – Indo HCM

 Table 9.10: PLOS for Footpaths

The present pedestrian characteristics derived by the study are compared with Indo-HCM guidelines and the PLoS category is identified. The PLoS at Church Street footpath is identified as A. This indicates that the pedestrians move in desired paths without any conflicts with other pedestrians. They are able to walk with selected speed and enjoy sufficient space for their movement.

B. QUALITATIVE ASSESSMENT – DETERMINATION OF WALKABILITY INDEX

The performance of the footpath facility will not be completed without measuring its pedestrian's comfort. The comfort level cannot be measured directly and again varies from pedestrian to pedestrian. The ideal way of quantifying the pedestrian comfort is to interact with them and collectively represent their opinion. One can quantify the pedestrian comfort level by 'Walkability Index' and its related Quality of Service (QoS).

The Walkability Index considers two aspects: significance of available footpath facilities and its satisfaction while experiencing the footpath. The walkability index is calculated as:

Walkability Index (WI) = $A_i \times B_i$

- A_i: importance weightage for physical and user characteristics
- B_i: satisfaction rating for physical and user characteristics

The important physical and user characteristics of the footpath were selected for this analysis and are listed in the table below.

Physical characteristics					
Footpath surface	A smooth surface (without any cracks) for comfortable walking.				
Footpath Width	A measure of width of the footpath available to the pedestrian.				
Obstructions	The number of obstructions per kilometer of the footpath was assessed.				
	Obstruction can be a pole, tree, garbage bin or a parked vehicle etc.				

 Table 89: Design factors considered for Walkability Index

Potential for vehicular conflict	It depends upon the condition of footpath; footpath is well protected, raised, availability of continuous guard rails etc.				
Continuity	ity It can be measured in terms of ups and downs in a particular stretch, kerb height viz., mountable or not.				
	User characteristics				
Encroachment	The informal commercial activities are an integral part of the footpath environment in India. It is due to presence of hawkers on side walk.				
Availability of crossing facilities	It is a measure in terms of availability of signal on at-grade crossing, median refuge, and foot over bridge on road crossing.				
Security	A pedestrian should feel safe during the day as well as at night while using footpath. It can be analyzed by illumination &visibility of footpath, police patrolling day & nighttime, presence of CCTV cameras.				
Walk environment	It is governed by the surroundings of the facility - good plantation, neat &clean walkway free of bad smell. The walking should be pleasant enough for pedestrian.				
Comfort	Facilities on footpath to make pedestrian comfortable from harsh sun & rain. It is measured by availability of trees, public toilets, sitting benches & dustbins on the footpath at proper locations.				

The importance and satisfaction weightage were rated on 1-5 scale, 5 being excellent and 1 being poor. The importance weightage was collected from BBMP officials and other transport planners and the satisfactory weightage from the pedestrians. The opinion survey conducted as part of the study gathers information on pedestrian responses. The collected response of 621 pedestrians on each of the parameter is listed in the following table.

PARAMETER	EXCELLENT	VERY GOOD	GOOD	SATISFACTORY	POOR	Importance
	5	4	3	2	1	Weightage
Footpath surface (1)	Even surface with no cracks, tactile flooring	Reasonable quality	Moderate quality, few bumps & cracks	Very bad condition. Lots of bumps & cracks.	poor	4.6
Responses	147	359	107	7	1	
Footpath width (2)	Sufficient width	Reasonable width	Moderate width	Less width	Inadequa te width	4.5
Responses	143	358	105	13	2	
Obstructions (3)	No obstruction	Very few, no problem in walking	Few, slight difficulty in walking	Many, very difficult to walk	Can't walk on footpath	4.5
Responses	113	363	117	23	5	
Potential for vehicular Conflict (4)	Well protected, no interruption from two wheelers	very few interruption from two wheelers	few interruption from two wheelers	many interruption from two wheelers	Very unsafe	4.5

Table 90: Pedestrian Satisfactory Rating of Church Street

Responses	101	359	127	29	5	
Longitudinal Continuity (5)	Continuous	1-2 ups and downs, curb cuts provided	Few ups & downs, mountable curb	Frequent ups &downs, difficult in curb mounting.	poor	4.5
Responses	113	379	120	8	1	
Encroachment (6)	Separate hawkers zone provided	Hawking on footpath but no problem in walking	Slightly difficult to walk because of encroachment	Very difficult to walk	Cannot walk	4.5
Responses	106	363	128	22	2	
Availability of crossing facilities (7)	Sufficient Crossing facilities, Very Safe to cross the road	slightly difficult to cross the road, but safe	difficult to cross the road, unsafe	very difficult to cross the road, unsafe	Poor Crossing facilities, Very unsafe	4.5
Responses	95	361	126	33	6	
Security (8)	Can walk during any time of day	Can walk till late night.	Can walk only till late evening.	Can walk only during daytime only	Unsafe during day also.	4.5
Responses	85	315	165	32	24	
Comfort (9)	Highly comfortable walk	Comfortable	Satisfactory	Slightly Uncomfortable	Highly Uncomfo rtable	5
Responses	193	319	100	8	1	
Walking Environment (10)	Very pleasant	Pleasant Environment	Satisfactory, very few disturbances	Satisfactory, few disturbances	Poor	5
Responses	209	308	97	6	1	

The collective response of pedestrians regarding satisfaction of using the footpath and user characteristics are graphically presented below. *The footpath on Church Street is rated extremely good for its physical condition and user supportive features.*



Figure 64: Pedestrian Satisfactory Rating of Physical Characteristics on Church Street



Figure 65: Pedestrian Satisfactory Rating of User Characteristics on Church Street

Users expressed satisfaction on factors such as footpath width, surface, and continuity as well as the protection from vehicular conflict. 70-80% positive responses were collected here.

The overall walking environment was rated as followed: 33.65% Excellent, 49.59% Very Good, 15.61% Good and 0.96% Satisfactory. *The satisfactory rating given for pedestrian comfort on Church Street is a clear indication of its usefulness to the public.*

To calculate the Walkability Index, the mean weightage of importance and satisfactory score of each parameter is determined. The values are listed in the table below.

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5	5
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
4.0	4.0	3.8	3.8	4.0	3.8	3.8	3.6	4.1	4.2

Table 91: Input Parameters for the Calculation of WI

The Walkability Index (WI) will be computed as below:

Walkability index (WI) = $\sum_{i=1}^{10} A1 \times B1$

<u>WI =181</u>

The Walkability Index value is calculated as 181 for the Church Street Footpath facility. This also corresponds with the high level of satisfaction expressed by pedestrians. A score of 250 would be the perfect walkability score to attain. The present value of 181 is hence not perfect but an impressively high value and indicates the quality of service. The calculated WI value is identified as Quality of Service, QOS A level, when compared with Indo-HCM guidelines.

Table 92: QOS Level- Indo HCM

Tuble 31111 Quality of bervice for rootputils			
QOS	Walkability Index / Score		
А	≥ 124		
В	< 124 - 106		
С	< 106 - 70		
D	< 70 - 52		
Е	< 52		

Table 9.14: Quality of Service for Footpaths

<u>The Church Street Footpath design and facilities attained its performance level (PLoS A and QoS A) and the users are satisfied with present facilities.</u>

4. INFRASTRUCTURE ASSESSMENT FOR PARKING

By design, Church Street has been provided with parking bays wherever space permits. Nine Parking Bays of varying capacity has been incorporated in the design. The parking bay details are given below. Parking is available for an area of 640 square meter in total.

Parking Bays	Length	Area(m ²)
Parking Bay 1	37	84.52
Parking Bay 2	28	63.82
Parking Bay 3	10.7	18.81
Parking Bay 4	14.3	25.2
Parking Bay 5	14.2	24.21
Parking Bay 6	12.7	22.5
Parking Bay 7	13.7	25.29

Table	93:	Parking	Bav	details
1 4010	/0.	I willing	Duj	actunit

Parking Bay 8	48.7	97.4
Parking Bay 9	51.8	279

Apart from this, many pay & park facilities are also available for users. Most of the shops has parking facilities available for its employees and customers. The details are listed below.

Table 94: Additional Pa	arking Facility details
-------------------------	-------------------------

Parking Facilities	
Shops having parking facilities	32
only for employees	
Shops having parking facilities	28
for customers	
Pay and Park Facilities	3 Brigade gardens, Shelton
	Hotel next to metro station
	and the Cross Road near to
	Adigas Hotel

Recently Traffic Police has banned on street parking on Church Street and has reinforced the same by placing no parking boards. This move has resulted into a severe on-street parking issue at Church Street and its crossroads. This study performed a Parking survey to identify the parking demand at Church Street.

A parking survey was conducted for 16 hours (7:30 AM to 11:30 PM) on two weekdays and weekends. A license plate survey was adopted for the survey. The type of vehicles, the registration number plate, type of parking and the parking duration was noted during the survey.

Though parking is banned on all bays, the bays towards the exit of Church Street was found to be functional. In another words, the on-street parking was more at 570 m where parking bays were not utilized. The study did a detailed analysis wherein parking demand was calculated for on-street parking segments and the parking bay utilization was calculated at segment 2, towards the exit of Church Street.









Segment 1: On Street Parking



Segment 2: Existing Parking BayUtilization

Figure 66: Parking Study Segments

Segment1

The first segment starts from brigade road to museum road located at around 570 m from entry. The crossroads were also considered as the study team could observe severe on-street parking at crossroad too. The data collected for four days i.e. two weekends and weekdays on this segment is listed in the following table.

Table 95: Number of vehicles parked on segment 1 (Main Street)

	DAY 1	DAY 2	DAY 3	DAY 4
Time	Thursday	Friday	Saturday	Sunday
	(01-08-19)	(02-08-19)	(03-08-19)	(04-08-19)

	Two- Wheeler	Auto	Car	LCV	HCV	Two-Wheeler	Auto	Car	LCV	HCV	Two-Wheeler	Auto	Car	LCV	HCV	Two-Wheeler	Auto	Car	LCV	HCV
7:30	0	0	0	0	0	11	3	2	2	1	1	1	1	1	0	0	0	0	1	0
8:00	3	0	0	2	0	11	3	2	2	1	0	2	3	3	0	1	0	0	1	0
8:30	0	0	0	1	0	5	2	2	3	1	3	0	6	7	0	0	0	1	1	0
9:00	3	0	0	2	0	4	3	1	2	1	2	0	8	3	0	3	0	1	0	0
9:30	1	0	0	2	0	4	2	1	1	1	1	1	8	4	0	2	0	1	0	0
10:00	4	1	0	1	0	5	2	1	1	1	10	2	10	3	0	0	0	0	0	0
10:30	3	0	0	3	0	2	1	2	3	1	2	1	7	2	0	0	0	0	0	0
11:00	7	1	1	2	0	1	1	2	4	0	7	1	13	1	0	1	0	1	4	0
11:30	13	0	4	1	0	4	1	0	1	2	2	0	13	2	0	1	0	1	4	0
12:00	12	0	6	1	0	5	2	1	5	2	6	0	5	1	0	1	0	1	4	0
12:30	6	0	6	1	0	2	0	1	2	2	6	0	7	1	0	0	0	0	0	1
13:00	3	0	6	1	0	13	1	11	3	2	4	0	7	1	0	0	0	0	0	1
13:30	0	0	5	1	0	14	3	18	1	1	0	0	10	1	0	0	0	0	0	0
14:00	0	0	3	1	0	20	3	36	0	1	0	0	12	1	0	0	0	0	0	0
14:30	2	0	9	2	0	21	0	38	5	1	0	0	14	0	0	0	0	0	0	0
15:00	13	3	5	1	0	16	2	45	1	1	1	0	13	0	0	0	0	0	0	0
15:30	14	3	0	1	0	27	3	22	1	1	1	0	/	0	0	0	0	0	0	0
16:00	5	0	6	0	0	32	1	32	1	0	10	2	9 21	0	0	7	0	0	0	0
10:50	0	0	1	0	0	7	3	10	1	$\frac{0}{2}$	10	2	25	0	0	2	0	0	0	0
17.00	15	0	8	0	0	31	1	31	0	1	2	0	13	0	0	8	0	7	0	0
18.00	19	0	14	0	0	20	3	30	1	2	2	0	3	0	0	8	0	16	0	0
18:30	11	0	13	0	0	13	0	15	0	0	0	0	1	0	0	6	0	16	0	0
19:00	6	0	13	0	0	10	0	19	0	0	3	0	1	0	0	7	1	24	0	0
19:30	5	3	12	0	0	15	0	20	0	0	1	0	1	0	0	2	0	10	0	0
20:00	2	1	13	0	0	10	0	21	0	0	4	0	1	0	0	0	0	22	0	0
20:30	5	4	22	0	0	7	3	18	0	0	1	0	1	0	0	2	2	14	0	0
21:00	6	0	9	0	0	3	0	5	0	0	0	0	1	0	0	1	0	13	0	0
21:30	3	0	6	0	0	3	0	4	0	0	0	0	1	0	0	0	0	0	0	0
22:00	0	0	0	0	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0
22:30	0	0	0	0	0	5	0	2	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUM	16 1	16	16 2	23	0	34 9	43	43 3	3 8	25	82	10	22 9	31	0	52	3	12 8	15	2
$\sum_{\mathbf{M}} \mathbf{SU}$			362					888					352					200		

While on-street parking was observed to be high on Friday, parking was comparatively lesser on other weekdays and Saturdays. Sunday experienced even lesser parking demand.

To evaluate on-street parking service and related issues, this study manually collected data on the following parking characteristics: parking demand⁷, parking volume, parking duration etc.

- The **parking demand** in this study means the maximum number of vehicles that are parked at the same time on the segment.
- The **parking volume** is the sum of the parked vehicles in the survey day.
- The **parking duration** refers to the average time span during which a vehicle is parked on the segment.

Notably, different types of vehicles are parked together on a street segment. Thus, in statistical analyses, this study did not directly use the counts of the vehicles, but the summed area (m²) based on the actual size of each vehicle, which was manually measured by fieldworkers. The area is also presented in equivalent car space [ECS] too. The following table lists the parking demand, volume and duration.

	DA	Y 1	DA	Y 2	DA	Y 3	DA	Y 4
Time	Demand		Demand		Demand		Demand	
	(m ²)	ECS	(m ²)	ECS	(m ²)	ECS	(m ²)	ECS
7:30	0	0	97.1	9.75	26.5	2.65	10	1
8:00	26	2.6	97.1	9.75	69	6.9	12	1.2
8:30	10	1	90.6	9.1	136	13.6	20	2
9:00	26	2.6	73.1	7.35	114	11.4	16	1.6
9:30	22	2.2	58.6	5.9	126.5	12.65	14	1.4
10:00	22.5	2.25	60.6	6.1	159	15.9	0	0
10:30	36	3.6	80.1	8.05	98.5	9.85	0	0
11:00	48.5	4.85	66.5	6.65	158.5	15.85	52	5.2
11:30	76	7.6	65.7	4.45	154	15.4	52	5.2
12:00	94	9.4	122.2	10.1	72	7.2	52	5.2
12:30	82	8.2	77.2	5.6	92	9.2	21.6	2.2
13:00	76	7.6	213.7	19.25	88	8.8	21.6	2.2
13:30	60	6	253.1	25.35	80	8	0	0
14:00	40	4	435.1	43.55	130	13	0	0
14:30	114	11.4	473.6	47.4	140	14	0	0
15:00	99.5	9.95	522.6	52.3	132	13.2	0	0
15:30	51.5	5.15	409.1	40.95	72	7.2	0	0
16:00	0	0	398.5	39.85	92	9.2	0	0
16:30	70	7	344	34.4	339	33.9	14	1.4
17:00	10	1	180.7	18.15	274	27.4	4	0.4
17:30	110	11	398.1	39.85	134	13.4	86	8.6
18:00	178	17.8	406.7	40.75	34	3.4	176	17.6
18:30	152	15.2	176	17.6	10	1	172	17.2
19:00	142	14.2	210	21	16	1.6	258.5	25.85
19:30	143.5	14.35	230	23	12	1.2	104	10.4
20:00	138.5	13.85	230	23	18	1.8	220	22
20:30	248	24.8	207.5	20.75	12	1.2	153	15.3
21:00	102	10.2	56	5.6	10	1	132	13.2
21:30	66	6.6	46	4.6	10	1	0	0

Table 96: Parking Demand at Main Street (m²/30 minutes)

⁷ Calculating parking demand for church street alone was a difficult task. A user would like to park at Church Street even if he/she wants to access neighboring roads like MG Road, Brigade etc. Hence the present study defines demand as the occupied street area of parked vehicles at Church Street.

22:00	0	0	32	3.2	0	0	0	0
22:30	0	0	30	3	0	0	0	0
23:00	0	0	0	0	0	0	0	0
23:30	0	0	0	0	0	0	0	0

The parking demand varied not only across the day but also across the week. On an average, the highest demand was observed on Friday. The highest parking demand was 522.6 m^2 which is equivalent to parking 52 cars.

DAYS	Cars	Two-Wheelers	Auto	LCV	HCV	PARKING VOLUME
DAY 1 Thursday (01-08-19)	226	1020	58.5	90	0	1394.5
DAY 2 Friday (02-08-19)	388	2670	121.5	220	43.2	3442.7
DAY 3 Saturday (03-08-19)	120	1140	27	160	0	1447
DAY 4 Sunday (04-08-19)	80	960	13.5	70	21.6	1145.1

Table 97: Parking Volume (m²/day)

In parking volume, the area occupied by vehicles parked on each day is summarized. An area of 3442.7 m^2 area is occupied for on-street parking. This is a serious concern and considerably reduces the capacity of road.

The parking duration of vehicles is analyzed and summarized in the following chart.



Figure 67: Parking Duration

It was observed that 60-70% of the vehicles parks for a short time interval, say less than 30 minutes. On weekends, study could observe that long duration parking was quite significant.

The following section analyzes the on-street parking at crossroads. Two crossroads were considered – one leading from Rest house Cres Road and second one from Museum Road. Both these crossroads connect to MG road. The data has been collected and analyzed for each crossroad separately.

		1 Th (01	DAY 1 aursda 1-08-1	iy 9)]] (0)	DAY 2 Friday 2-08-1	2 y 9)			I Sa (0)	DAY 3 iturda 3-08-1	; iy 9)			E S (04	DAY 4 unday I-08-1	7 7 9)	
Time	Two- Wheeler	Auto	Car	LCV	HCV	Two- Wheeler	Auto	Car	TCV	HCV	Two- Wheeler	Auto	Car	LCV	HCV	Two- Wheeler	Auto	Car	LCV	HCV
7:30	14	1	31	2	0	7	2	13	2	0	13	0	17	1	0	18	0	8	3	0
8:00	16	1	33	3	0	9	1	28	2	0	16	0	17	1	0	19	0	8	3	0
8:30	25	2	35	3	0	37	2	31	0	0	14	1	17	1	0	20	0	8	2	0
9:00	43	2	43	1	0	49	2	49	0	0	22	2	21	0	0	21	0	10	1	0
9:30	42	2	44	1	0	47	0	38	0	0	43	2	22	0	0	20	0	10	1	0
10:00	85	2	45	1	0	50	0	37	0	0	44	2	22	0	0	14	0	5	0	0
10:30	159	2	52	2	0	70	0	36	0	0	78	2	28	0	0	15	0	8	0	0
11:00	163	2	53	2	0	88	2	41	0	0	77	3	33	0	0	17	0	8	0	0
11:30	161	3	52	2	0	88	2	40	0	0	76	4	33	0	0	17	0	8	0	0
12:00	168	1	49	0	0	80	2	43	0	0	79	2	33	0	0	46	0	8	0	0
12:30	170	2	43	0	0	85	2	45	0	0	79	2	32	0	0	45	0	9	0	0
13:00	169	2	43	0	0	108	2	46	0	0	80	1	34	1	0	52	0	17	0	0
13:30	169	2	43	0	0	111	0	3/	0	0	36	2	28	0	0	64	1	15	0	0
14:00	173	2	30	0	0	110	1	30	0	0	107	1	32	1	0	49	1	14	0	0
14:50	174	$\frac{2}{2}$	43 50	0	0	77	1	42	0	0	91 80	1	25	2	0	36	0	27	0	0
15.00	174	$\frac{2}{2}$	49	0	0	5	1	42	1	1	91	1	25	1	0	40	0	27	1	0
16.00	130	0	2	0	0	97	2	9	0	0	115	3	7	0	0	109	2	9	0	0
16:30	126	0	2	0	0	93	2	9	0	0	109	3	8	0	0	113	2	9	0	0
17:00	119	0	2	0	0	91	0	6	0	0	103	3	7	0	0	115	2	9	0	0
17:30	118	0	6	0	0	75	0	5	0	0	100	3	7	0	0	114	2	9	0	0
18:00	110	0	9	0	0	70	3	10	0	0	109	2	7	0	0	109	2	9	0	0
18:30	110	0	11	0	0	49	0	2	0	0	113	2	7	0	0	100	2	8	0	0
19:00	102	1	9	0	0	46	0	3	0	0	133	2	7	0	0	99	2	7	0	0
19:30	92	3	11	0	0	32	0	2	0	0	133	2	7	0	0	94	2	7	0	0
20:00	74	3	12	0	0	22	0	0	0	0	129	2	5	0	0	89	2	6	0	0
20:30	67	1	10	0	0	16	0	0	0	0	106	1	5	0	0	81	2	5	0	0
21:00	39	1	8	0	0	13	0	0	0	0	36	1	2	0	0	76	2	5	0	0
21:30	30	0	5	0	0	12	0	0	0	0	29	1	2	0	0	73	2	5	0	0
22:00	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22:30	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUM	3195	4	833	17	0	1756	27	658	5	1	2250	51	522	522 9 0 1709 26 276 11			11	0		
$\sum_{\mathbf{M}} \mathbf{SU}$			4086					2447					2832					2022		

Table 98: Number of vehicles parked on segment 1 (Cross Road 1- Rest House Cres Road)

Table 99: Number of vehicles parked on segment 1 (Cross Road 2- from Museum Road)

		1 T1 (0)	DAY 1 hursd 1-08-1	1 ay 19)			[] (0)	DAY 2 Friday 2-08-1	2 y 19)			1 Sa (0	DAY 3 aturda 3-08-1	3 ay 19)			1 S (04	DAY 4 Sunda 4-08-1	4 y .9)	
Time	Two- Wheeler	Auto	Car	LCV	HCV	Two-Wheeler	Auto	Car	LCV	HCV	Two-Wheeler	Auto	Car	LCV	HCV	Two-Wheeler	Auto	Car	LCV	HCV
7:30	0	1	18	10	0	2	1	23	0	10	0	0	4	0	2	0	0	1	4	0

8:00	0	2	18	11	0	2	1	23	0	10	0	1	17	0	3	0	0	2	4	0
8:30	2	3	21	13	0	1	1	26	4	11	3	1	11	0	3	0	0	3	5	0
9:00	6	2	16	14	0	1	2	26	4	11	3	0	12	1	3	0	0	3	7	0
9:30	10	5	15	13	0	2	2	26	4	11	3	1	12	2	3	0	0	4	2	0
10:00	21	5	16	15	0	9	6	23	4	5	5	3	12	3	3	1	1	6	3	0
10:30	22	6	17	17	0	13	9	26	6	5	4	0	12	2	3	0	0	5	3	0
11:00	22	1	17	16	0	18	10	26	9	5	5	0	17	2	2	0	0	4	3	0
11:30	28	2	31	3	0	18	9	25	9	5	6	0	17	4	3	0	0	4	2	0
12:00	21	1	17	15	1	12	0	1	2	0	7	0	27	4	3	1	0	1	3	0
12:30	23	2	20	15	1	17	0	1	2	0	5	0	25	3	3	2	0	3	2	0
13:00	22	3	20	14	1	25	0	14	4	0	6	0	31	4	2	1	0	1	2	0
13:30	19	0	18	10	0	25	0	14	4	1	6	0	30	4	2	0	0	2	2	0
14:00	22	4	36	9	0	22	2	14	2	1	6	0	27	3	2	0	0	2	2	0
14:30	21	4	33	9	0	21	2	13	2	1	5	0	15	3	2	0	1	3	2	0
15:00	27	0	29	4	0	16	1	14	1	1	10	0	24	4	2	1	0	4	2	0
15:30	28	3	34	4	0	16	1	12	1	1	10	0	24	4	2	0	0	4	2	0
16:00	35	2	45	0	0	17	2	46	1	0	6	0	23	0	0	3	0	3	0	0
16:30	19	0	34	0	0	16	1	35	0	0	2	0	17	0	0	5	0	8	0	0
17:00	19	0	26	0	0	13	2	8	0	0	2	0	17	0	0	6	0	6	0	0
17:30	19	0	17	0	0	20	3	41	0	0	0	0	19	0	0	4	0	10	0	0
18:00	16	1	17	0	0	15	0	41	0	0	0	0	13	0	0	4	0	8	0	0
18:30	11	0	9	0	0	12	5	11	0	0	0	0	14	0	0	6	0	7	0	0
19:00	11	0	9	0	0	8	6	15	0	0	0	0	9	0	0	4	0	10	0	0
19:30	10	2	9	0	0	15	0	20	0	0	0	0	10	0	0	1	1	9	0	0
20:00	9	2	10	0	0	10	0	21	0	0	0	0	7	0	0	0	0	5	0	0
20:30	3	0	5	0	0	8	2	18	0	0	0	0	6	0	0	0	0	3	0	0
21:00	2	0	3	0	0	3	1	4	0	0	0	0	6	0	0	0	0	1	0	0
21:30	3	0	3	0	0	4	0	3	0	0	0	0	4	0	0	0	0	0	0	0
22:00	0	0	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0
22:30	0	0	0	0	0	4	0	3	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:30	0	0	0	0	0	7	3	11	0	0	0	0	0	0	0	0	0	0	0	0
SUM	451	51	563	192	3	379	72	585	59	78	94	6	462	43	43	39	3	122	50	0
∑SUM			1260					1173					648					214		

The parking was severe at Rest House Cres crossroad which leads to MG road. It is quite difficult to separate the parking for MG road and Church Street. Since the surrounding area is filled with high commercial activity, users were parking on-street wherever they found a space. The following table lists the parking demand, volume and duration.

	DA	Y 1	DA	Y 2	DA	Y 3	DA	Y 4
Time	Demand		Demand		Demand		Demand	
	(m ²)	ECS	(m ²)	ECS	(m ²)	ECS	(m ²)	ECS
7:30	362.5	36.25	173	17.3	206	20.6	146	14.6
8:00	396.5	39.65	322.5	32.25	212	21.2	148	14.8
8:30	439	43.9	393	39.3	212.5	21.25	140	14
9:00	535	53.5	597	59.7	263	26.3	152	15.2
9:30	543	54.3	474	47.4	315	31.5	150	15
10:00	639	63.9	470	47	317	31.7	78	7.8
10:30	867	86.7	500	50	445	44.5	110	11
11:00	885	88.5	595	59.5	497.5	49.75	114	11.4
11:30	875.5	87.55	585	58.5	500	50	114	11.4
12:00	830.5	83.05	599	59.9	497	49.7	172	17.2
12:30	779	77.9	629	62.9	487	48.7	180	18

Table 100: Parking Demand at Crossroad 1 ($m^2/30$ minutes)

13:00	777	77.7	685	68.5	514.5	51.45	174	17.4
13:30	777	77.7	592	59.2	361	36.1	282.5	28.25
14:00	735	73.5	600	60	548.5	54.85	242.5	24.25
14:30	787	78.7	644.5	64.45	512	51.2	208	20.8
15:00	857	85.7	578.5	57.85	452.5	45.25	342	34.2
15:30	845	84.5	106.1	10.65	446.5	44.65	320	32
16:00	280	28	293	29.3	313.5	31.35	317	31.7
16:30	272	27.2	285	28.5	311.5	31.15	325	32.5
17:00	258	25.8	242	24.2	289.5	28.95	329	32.9
17:30	296	29.6	200	20	283.5	28.35	327	32.7
18:00	310	31	253.5	25.35	297	29.7	317	31.7
18:30	330	33	118	11.8	305	30.5	289	28.9
19:00	298.5	29.85	122	12.2	345	34.5	277	27.7
19:30	307.5	30.75	84	8.4	345	34.5	267	26.7
20:00	281.5	28.15	44	4.4	317	31.7	247	24.7
20:30	238.5	23.85	32	3.2	266.5	26.65	221	22.1
21:00	162.5	16.25	26	2.6	96.5	9.65	211	21.1
21:30	110	11	24	2.4	82.5	8.25	205	20.5
22:00	0	0	12	1.2	0	0	0	0
22:30	0	0	6	0.6	0	0	0	0
23:00	0	0	0	0	0	0	0	0
23:30	0	0	0	0	0	0	0	0

Table 101: Parking Demand at Crossroad 2 (m²/30 minutes)

	DA	Y 1	DA	Y 2	DA	Y 3	DA	Y 4
Time	Demand		Demand		Demand		Demand	
	(m ²)	ECS	(m ²)	ECS	(m ²)	ECS	(m ²)	ECS
7:30	284.5	28.45	454.5	45.85	83.2	8.4	50	5
8:00	299	29.9	454.5	45.85	239.3	24.05	60	6
8:30	357.5	35.75	544.1	54.85	185.3	18.65	80	8
9:00	321	32.1	548.6	55.3	200.8	20.2	100	10
9:30	322.5	32.25	550.6	55.5	215.3	21.65	60	6
10:00	374.5	37.45	423	42.5	238.3	23.95	96.5	9.65
10:30	411	41.1	494.5	49.65	212.8	21.4	80	8
11:00	378.5	37.85	539	54.1	243.2	24.4	70	7
11:30	405	40.5	524.5	52.65	286.8	28.8	60	6
12:00	388.1	38.85	54	5.4	388.8	39	42	4.2
12:30	426.6	42.7	64	6.4	354.8	35.6	54	5.4
13:00	419.1	41.95	230	23	405.2	40.6	32	3.2
13:30	318	31.8	251.6	25.2	395.2	39.6	40	4
14:00	512	51.2	234.6	23.5	355.2	35.6	40	4
14:30	480	48	222.6	22.3	233.2	23.4	54.5	5.45
15:00	384	38.4	208.1	20.85	343.2	34.4	62	6.2
15:30	449.5	44.95	188.1	18.85	343.2	34.4	60	6
16:00	529	52.9	513	51.3	242	24.2	36	3.6
16:30	378	37.8	386.5	38.65	174	17.4	90	9
17:00	298	29.8	115	11.5	174	17.4	72	7.2
17:30	208	20.8	463.5	46.35	190	19	108	10.8
18:00	206.5	20.65	440	44	130	13	88	8.8
18:30	112	11.2	156.5	15.65	140	14	82	8.2
19:00	112	11.2	193	19.3	90	9	108	10.8
19:30	119	11.9	230	23	100	10	96.5	9.65
20:00	127	12.7	230	23	70	7	50	5

20:30	56	5.6	205	20.5	60	6	30	3
21:00	34	3.4	50.5	5.05	60	6	10	1
21:30	36	3.6	38	3.8	40	4	0	0
22:00	0	0	24	2.4	0	0	0	0
22:30	0	0	38	3.8	0	0	0	0
23:00	0	0	0	0	0	0	0	0
23:30	0	0	137.5	13.75	0	0	0	0

While parking demand varied across the day it also varied across the week. However, Cross Road 1 was in demand on all days. The following table lists the parking volume on crossroads.

DAYS	Cars	Two-Wheelers	Auto	LCV	HCV	PARKING VOLUME
DAY 1 Thursday (01-08-19)	790	524	45	0	0	1359
DAY 2 Friday (02-08-19)	890	720	36	50	0	1696
DAY 3 Saturday (03-08-19)	910	882	54	40	0	1886
DAY 4 Sunday (04-08-19)	500	584	13.5	30	0	1114

Table 102: Parking Volume at Cross road 1 (m²/day)

Table 103: Parking Volume at Cross road 2 (m²/day)

DAYS	Cars	Two-Wheelers	Auto	LCV	HCV	PARKING VOLUME
DAY 1 Thursday (01-08-19)	2720	364	234	240	21.6	3579.6
DAY 2 Friday (02-08-19)	1660	204	139.5	220	21.6	2245.1
DAY 3 Saturday (03-08-19)	50	52	562.5	100	86.4	850.9
DAY 4 Sunday (04-08-19)	330	28	13.5	80	0	451.5

In parking volume, the area occupied by vehicles parked on each day is summarized. The on-street parking was more on Cross road 2. An area of 3579 square meter was occupied on Thursday. On crossroad 1, it was more of two-wheelers while cars were more in numbers on crossroad 2. The presence of LCV and HCV is to be noted. On weekends, the utilization found was considerably reduced.

The parking duration of vehicles is analyzed and summarized in the following chart. The parking duration also varied at both crossroads. Long term parking (>180 mint.) was observed at Cross Road 1while at crossroad 2, it was mixed in nature.



Figure 68: Parking Duration at Cross road 1



Figure 69: Parking Duration at Cross road 2

Segment 2

Segment 2 is from Museum Road to St. Mark's road measuring a distance of around 110m where parking bays are used for parking. Segment 2 consists of two parking bays on Left side and Right Side. Right parking bay, all categories of vehicle were parked whereas in the left parking bay only cars were parked.



LHS- Parking Bay – 279 m²

RHS- Parking Bay - 97.4 m²

The parking volume (m^2/day) for both LHS and RHS parking bays are listed in the following table.

DAYS	Cars	Two-Wheelers	Auto	LCV	HCV	PARKING VOLUME
DAY 1 Thursday (01-08-19)	390	94	9	30	0	523
DAY 2 Friday (02-08-19)	280	40	9	20	21.6	370.6
DAY 3 Saturday (03-08-19)	220	70	31.5	0	0	321.5
DAY 4 Sunday (04-08-19)	350	62	31.5	10	0	453.5

Table 104: RHS – Parking Bay – Parking Volume (m²/day)

Table 105: LHS – Parking Bay – Parking Volume (m²/day)

DAYS	Cars	Two-Wheelers	Auto	LCV	HCV	PARKING VOLUME
DAY 1 Thursday (01-08-19)	700	12	4.5	0	0	716.5
DAY 2 Friday (02-08-19)	700	2	4.5	30	0	736.5
DAY 3 Saturday (03-08-19)	850	6	0	0	0	856
DAY 4 Sunday (04-08-19)	920	10	18	0	0	948

The parking duration (minutes) for both LHS and RHS parking bays are summarized in the following charts.



Figure 70: Parking Duration – RHS Parking Bay



Figure 71: Parking Duration – LHS Parking Bay

The parking volume was high on LHS parking bays. There were a greater number of cars utilizing those bays. The parking duration was also observed to be more at these parking lots. The parking duration extended from 30-90 minutes and more. Since the parking was free, most of the users were found using the facility according to their convenience.

The efficiency of the parking lots is summarized in the following table. The area occupied at different time duration is calculated and the utilization is identified.

		Day 1 Thursday 01-08-19)		(Day 2 Friday 02-08-19)		(Day 3 Saturday (03-08-19))		Day 4 Sunday (04-08-19))
Time	Area available (m ²)	Area Occupied (m ²)	Percenta ge	Area available (m ²)	Area Occupied (m ²)	Percenta ge	Area available (m ²)	Area Occupied (m ²)	Percenta ge	Area available (m ²)	Area Occupied (m ²)	Percenta ge
7:30	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0
8:00	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0
8:30	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0
9:00	97.4	14.5	14.9	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0
9:30	97.4	14.5	14.9	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0

Table 106: Parking Utilization at RHS Parking Bay

10:00	97.4	6	6.2	97.4	2	2.1	97.4	0	0.0	97.4	4	4.1
10:30	97.4	8	8.2	97.4	0	0.0	97.4	0	0.0	97.4	4	4.1
11:00	97.4	38	39.0	97.4	10	10.3	97.4	2	2.1	97.4	0	0.0
11:30	97.4	2	2.1	97.4	2	2.1	97.4	2	2.1	97.4	26.5	27.2
12:00	97.4	18	18.5	97.4	6	6.2	97.4	16	16.4	97.4	26.5	27.2
12:30	97.4	14	14.4	97.4	6.5	6.7	97.4	16	16.4	97.4	26.5	27.2
13:00	97.4	26	26.7	97.4	6	6.2	97.4	2	2.1	97.4	26.5	27.2
13:30	97.4	26	26.7	97.4	14	14.4	97.4	2	2.1	97.4	26.5	27.2
14:00	97.4	26	26.7	97.4	6	6.2	97.4	6	6.2	97.4	26.5	27.2
14:30	97.4	26	26.7	97.4	6	6.2	97.4	16	16.4	97.4	24	24.6
15:00	97.4	26	26.7	97.4	30	30.8	97.4	10	10.3	97.4	24	24.6
15:30	97.4	24	24.6	97.4	30	30.8	97.4	10	10.3	97.4	24	24.6
16:00	97.4	48	49.3	97.4	10	10.3	97.4	10	10.3	97.4	6	6.2
16:30	97.4	110	112.9	97.4	80	82.1	97.4	36.5	37.5	97.4	39.5	40.6
17:00	97.4	40	41.1	97.4	90	92.4	97.4	28	28.7	97.4	127.5	130.9
17:30	97.4	56	57.5	97.4	6	6.2	97.4	28	28.7	97.4	30.5	31.3
18:00	97.4	68	69.8	97.4	6	6.2	97.4	47	48.3	97.4	30.5	31.3
18:30	97.4	26	26.7	97.4	20	20.5	97.4	51.5	52.9	97.4	46	47.2
19:00	97.4	18	18.5	97.4	24.5	25.2	97.4	89	91.4	97.4	28	28.7
19:30	97.4	8.5	8.7	97.4	30	30.8	97.4	20	20.5	97.4	36.5	37.5
20:00	97.4	70	71.9	97.4	30	30.8	97.4	41	42.1	97.4	40	41.1
20:30	97.4	12	12.3	97.4	44	45.2	97.4	0	0.0	97.4	42	43.1
21:00	97.4	0	0.0	97.4	108	110.9	97.4	0	0.0	97.4	54	55.4
21:30	97.4	0	0.0	97.4	4	4.1	97.4	0	0.0	97.4	10	10.3
22:00	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	10	10.3
22:30	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	10	10.3
23:00	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0
23:30	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0	97.4	0	0.0

Table 107: Parl	ting Utilization	at LHS I	Parking Bay
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		Day 1 Fhursda 01-08-19	y))	(Day 2 Friday 02-08-19)			Day 3 Saturday (03-08-19	,)		Day 4 Sunday (04-08-19)
Time	Area available (m ²)	Area Occupied (m ²)	Percentage	Area available (m ²)	Area Occupied (m ²)	Percentage	Area available (m ²)	Area Occupied (m ²)	Percentage	Area available (m ²)	Area Occupied (m ²)	Percentage
7:30	279.5	0	0.0	279.5	0	0.0	279.5	0	0.0	279.5	0	0.0
8:00	279.5	0	0.0	279.5	0	0.0	279.5	0	0.0	279.5	25	8.9
8:30	279.5	0	0.0	279.5	0	0.0	279.5	0	0.0	279.5	37.5	13.4
9:00	279.5	0	0.0	279.5	0	0.0	279.5	0	0.0	279.5	87.5	31.3
9:30	279.5	12.5	4.5	279.5	12.5	4.5	279.5	0	0.0	279.5	75	26.8
10:00	279.5	25	8.9	279.5	25	8.9	279.5	0	0.0	279.5	50	17.9
10:30	279.5	25	8.9	279.5	25	8.9	279.5	0	0.0	279.5	25	8.9
11:00	279.5	150	53.7	279.5	150	53.7	279.5	100	35.8	279.5	187.5	67.1
11:30	279.5	137.5	49.2	279.5	137.5	49.2	279.5	50	17.9	279.5	25	8.9
12:00	279.5	125	44.7	279.5	125	44.7	279.5	112.5	40.3	279.5	125	44.7
12:30	279.5	150	53.7	279.5	150	53.7	279.5	112.5	40.3	279.5	125	44.7
13:00	279.5	150	53.7	279.5	150	53.7	279.5	187.5	67.1	279.5	125	44.7
13:30	279.5	150	53.7	279.5	150	53.7	279.5	187.5	67.1	279.5	125	44.7
14:00	279.5	150	53.7	279.5	150	53.7	279.5	175	62.6	279.5	125	44.7
14:30	279.5	150	53.7	279.5	150	53.7	279.5	175	62.6	279.5	125	44.7
15:00	279.5	150	53.7	279.5	150	53.7	279.5	137.5	49.2	279.5	125	44.7
15:30	279.5	150	53.7	279.5	150	53.7	279.5	25	8.9	279.5	125	44.7

16:00	279.5	162.5	58.1	279.5	162.5	58.1	279.5	12.5	4.5	279.5	200	71.6
16:30	279.5	87.5	31.3	279.5	87.5	31.3	279.5	200	71.6	279.5	187.5	67.1
17:00	279.5	150	53.7	279.5	150	53.7	279.5	175	62.6	279.5	250	89.4
17:30	279.5	137.5	49.2	279.5	137.5	49.2	279.5	162.5	58.1	279.5	112.5	40.3
18:00	279.5	150	53.7	279.5	150	53.7	279.5	225	80.5	279.5	162.5	58.1
18:30	279.5	162.5	58.1	279.5	162.5	58.1	279.5	275	98.4	279.5	137.5	49.2
19:00	279.5	125	44.7	279.5	125	44.7	279.5	237.5	85.0	279.5	75	26.8
19:30	279.5	112.5	40.3	279.5	112.5	40.3	279.5	262.5	93.9	279.5	137.5	49.2
20:00	279.5	100	35.8	279.5	100	35.8	279.5	287.5	102.9	279.5	87.5	31.3
20:30	279.5	62.5	22.4	279.5	62.5	22.4	279.5	175	62.6	279.5	112.5	40.3
21:00	279.5	37.5	13.4	279.5	37.5	13.4	279.5	125	44.7	279.5	50	17.9
21:30	279.5	25	8.9	279.5	25	8.9	279.5	25	8.9	279.5	37.5	13.4
22:00	279.5	0	0	279.5	0	0	279.5	0	0	279.5	0	0
22:30	279.5	0	0	279.5	0	0	279.5	0	0	279.5	0	0
23:00	279.5	0	0	279.5	0	0	279.5	0	0	279.5	0	0
23:30	279.5	0	0	279.5	0	0	279.5	0	0	279.5	0	0

On-street parking is a serious issue at Church Street which needs immediate attention. It is observed that parking demand on Church Street is high but the restriction on designed parking bays are resulting in on-street parking taking space from the carriageway that reduces the capacity of the carriageway. Since the parking is free users are not worried about the duration of parking.

On-street parking and related parking issues is not a problem in isolation on Church Street but is a problem common to all popular commercial streets. Unfortunately, the parking demand street is surplus of the supply and it distorts the equilibrium. A multilevel car parking is something stake holders can think of as one of the solutions. But with a sustainable approach, one should think about various strategies to reduce the parking demand. A comprehensive study is required in this aspect.

To resolve Church Street parking issues, the existing parking bays can be converted to functional bays with pricing. Formulas can be worked out for fixing base price and dynamic variation can be considered to manage the parking demand.

5. CURRENT ISSUES/CONCERNS AT CHURCH STREET

This section analyzes the current issues prevailing at Church Street which needs to be improved for better functioning of street activities.

A. VIOLATION OF RESTRICTED VEHICULAR MOVEMENT

Church Street operates as a one-way road but is regularly violated. Violations were more visible among two-wheelers, cars, and autos. The following graph summarizes the violations occurring amongst two-wheelers, cars, and autos. 20-30% of vehicles were violating the one-way rule. This results in severe vehicular conflicts as well as pedestrian-vehicle conflicts (see the images below). Strict monitoring and enforcement is required to alleviate this issue.



Two wheeler volume count and vioaltions to one way movement

Figure 72: Two-wheeler Volume Count and violations to one-way movement



Figure 73: Car Volume Count and violations to one-way movement



Figure 74: Auto Volume Count and violations to one-way movement



Figure 75: Violations to one-way movement and Conflicts

B. MAINTENANCE AND OTHER ISSUES

The maintenance of the street should be made more rigorous and effective. Many of the bins installed at the time of redevelopment have been broken and requires replacement. It is also necessary to provide separate bins for wet and dry waste. The waste should be cleared from the bins on alternate days. It was also observed that at several places, the cobblestones were damaged and needed repair or replacement. It was observed that service vans while offloading heavy cylinders and beer kegs were damaging the paving. The on-street plantations also needs regular maintenance.





Figure 76: Issues related to maintenance

There are several stalls that have opened on Church Street that sells cigarettes and these spots have also emerged as smoking zones creating discomfort to pedestrians. Most of the pedestrian responded during opinion survey that they face a lot of difficulty negotiating their walk around smoking corners. The stalls are street vendors or small makeshift stalls with no licensing. Smoking is public places is illegal as per law and the same must be enforced without fail.



The other issue is the haphazard parking of on-demand vehicles like ola/uber taxis, bounce vehicles and food delivery bikes that park according to their convenience. A zone can be designated on

cross roads for parking on shared bikes and hail taxis but delivery vehicles must be enforced to use parking within respective buildings.



6. PUBLIC PERCEPTION

When a project is implemented it is essential to collect response or feedback from the user's perspective. The "user" can be either directly or indirectly be affected by the project. In most cases, an Opinion Survey with well framed questions will serve this purpose. For this project, the prime focus was on pedestrians, shopkeepers, residents and cyclists. To capture their perception of the project, an opinion survey was carried out as part of the study. Questionnaires were framed differently for different category of users and were approved by BBMP officials. Questionnaires are attached in the Appendix. The following section summarizes the responses of users in each category.

1. SHOPKEEPERS OPINION SURVEY

A total of 99 shops were surveyed.

WORKING HOURS - WEEKDAYS

The users were asked about the number of working hours in a day. Most of them were working for less than 15 hours in a day. The collected responses are listed below.

- 48.48% shopkeepers: <10 hours per day
- 45.45% shopkeepers: 11-15 hours per day
- 2.02% shopkeepers: >20 hours per day
- 1.01% shopkeepers: 16-20 hours per day
- 3.03% shopkeepers: Not responded

PARKING FACILITY

Of the 99 shops, 60 have parking facilities for **employees** and rest 39 did not have. When asked for the parking facility for **customers**, 28 responded in the affirmative. Most of the shopkeepers did not have parking facility available for customers.

MODES USED BY EMPLOYEES TO REACH SHOPS/OFFICES

When asked for the modes used to reach their shops and working places, 49% responded with twowheeler and 27% with metro. The collected responses are listed in the table below.

Mode Used	Total Number	Total sum
Two-wheeler	951	
Car	38	
Metro	521	
Bus	154	1941
Walk	80	
Cycle	17	
Accommodation	180	

Table 108: Travel Mode used by Employees

RATING - REDESIGN OF THE CHURCH STREET

When asked for the experience of shopkeepers on the redesigned street. Most of them were happy with the revamped look of Church Street. 80% of the users responded positively - 36% very good, 26% excellent and 18% as good. The responses are summarized the following chart.





SIGNIFICANT CHANGE IN BUSINESS AFTER THE REDESIGN

47.47% responded that there are no visible changes in their business. 30% responded that the implementation time and the restriction in parking facility decreased their business. Around 20% responded positively. The responses are summarized in following chart.



Figure 78: Shop owners Response on Change in Business

2. PEDESTRIAN OPINION SURVEY

PEDESTRAIN PROFILE

A total of 621 pedestrians were interviewed and the responses were collected from the street. Of the 621 pedestrians, 61.19% were male and 38.83% were female. Majority of them were in the age group of 20-40 years. Details are listed in the table below.

Age Group	<20	20-29	30-39	40-49	>50
Male	9.17%	17.71%	19.32%	10.95%	4.02%
Female	6.44%	16.9%	7.93%	5.15%	2.41%

Table 109: General Profile of Pedestrians

The occupation of the users varies widely. Most of the users were students/professionals and businesspeople. The connectivity to educational institutions and various workplaces from MG road counts to maximum number of pedestrians.



Figure 79: Pedestrian Job Profile

FREQUENCY AND PURPOSE OF FOOTPATH USAGE

The users were asked about the frequency with which they used the sidewalks on Church Street in a week. Most of them were occasional users of the street. The collected responses are listed below.

• 21.57% pedestrian: Every day in a week

- 16.90% pedestrian: 4-5 days per week
- 13.20% pedestrian: 1-2 days per week
- 9.01% pedestrian: Weekends only
- 4.34% pedestrian: 3-4 days per week
- 34.94% pedestrians: occasionally

Regarding the purpose of visit, 42% responded for shopping/recreation purpose and 32% for workand business-related purpose.

School/College	8.69%
Other	14.65%
Fitness	0.80%
Residential	177%
Shopping/Recreation	42.19%
Work/Business	31.88%

Figure 80: Purpose of street usage

ACCESS TO CHURCH STREET

The users accessed Church Street by different modes. Most of them were accessing street by Metro and by two wheelers. 32% responded saying they took metro and 30% with two-wheeler. The details are listed below.

Walk	6.11%
Metro	31.56%
cycle	2.25%
Bus	5.31%
Auto/cab	12.88%
4 Wheeler	12.39%
2 Wheeler	29.46%
-	I

Figure 81: Access to Church Street

When asked about where people accessing the street using two wheelers park their vehicle, 21.09% responded that they park their vehicle at a paid parking facility nearby and 15.45% responded by saying that they park within their building premise's parking lot. The paid parking facilities at Church Street was well utilized by public.

Others	8.85%
Paid parking nearby	21.09%
Building premises parking lot	15.45%
On-street,(illegal)	3.38%
On-street, designated lot	2.89%

Figure 82: Parking of vehicle

CHURCH STREET REDESIGN – AWARENESS AND EFFECTIVENESS

The users were asked regarding the impact the design and redevelopment of Church Street has had on their everyday experience of the street and most responded in the positive and opined that the street has become pedestrian friendly. The responses are summarized below in the table.

 Table 110: Church street redesign – pedestrian response

Have you experienced church street before and after the redesign	<u>YES, 66.02%</u>	NO, 33.97%
If yes, what do you feel about the new changes implemented? Is it Pedestrian friendly?	<u>YES, 85.5%</u>	NO, 14.49%
Have you walked on the cobblestone on the carriageway?	<u>YES, 78.09%</u>	NO, 21.9%
If yes, is the cobblestone surface providing a good walking comfort?	<u>YES, 81.96%</u>	NO, 18.03%
Is the new design making you to walk more often to the church street for shopping/recreational activities?	<u>YES, 82.28%</u>	NO, 17.55%
Is there any vehicle conflict at present?	<u>YES, 23.67%</u>	<u>NO, 76.32%</u>
Is there any difficulty with parking facilities?	<u>YES, 44.12%</u>	NO, 55.87%

Most of the pedestrians were happy with the revamped look of Church Street. The design was highly appreciated and 86% of users responded saying that the street is now pedestrian friendly.

Few of the concerns raised by pedestrians were regarding parking difficulties and pedestrianvehicle conflict. Users commented that the present vehicle speed should be lowered to cross safely at intersections and other crosswalks.
USER'S WALKING COMFORT

When asked about the overall walking experiences of pedestrian users on the redesigned street, 97% rated their experience as good quality. The responses are summarized in the following chart.





3. BICYCLISTS OPINION SURVEY

GENERAL DETAILS OF CYCLISTS

Cyclists were observed in good numbers on the street. They were making use of both sidewalk and carriageway to negotiate the street. The study was only able to capture only a small sample size of 23 bicyclists as several bicyclists were not willing to respond. Of the 23 cyclists, the general profile, trip purpose and usage of Church Street are tabulated below.

Most of them were regular users of Church Street and the trip purpose was mixed comprising of school/college trips, work trips, recreational trips and for fitness purposes too. They were making use of the existing cycle parking facilities as well.

Are you a regular user of church street?								
YES, 78.26%				NO, 21.73%				
Purpose of street	use?							
-								
School/college	Work/business	Resid	ential	Shopping/Recreation	Fitness			
17 39%	34 78%	_		21 73%	26.08%			
17.3270	17.57/0 54.76/0 - 21.75/0 20.06/0							
Frequency of usa	ge in a week?							
Every day	1-2 days,	3-4 (lays	5-6 days	Weekends			
73 91%	13.04%		-	_ `	only			
13.7170	10.0170				12.040/			
					13.04%			
Do you use the cycle parking facilities available at church street?								
	• 0							
YES 60.86%				NO 39.13%				
120,00000				1.0, 57.1570				

 Table 111: General profile of Bicyclists

DESIGN AND IMPROVEMENT

Most of the cyclists responded positively regarding cycling experience on the carriageway where 47.82% responded that the riding experience was very good. The details are listed below in the tabular form.

Have you experienced the road before and after the redesigning of church street?						
YES, 30.43% NO, 69.56%						
Rate the overall experience						
Excellent,	Very good	Go	od	Satisf	actory	Poor
-	47.82%	26.0)8%	17.3	39%	8.69%
Whether the road (Cobble Stone Carriageway) is comfortable to ride?						
YES, 56.52% NO, 43.47%						

Table 112: Church street redesign - Bicyclists response

4. **RESIDENTS' OPINION SURVEY**

This study also undertook an opinion survey amongst residential apartments situated on Church Street. A total of 19 responses were collected. The responses collected per apartment are as follows: Deauville Apartments -9, Ghar Apartments -8, Daffodils Apartments -2. The details are summarized below.

The variation in age, job profile was reflected in the purpose of trips and in the number of trips. All the residents were parking their vehicles in their building's parking lot.

Age	<25 years 25-40 year		40-60 years	>60 years
Group	9.09%	20.45%	36.36%	34.09%
Job	Student	Professionals	Business	others
Profile	3.84%	9.61%	30.76%	55.76%
	School/College	Office	Business	others
Purpose	3.84%	9.61%	30.76%	55.76%
Frequency	<2 trips/week	2-4 trips/week	>4 trips/week	weekends
of Trips	5.26%	10.52%	36.84%	52.63%
Where do	lo Building premises parking lot		On street	others
you park			parking	
your	10	0%	-	-
vehicle?				

Table 113: General Profile of Residents

REDESIGN OF CHURCH STREET

Regarding the redesign of Church Street, the responses for various questions are summarized in the following table.

Have you experie	nced the road be	fore an	d after (the redesigning of ch	urch street?		
			í.				
YES, 94.73% NO, 5.26%							
Rate the overall e	xperience						
Excellent	Very good	G	bod	Satisfactory	Door		
					1 001		
15.78%	26.31%	26.3	31%	10.52%	21.05%		
Is the present stre	et more pedestri	an friei	ndly?				
YES, 94.73%				NO, 5.26%			
Are vou using	z church stre	et sid	ewalk/c	obblestone for fi	tness purpose		
(Morning/Evenin	g, walk and cycli	ng)?					
YES, 52.63%				NO, 47.36%)		
If yes, is the cobb	lestone surface p	rovidin	g a good	d walking comfort?			
YES, 68.42%				NO, 31.57%)		
Is there any vehic	le conflict at pres	sent?					
YES, 78.94%				NO, 21.05%)		
Is there any diffic	ulty with parkin	g facilit	ies?				
YES, 78.94%				NO, 21.05%)		
Any other difficul	lties with existing	, faciliti	es?				
YES, 73.68%				NO, 26.31%)		

Table 114: Church street redesign – Residents response

Most of these residents interviewed were longtime residents of Church Street and has expressed mixed response towards the redesign. Regarding the new infrastructure, few appreciated, while 31% rated it as satisfactory to poor. However, most of them (97%) agreed that the design is more pedestrian-friendly in nature. The street was even used for fitness purposes like morning/evening walks and cycling by 50% of the residents. The Cobblestone has been equally liked and disliked by users. On rainy days, users have witnessed many two-wheelers skidding on the road surface.

The reason for the negative feedback were elicited as frequent violation of one way rule, speed and on-street parking menace. Residents complained that the violation of one way makes the street unsafe for pedestrians. They also opined that over speeding of vehicles was a concern that affects the safety of users. The reduction in carriageway capacity caused by illegal on-street parking was also a concern felt strongly by residents. Apart from these, residents were also not happy with the current maintenance practices. The choice of planation, trash bins and its maintenance, smoking corners on sidewalks, activities at night near pubs were the other severe concerns of the residents.

5. TWO-WHEELER OPINION SURVEY

A concise summary of Two-wheeler response is listed in the following section. A total of 250 responses were collected in this aspect. Most of them were regular users of the street.

Are you a regular	r user of church st	reet	YES,	66%	NO, 3	4%
Frequency of usa	ge in a week:					
Everyday 44%	1-2 Days 3-4 Days 32% 4%			5-6 Days 18%	Weekends Only 2%	
Purpose of street	use:					
School/College 4%	Work/Business Residential 56% 2%		Shopp	bing/Recreation 38%	Fitness -	Others -
Where do you pa	rk the vehicle?					
On-Street, Designated Lot 4%	On-Street(Illegal) 32%		Buil P	ding Premises arking Lot 44%	Paid Parking Nearby 20%	
Are there any difficulties with parking facilities				YES, 70%	No, 30%	
Any other difficulties with existing facilities			٦	YES, 24%	No,76%	
Other Difficulties			 Cobblestone carriageway is slippery when it rains Maintenance of street is not adequate 			r is not
Have you experie the redesigning of	enced the road be f church street	fore and after	YES, 74% No, 26		26%	
Whether the road(cobble stone carriageway) is comfortable to ride				YES, 62% No, 389		38%
Do you think a speed limit has to be imposed on church street			YES, 100% No		No	
How do you feel	the new changes	s implemented	l? Rate	the overall exp	erience.	
Excellent 12%	Very Good 16%	Goo 52%	d Satisfactory 6 20%			Poor -

Table 115: Church street redesign – Two-wheeler response

• Most of the two-wheelers were happy with the infrastructure improvement. They rated the redesign as good.

• The major concern for two wheelers were – parking and slippery surface of cobblestone carriageway during rains. 70% of two-wheelers complained that there is not enough parking space. Most of them were parking illegally on-street.

- Another concern was the riding comfort. Users reported that the carriageway surface becomes slippery under wet conditions and few even informed that they have been injuries due to falls during rains on Church Street.
- The other parameter to be highlighted is regarding the speed limit. Vehicles also finds the pedestrian movement at church Street high. Most of the users were for a stricter enforcement in speed limit.

6. CAR USERS OPINION SURVEY

A concise summary of car user responses is listed in the following section. A total of 60 responses were collected.

Are you a regular user of church street			YES,	80%	NO, 20%	
Frequency of usa	ige in a week:					
Everyday	1-2 Days	3-4 Days		5-6 Days	Weekends Only	
56%	20%	10%		14%	-	
Purpose of street	use:					
School/College	Work/Business	ork/Business Residential		oing/Recreation	Others	
3%	57%	3%		37%	-	
Where do you pa	rk the vehicle?					
On-Street,	On-Street(Illegal)	Buile	ding Premises	Paid Parking	
Designated	37%)	Р	arking Lot	Nearby	
Lot				40%	23%	
Are there any dif	ficulties with parl	king facilities	, second s	YES, 60%	No, 40%	
Any other difficulties with existing facilities				YES, 10%	No,90%	
Other Difficultie	S		•	Pedestrian inter	ference while	
				driving		
Have you experie	enced the road be	fore and after	Y	YES, 77%	No, 23%	
the redesigning of	of church street					
Whether the road	d(cobble stone ca	rriageway) is	Y	YES, 84%	No, 16%	
comfortable to ri	de					
Do you think a sp	beed limit has to b	e imposed on	YES, 100%		No	
church street						
How do you feel	the new changes	s implemented	l? Rate	the overall exp	erience.	
Excellent	Very Good	Goo	d	Satisfactory	Poor	
20%	33%	34%)	13%	-	
• Most of the car users were hanny with the infrastructure improvement. They rated th						

Table 116: Church street redesign – Car Users response

- Most of the car users were happy with the infrastructure improvement. They rated the redesign as good.
- The major concern for car users were pedestrian interference on road and the inadequate parking space. Users responded positively when asked about introduction of a speed limit enforcement.

CHAPTER 6 RECOMMENDATIONS AND SCOPE FOR PEDETRIANISATION AT CHURCH STREET

There are few critical issues prevailing at Church Street which needs immediate attention. The present study proposes various recommendations to resolve these issues.

1. ROADWAY CAPACITY AND LEVEL OF SERVICE

The present carriageway width is 6 meters with a capacity of 2400 PCUs/hour. However, due to the illegal on-street parking, the capacity of the carriageway is being reduced to 1512 PCU/hour [calculated as per Indo-HCM guidelines, refer Chapter 5 for details]. The limited carriageway left severely affects the Level of Service [LoS]. The LoS identified on a weekday is listed below. The LoS at peak hours is identified as D.



Figure 84: Present Level of Service [LoS] of Church Street

For an efficient flow of traffic, the infrastructure should be at LoS C or above. To increase the capacity of the road segment, the on-street parking must be strictly controlled. If the street can be free of illegal on-street parking the LoS can considerably be improved. Following figure shows the improved LoS if the on-street parking is banned on the street.



Figure 85: Improved Level of Service [LoS] with Recommendation 1

Recommendation 1: Prohibit illegal on-street parking on Church Street. Strict enforcement to be ensured.

2. PARKING MANAGEMENT

It is difficult to calculate the parking demand for Church Street alone as users of surrounding roads like MG Road also use Church Street for parking. The study calculated the present parking demand by considering the illegal on-street parking ($m^2/30$ minutes) at Church Street and its crossroads. This has been compared with supply, which is the existing parking bay capacity available.

The following picture describes the current parking demand – supply at different time intervals, 7.30 AM to 23.30 PM for four days – Thursday, Friday, Saturday and Sunday. The demand [illegal on-street parking] ($m^2/30$ minutes) is plotted on X axis and the supply [existing designed parking bay capacity] ($m^2/30$ minutes), is plotted on Y axis assuming full capacity at various time intervals.



Figure 86: Present Parking Demand -Supply at Church Street

The parking demand at Church Street is identified as 2-3times more than its capacity. This distorts the equilibrium and must be tackled with suitable parking management measures. This is not an isolated issue on Church Street alone but most of the CBD roads in Bengaluru is affected by inadequate parking facilities and severe illegal on-street parking. A single solution will not eradicate this issue and hence a multipronged approach is required.

The study has proposed following recommendations to improve the present parking scenario at Church Street.

Recommendation 2: Allow paid parking at the designated on-street parking bays on Church Street. This will provide a parking space of 640 m² area.

Impact: The designated parking space on Church Street to some extent can meet the demand on Church Street when strict enforcement is ensured to clear illegal on-street parking. However, as long as on-street parking is free there will always be a surge in demand. To reduce the demand and to restrict the duration for which people use on-street parking space on a commercial street, the study proposes a priced parking concept. Pricing formulas can be worked out for fixing base price and in addition dynamic variation can be considered upon the base fee to manage the parking demand. This will also act as a source of revenue for the civic agency which can be then utilized for street asset management.

Recommendation 3: A multilevel car parking with smart parking information system is also a need for MG Road, Church Street and the surrounding areas. This is a long-term solution which needs a comprehensive study. Concepts like Valet parking can be worked out as a business model on PPP basis if such parking facilities are constructed.

3. PEDESTRIAN FRIENDLY STREET

The Tender SURE redesign at Church Street has improved the infrastructure quality by prioritizing non-motorized transport users such as pedestrians and bicyclists. To enhance the street further and to make it as a pedestrian friendly one, the concept of pedestrianization can be explored. An overview of pedestrianization concept is described in the following section.

PEDESTRIANIZATION AND ITS BENEFITS

Pedestrianization is defined as the creation or conversion of different public spaces exclusively for pedestrian use. These are the zones in town or city reserved for pedestrians only. In such zones all the vehicles are prohibited and are instituted by communities who feel that it is desirable to have pedestrian only areas. Converting a street or an area to pedestrian only use is called pedestrianization. Cases of pedestrianization has proved to increase not only the accessibility and mobility for pedestrians but also the amount of shopping and other business activities in the area. The various benefits of pedestrianization is well summarized in the following figure.

Economic	Social	Environmental		
Improved accessibility Particularly for non-drivers	Reduces external transportation costs (crash risk, pollution, etc)	Reduced energy consumption and pollution emissions		
Minimized conflict points with vehicles. Reduced transportation costs	Improved opportunities to preserve cultural resources (historic buildings)	Improved aesthetics		
Facility to park vehicles/ cycle parking lot with locking facilities.	Increased exercise	Open space preservation		
Facilities such as trolley/ rest room/landscaping/ street furniture/ample shading/ way finding signs/ Boards	Very low levels of TW/car use, resulting in much less traffic on surrounding roads	Reduced land needed for roads and parking facilities		
Increase local business activity and employment	High rates of walking and cycling	less land taken for parking and roads - more available for green or social space		
Health cost saving from improved exercise	Improved accessibility for people who are transport disadvantaged	No air pollution. Better for health of shopkeepers and shopper		

Figure 87: Benefits of Pedestrianization [Source: DULT, Pedestrianization of Gandhi Bazaar Report]

DIFFERENT FORMS OF PEDESTRIANIZATIONS

Pedestrianization can be practiced in various forms. A street can have full pedestrianization, parttime pedestrianization and partial pedestrianization or traffic calming streets.

- **Full time pedestrian streets:** In this design arrival of vehicles into street is fully forbidden. In most cases only emergency service vehicles can enter.
- **Part-time Pedestrian Streets:** Part-time pedestrian streets are those where vehicular access is allowed only in specific periods.
- **Traffic Calming Streets:** The third form of pedestrianization is traffic calming streets. They serve to reduce the dominance and speed of road vehicles. There are no restrictions to vehicle access here. Various traffic calming measures are used to slow down the speed of vehicles. They include speed tables, narrower traffic lanes and use of different road textures and colors to remind drivers that they are within traffic calming zones.

PEDESTRIANIZATIONS - PRACTICES AROUND THE WORLD

Pedestrianization has been in practice around the world and the impacts of the same has been quantified. An overview of various practices is well summarized in the report "Pedestrianization In India and Across the Globe" by ITDP. Few examples studied in the report are listed below:

STRØGET, COPENHAGEN

Copenhagen is Denmark's capital and greater Copenhagen has a population of 1.3 million inhabitants. Once a small fishing village, the city grew to become a bustling trading port. The inner city continues to be Copenhagen's most important business and cultural area, with various shops and institutions. Strøget, Copenhagen's main thoroughfare, in 1880, was a workplace, a place to sell or transport goods. The street was frequented by the privileged for shopping and leisurely walks. In the years leading up to 1962, the growing number of cars led to an increasing pressure on streets and squares for both traffic and parking. Strøget was invaded by cars and pedestrians were confined to two narrow footpaths with space just enough to walk - no room to stop or shop.

	STRØGET, COPENHAGEN
<u>1880</u>	• In 1880, Strøget was a trading street
<u>1960</u>	 By 1960, the street was invaded by car traffic Two narrow pavements for pedestrians with no room to stop & shop
<u>1962</u> Pedestrianization trial	 Pedestrianization trial in 1962 for 1.1 km stretch Parking on the squares along the street reduced in 1962 Recreational activities developed
<u>1964</u> <u>Permanently</u> pedestrianized	• After a successful 2-year trial period - with much cleaner air - and no traffic - plus many happy pedestrians - Copenhagen's city council decided to transform the tested zone into a permanent "Pedestrian Street" in February - 1964.
<u>2000</u>	• by 2000, a total of 100,000 sq.m was pedestrianized

Table 117: Stepwise Approach for Pedestrianization- Case study - Strøget, Copenhagen

Today, 80% of the movement through the city center is foot traffic. The whole of inner Copenhagen has become an area devoted to people on foot. Strøget today has

- 6 times more area for pedestrians than in 1962.
- Is 10-12 m wide carrying 145 people/min
- Has seen an increase in sales by 30%





The key to the success of the pedestrianisation project in Copenhagen was the gradual expansion of the system & for 2 reasons:

Gave residents time to adapt, to develop a new city culture - to change from driving and parking their cars to walking, using bicycles and public transport. Has become easier for city's politicians to take small stepwise decisions based on previous successful measures

Figure 88: Before and After Pedestrianization

The key to success has been the gradual expansion of the pedestrianization project, giving citizens the time to adapt to the new culture of not using their cars.

WARRANTS FOR IMPLEMENTING PEDESTRIANIZATION

Considering the countless benefits of Pedestrianization, it can be implemented in any situation and it should not need any warrants. However, there are some basic aspects that can be used as warrants and indicators for Pedestrianization. Few of the indicators are:

- Reclaiming public space for public welfare and development of public amenities
- High mode share of sustainable modes like pedestrian, NMT and transit
- Street geometry and street width are not enough and appropriate for motorized transport/ LOS is in unacceptable range
- Presence of good public transport within walking or bicycling distance
- Noise level/ Pollution (Air Quality Index: AQI) is in unacceptable range
- On popular public demand

Only limited studies have been performed in these areas. Hence, the application of warrants and its limits are questionable. However, the point to understand here is that by pedestrianizing an area, it is not only the pedestrians who gets benefitted, the infrastructure, the environment etc. are also getting enhanced indirectly.

4. PEDESTRIANIZATION AT CHURCH STREET

Considering the present scenario at Church Street, where LoS is D (not satisfactory), severe illegal on-street parking [parking demand >3 times of its capacity], speeding of vehicles at off-peak hours [resulting to pedestrian conflicts], Church Street necessarily needs improvement. The introduction of pedestrianization concept can make visible changes in the present scenario. Following are few major indicators which warrants for pedestrianization at Church Street.

1. <u>High Mode Share of Pedestrians</u>

The pedestrian activity of the street is more. The pedestrian footfall at Church Street is observed in the range of $30,000 \pm 5,000$ while the total motorized vehicle usage was only $15,000 \pm 5,000$. This demands pedestrian favouring measures at Church Street to assure the comfort and convenience to pedestrians.



Figure 89: Present Modal Share at Church Street [Saturday]

2. Availability of Public Transit - Metro Stations

Church Street is easily accessed by MG Road Metro Station. BMTC provides connectivity to various directions from St. Marks Road and War Memorial Junction. The upcoming metro station at Kamraj Junction in Phase 2, also promises many more users soon and this is likely to add more pedestrians to the street. If the street favours pedestrian comfort, a shift can be made towards public transport from the automobile dependence of users.

3. <u>Present infrastructure Constraints</u>

Following factors also needs improvement to enhance the quality of the street:

- LoS of carriageway (at present D at peak hours)
- Speeding of vehicles at off peak hours (~30-35 kmph)
- Excessive Parking Demand
- Illegal on-street parking

All the above parameters can be improved by pedestrianizing Church Street. Two proposals have been recommended towards this. The recommendations in this regard are as follows:

<u>Recommendation 4: Proposal 1 – Partial Pedestrianization [Traffic Calming Measures] at</u> <u>Church Street</u>

Maintain the existing street by continuing the present activities but impose following traffic calming measures to improve the infrastructure quality and enhance pedestrian walking comfort.

- Traffic Speed Limit: The speed limit should be restricted to 10 KMPH.
- Strict Enforcement : No illegal on-street parking and no one-way violation
- Short term Paid Parking: Dynamically priced parking at designated parking bays on Church Street

Impact: With strict implementation of the above traffic calming measures and with continuous monitoring, the LoS will improve [carriageway width availability], parking demand may reduce [additional parking space, paid parking may induce users to park for short duration] and eventually the pedestrian conflicts will lower [speed limit restriction]. This proposal is suitable more at church Street as the existing street activity and functionality is not getting disturbed. However, a strict monitoring and enforcement strategy is imperative to execute the same.

<u>Recommendation 5: Proposal 2 – Part time Pedestrianization [time period restriction] at</u> <u>Church Street [exemptions: residents, emergency vehicles]</u>

The other proposal is to introduce part time pedestrianization at Church Street where vehicular access is allowed only at specific time periods.

Church Street has a constant nature on weekdays from Monday to Thursday. The Street becomes highly active on Fridays and Saturdays. Sunday, the vehicular movement is less as compared to any weekday. The following table summarizes the hourly movement of pedestrians and motor vehicles on a weekday (Wednesday, Friday, Saturday and Sunday). The street is accessed by a volume of 30863, 35417 ped/day pedestrians and 20646 and 18197 vehicles/day [7877.76 and 7243.48 PCU/day] on Fridays and Saturdays.

Time	Pedestrian Footfall (ped/hour)			Vehicular Movement (PCU/hour)				
	24/7/19	26/7/19	20/7/19	28/7/19	24/7/19	26/7/19	20/7/19	28/7/19
	Wednesday	Friday	Saturday	Sunday	Wednesday	Friday	Saturday	Sunday
00:00	167	327	421	935	102.85	124.2	159.12	253.22
01:00	169	215	550	575	53.37	121.93	239.06	271.76
02:00	120	113	271	178	16.69	55.38	103.66	128.27
03:00	38	51	82	91	36.38	28.68	52.55	49.41
04:00	16	21	17	25	23.85	34.46	44.09	42.8
05:00	37	45	36	20	39.76	37.51	41.44	31.77
06:00	96	125	92	102	83.11	61.55	87.76	58.52
07:00	254	263	250	232	205.97	226.44	105.81	77.54
08:00	593	707	492	377	332.07	363.67	209	98.14
09:00	751	881	668	423	388.92	410.37	305.25	165.82
10:00	858	1101	837	654	393.12	400.38	351.48	199.55
11:00	1116	1226	1172	859	403.47	572.29	311.46	201.88
12:00	1518	1606	1821	1360	395.07	541.57	377.79	175.82
13:00	2325	2795	2802	1744	433.5	490.69	488.56	247.93
14:00	2346	2454	2474	1933	457.7	466.29	428.73	212.92
15:00	2067	2186	2390	2159	474.02	413.79	507.37	229.91
16:00	1941	2193	2611	2122	407.48	525.05	502.27	197.44
17:00	2005	2480	2740	2241	429.14	517.45	495.77	216.66
18:00	2627	3167	3393	2416	507.24	634.57	551.12	231.22
19:00	2858	3216	3478	2428	436.29	571.53	453.76	310.67
20:00	1842	2204	3178	2221	310.83	456.65	461.11	258.3
21:00	1200	1567	2449	1461	241.09	299.7	364.14	220.42
22:00	651	1242	1967	1018	226.4	288.84	360.04	235.2
23:00	376	678	1226	515	173.02	234.77	242.14	168.1

Table 118: Total Vehicle Volume Count in PCU, Friday

The movements were high at two different time intervals – noon peak hours [1-2 PM] and evening peak hours [6-7 PM]. Activity is more at evening peak hours and it generates a volume of 3000 pedestrians/hour and 600 PCU/hour. The ideal timing for part time pedestrianization can be a time interval which is inclusive of the evening peak hours. **The present study recommends a partial pedestrianization for a time interval from 4.00 PM to 9.00 PM on all days.** These are also typically the timings used to pilot pedestrian-friendly streets and walking plazas. People could greatly enjoy their shopping experiences and family outings during weekends if the environment could provide for all the members in the family, with a safe hazel-free area where children can do their own creative activities.

Selecting the time period is a critical parameter here. The present study derived the time interval, 4.00 PM to 9.00 PM; based on the peak pedestrian footfall and vehicular movement observed. The time interval should be finalized by considering the opinions of merchants/shop owners/office employees/residents/traffic police etc. The point to remember is that Church Street is home not only for recreational activities but also for offices/workspaces and residential purpose too.

The residents, though few in numbers is the inhabitants of Church Street. The present study understands that with vehicular restriction at Church Street, it is impossible to access their dwellings. This is of serious concern and must find a permanent solution after discussing it with all residents of Church Street. As a temporal mean, Residents can be exempted from partial pedestrianization; but with strict enforcement on speed limit.

Impact: when the street is getting blocked for vehicular movement, the traffic must be rerouted, and it is expected to affect the nearby intersections/link road etc. The present study has analyzed the scenario and its findings are summarized in the following section.

The number of vehicles which access Church Street at 4-9 PM time interval is as follows:

Day	Time	No. of	Vehicles	Link Volume on
		Vehicles [Sum]	Vehicles, PCU	crossroads, PCU
Monday (22-07-19)	4.00-9.00	6571	2249.02	1328.58
Tuesday (23-07-19)	PM	6542	2245.92	1382.27
Wednesday(24-7-19)		6956	2332.07	1839.14
Thursday (25-07-19)		6320	2197.02	435.32
Friday (26-07-19)		8262	3004.95	1815.72
Saturday (20-7-19)		7331	2828.17	1536.56
Sunday (21-07-19)		3867	1661.41	791.8
Saturday (27-07-19)		5683	2270.96	1433.95
Sunday (28-07-19)		3629	1434.71	271.62

Table 119: Expected Vehicle Volume Count @ restricted hours

It means, a vehicular volume of 7000±1000 vehicles are denied accessing the Church Street. Also a volume of 2000±1000 vehicles are restricted using the link roads (cross roads). The rerouting of these vehicles would have adverse impact on nearby intersections/adjascent link roads etc. Traffic Police should be in a position to monitor the changes in the traffic flow/operations in the adjascent roads and accordingly measures can be proposed.

5. COMMUNITY AWARNESS AND ACTIVE PARTICIPATION

Experience in most pedestrianized areas and streets around world is that its implementation is always met with heavy opposition from potentially affected users. Most people oppose the move due to many misconception and negative perception.

Present study captures user's response towards the pedestrianization concept and their opinion towards implementation of it at Church Street. The response of various users is summarized below.



Figure 90: Users Opinion towards Pedestrianization at Church Street

Collecting the response from the users were difficult as the study team realized that most of the users were not aware of the concept of pedestrianization and the real objectives behind it. The collected response is as follows - 20-30% responded positively, 60 % opposed and 10% had no response. This is an expected response from the users.

Recommendation 6: Community Participation and Awareness programs for users to understand 'Pedestrianization' and its objectives.

Before the implementation of the Pedestrianization scheme, it is very important to educate people about benefits of Pedestrianization. Hence the study team recommends conducting awareness program bring awareness to various users groups. Civic agency can also adopt events such as 'Open Street Day', 'Vehicle free day' or 'Cycle Day' to demonstrate the benefits of pedestrianization.