Agra Smart City Mission REHABILITATION OF MAJOR ROADS, AGRA DPR

Submitted by:





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CHAPTER 1. EXECUTIVE SUMMARY

Agra is the third largest city of Uttar Pradesh and is a commercial city, having small-scale and household industries. Agra is known for handicraft work majorly marble, leather, carpet, brassware, artistic daring and jewelry craft which attracts a large number of domestic tourist and from all over the world.

Agra is located at the junction of four national highways namely Delhi Kolkata(NH-2), Agra Mumbai(NH-3), Agra Jaipur(NH-11) and Agra Aligarh(NH-93). It has two state highways namely Agra Fatehabad(SH-62) AND Agra Gajnair(SH-39). Agra Fatehabad(SH-62) lead to inner ring road which connects NH-2 and Yamuna Expressway forming not only spine of the city but provide improved access to Taj Mahal for the tourist.

Preparation of a Detailed Project Report and Rehabilitation of Major road in Agra, to enhance the experience of accessing Taj Mahal and other monuments as well as pedestrian-friendly design. Total Length of all these major roads is approx. 20km under smart city mission for the ABD area (Area based development).7.5 km of Fatehbad Road project completed and floated individual tender for it. The Major Roads identified under Agra smart city for Area Based Development are:

- R1- Yamuna Kinara- 1km x 20m
- R2- Fort- 1Km x 18m
- R3- Station- 0.8km x 12m
- R4- Taj West Gate Corridor- 1.4km x 18m
- R5- Golf Course- 0.4km x 13m
- R6- Mandi 0.7km- 17-35m
- R7- Police Line- 0.9km x 15m
- R8- Basai- 0.1km x 27m
- R9- Marriott- 1.2km x 15m
- R10- Tora- 0.5km x 39m
- R11- Kala Kheria- 0.5km x 18m
- R12- TDI- 1.5km x 17m

Total Project cost of 12 Major roads:



CHAPTER 2. INTRODUCTION TO AGRA- SCOPE & METHODOLOGY

2.1 Introduction to Agra

Agra city is governed by Municipal Corporation which comes under Agra Metropolitan Region. The Agra city is located in the Uttar Pradesh state of India. As per provisional reports of Census India, the population of Agra in 2011 is 1,585,704; of which male and female are 845,902 and 739,802 respectively. Although Agra city has population of 1,585,704; its urban / metropolitan population is 1,760,285 of which 939,875 are males and 820,410 are females.



Figure 1: Agra Master Plan 2021







Figure 2: Land use as per Master Plan 2021



Figure 3: Agra District Map





2.2 Regional Setting

Agra city is located on the banks of the river Yamuna. As one of India's major tourist destination, the city is part of many tourist circuits such as the Golden Triangle tourist circuit, along with Delhi and Jaipur; and the Uttar Pradesh Heritage Arc, a tourist circuit of UP state, along with Lucknow the capital of the state and Varanasi. Its proximity to the national capital and the well-connected road and rail network has made it a major center in the regional setting.

Cities	Distance from Agra Connectivity Mode		
Delhi (National Capital)	209 Km	Air, Rail, Road, (Express Way)	
Lucknow (State Capital)	336 Km	Air, Rail, Road, (Express Way)	
Aligarh	90 Km	Rail, Road	
Jaipur	240 Km	Rail, Road	
Gwalior	120 Km	Rail, Road	
Kanpur	300 Km	Rail, Road	

Table 1: Distance from Agra to different cities



Figure 4: Agra city-Regional setting





2.3 **Demographic Characteristics**

According to the census 2011, the Agra Urban Agglomeration has a population of 17.65 lakhs. It comprises of the Agra Municipal Corporation area (Pop. 15.85 lakhs), Agra cantonment (Pop. 0.5 Lakhs) and adjacent rural areas. Compared to a population of 12.75 lakhs in 2001, the decadal growth rate of pollution has been 38.03 which is highest in the last five decades. During the post-independence period, commerce showed a phenomenal increase with the associated industrial development and establishment of the industrial estates, which resulted in attracting people to the city.

Table 2: Population Growth Agra

Census of India 2011 Year	Population (lakhs)	llation (lakhs) Growth Rate (%)	
1961	4.62	-	
1971	5.91	27.92	
1981	7.81	32.15	



Figure 5: Decadal Population Growth Agra City

Some of the key demographic characteristic of Agra Urban Agglomeration are as follows.

- Total Population: 1,760,285
- Sex Ratio: 873
- Average Literacy Rate: 73.13 %
- Population Density (District): 1,093 persons/ sq.km





In the city of Agra, the core city area holds up a major share of the city population and has a very high population density. The area under the jurisdiction of the Agra Cantonment also has relatively lesser population density due to its land use character. However, the outward growth pockets are sparsely populated. It is important to note that, as per the city growth trends, some pockets along the proximity to main roads has been witnessing an increase in the number of settlements.

2.4 Economy

Agra is a tourist city famous for its world-famous heritage architectural wonders such as Taj Mahal, Fatehpur Sikri, etc. Tourism is also the major contributor to the city economy.

Other than its economic engagement through tourism, major industrial activity is in the form of smallscale and household industries. These are mainly located in the old Mughal city particularly Lohamandi, Rakabganj, Kotwali, Tajganj areas. The large-scale units are located in Chatta and Hariparvat areas. The city is famous for its major handicrafts products of marble, leather, carpet, brassware, artistic daring and jewelry crafts. Agra is also famous for its Petha. As far as agriculture is concerned, the area has infertile land and is prone to floods, hence the agriculture has been a subsidiary activity in the region limited to some areas.

Some of the major tourist destinations in the city are Agra Fort, Tomb of I'timād-Ud-Daulah, Mehtab Bagh, Panch Mahal, Jama Masjid, Tomb of Akbar (Sikandara), Moti Masjid, Guru Ka Taal Gurudwara, Ram Bagh, Mankameshwar Temple, etc. Tourists from all over the world visit the city around the year.



Figure 6: Different types of Local Art Forms in Agra



	2012	2013	2014	2015	2016
Number	9158976	9114221	9601728	10812435	10332917
Change in tourist numbers	-	-0.49%	5.35%	12.61%	-4.43%
% of Foreign Tourists	14.7%	13.6%	12.3%	12.4%	13.2%

Table 3: Number of Tourist visit to Agra

One of the key factors that draw a major number of tourist to the city is the connectivity it enjoys with the Delhi. Agra is well connected with the National capital via road and rail. The following section elaborates the regional setting of the city.

2.5 Review of Existing Transport System

The city of Agra has a radial pattern of the road network. The city was formed on the banks of river Yamuna, which also makes it a natural barrier within the city. The railway lines stretching along North-South Direction and East-West direction also act as a barrier cutting the city into different parts. Railway over bridges is one of the major components that act as a connector. However, ROB experience heavy traffic now a day, leading to congestion in the city. Due to heavy traffic demand, some of the ROBs have been widened. The old part of Agra, being a historical city has a network of narrow roads. Some of the major roads of the city are appended below:

- Mall Road
- M.G. Road
- Taj road
- Idgah Road
- NH 19 towards Delhi and Kanpur
- NH 44 towards Dholpur
- NH 509 towards Aligarh
- NH 21 towards Fatehpur Sikri, Bharatpur, and Jaipur
- Dayal Bagh Road
- Mughal Road
- Fatehabad Road
- Inner Ring Road
- Yamuna Expressway
- Agra Lucknow Expressway



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Figure 7: Existing Connectivity and Transport Setting Area

Connectivity aspects of the Agra city area described in the following subheadings.

2.6 Rail Connectivity

Location of Agra falls on the important railway corridors of the country such as Delhi - Mumbai, Delhi - Chennai. Some trains also connect the city to eastern areas of India via direct trains to the city like Kolkata. The high frequency of trains through these routes makes Agra well connected by rail with other major cities. Apart from the regular trains, Agra city is also connected through tourist circuit trains such as - the Palace on Wheels, the Royal Rajasthan on Wheels, the Buddhist Special Train etc. Agra has following Railway Stations of Indian Railways:

- Agra Cantonment Railway Station, Agra
- Agra Fort Railway Station, Agra
- Agra City Railway Station, Agra
- Raja Ki Mandi Railway Station, Agra
- Idgah Railway Station, Agra
- Yamuna Bridge Railway Station, Agra
- Billochpura Railway Station, Agra



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- Fatehpur Sikri Railway Station, Agra
- Etmadpur Railway Station, Agra
- Keetham Railway Station



Figure 8: Agra Cantt Railway Station

2.7 Road Connectivity

The city of Agra is well connected by the road. The following points elaborate the regional road connectivity with Agra.

- 1. Northside connectivity: NH2 highway and recently built Yamuna Express Highway are the two parallel roads that connect Agra to the north. The drive to Delhi is about 4 to 5 hours.
- 2. Eastside connectivity: Both the NH-2 and Yamuna Express highway continues to the East till Kanpur and Lucknow.
- 3. Westside connectivity: From Jaipur NH11, a four-lane highway, connects Agra with Jaipur via the bird sanctuary town of Bharatpur.
- 4. Southside connectivity: From Gwalior, a distance of around 120 km, takes around 1.5 hours on the National Highway 3, also known as the Agra - Mumbai Highway.





Figure 9: Road Network Inventory

2.8 Air Connectivity

Agra is also connected via air through Kheria Airport, Agra. Presently it has direct flight services to Delhi, Khajuraho, and Varanasi. However, Agra currently has only 0.2% share3 of the passenger air traffic demand of the state. Agra is also supposed to get its direct air connectivity to Jaipur shortly.

2.9 Project Brief

Agra is the city of the inimitable Taj Mahal. It is as loved by Indians as it is by foreigners who throng here in large numbers to admire its beauty. Along with Delhi and Jaipur, Agra forms the Golden Triangle of tourism in India. Situated in Uttar Pradesh, Agra is synonymous with the Taj Mahal, however, there's a lot more to the city than this world-famous monument. Right from the epic Mahabharata to the Mughal Dynasty, Agra has been monumental and has played a significant role in shaping India's history. Agra has two UNESCO World Heritage sites which are Agra Fort and Taj Mahal, however, Taj Mahal features in the 50 most popular tourist destinations in the world.



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REHABILITATION OF MAJOR ROADS, AGRA

Near the gardens of the Taj Mahal stands the important 16th-century Mughal monument known as the Red Fort of Agra. This powerful fortress of red sandstone encompasses, within its 2.5-km-long enclosure walls, the imperial city of the Mughal rulers. It comprises many fairy-tale palaces, such as the Jahangir Palace and the Khas Mahal, built by Shah Jahan; audience halls, such as the Diwan-i-Khas; and two very beautiful mosques.

Apart from these It is very important for the approach road towards the monuments which is pedestrian friendly as well as all types of traffic, utilities and other required amenities for the smart road. In Agra, Fatehabad Road is the very important road to reach out known and lesser-known heritage monuments. This road connects to Taj Mahal by Taj east, west and south gate roads. It is connected from the Yamuna expressway so it is the very important road for the all tourist who come from the Delhi so that this road requires all basic facilities, landscaping, street furniture and pedestrian infrastructure to attract more tourist on this road. This project covers all type of facilities and amenities.

This map Shows all known monuments in Agra and connected roads to Taj Mahal and ABD area for the smart city.



Figure 10: ABD Area and Regional connectivity map



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2.10 Scope of Project

Main task:

Preparation of a Detailed Project Report and Rehabilitation of Major road in Agra, to enhance the experience of accessing Taj Mahal and other monuments as well as pedestrian-friendly design. Total Length of all these major roads is approx. 20km under smart city mission for the ABD area (Area based development). Fatehbad Road project floated as an individual project. The Major Roads identified under Agra smart city for Area Based Development are:

- R1- Yamuna Kinara- 1km x 20m
- R2- Fort- 1Km x 18m
- R3- Station- 0.8km x 12m
- R4- Taj West Gate Corridor- 1.4km x 18m
- R5- Golf Course- 0.4km x 13m
- R6- Mandi 0.7km- 17-35m
- R7- Police Line- 0.9km x 15m
- R8- Basai- 0.1km x 27m
- R9- Marriott- 1.2km x 15m
- R10- Tora- 0.5km x 39m
- R11- Kala Kheria- 0.5km x 18m
- R12- TDI- 1.5km x 17m

Main Components of the Major roads

- Survey of streets and give proposals.
- Widening of the road by PWD department
- Resurfacing with landscaping, underground utilities, open drains to be covered
- Pedestrian friendly road and promote NMT.
- Smart Bus shelters, E-Toilets, Kiosk, street vending zone.
- Signages, street furniture, street lights.

The prime scope of the rehabilitation of the sections of the Major road, Agra are:

- To relieve congestion.
- To provide better linkage to the arterial roads.
- To provide improved access to Taj Mahal.
- To connect the new urban nodes outside /nearby.

2.10.1 Detailed Scope of Work

2.10.1.1 Identifying road stretch and potential Development

The scope of work included Identification road stretch for the redesigning and scope of development to enhance the experience of accessing the Taj Mahal as well as other places. To target more tourists on this



type of road it requires more components which are beautified the surrounding area and gives more importance to pedestrian and tourists with basic facilities

The following tasks are to be undertaken for detailed concept plan:

A. Identification of Stretch

Based on smart city proposal redesigning has been already identified for the smart road and basic facilities for tourist/pedestrian to improve the approach road, beautification of the surrounding road.

B. Proposal for landscaping, street furniture, NMT and utilities

Based on the preliminary survey and topographical survey identify the potential requirements of the road for citizens, tourist, and pedestrians. After Focus group discussion and analysis making one proposal on major road to enhance the experience of streets and Install or deploy street furniture, utilities, lightening, signages.

2.11 Methodology



Figure 11: Methodology for Project





CHAPTER 3. LITERATURE STUDIES

3.1 Roads and NMT

SUTP: Walking and cycling

In this exercise, we reviewed the literature regarding Transport Infrastructure planning and design to get an idea of design standards, best practices, and emerging trends. The Documents reviewed were:







REHABILITATION OF MAJOR ROADS, AGRA



Figure 12: Special arrangement of NMT zone, Germany

This document gives the importance of pedestrian trips and non-motorized vehicle trips. Then it discusses its design aspects. Increasing number of city governments in developed and developing cities have recently begun actively promoting bicycling and walking. It discusses some of the case studies.



ITDP: Better streets, better cities

Figure 13: Cross-section of a 45m wide road

It is a Street design manual developed by the Institute for Transportation and Development Policy (ITDP) and Environmental Planning Collaborative (EPC). This document contains the following aspects.

- Importance of streets, identifying the stakeholders
- Street design elements- discusses 16 elements





- Street templates- Collection of design solutions
- Intersection templates- Collection of standard templates
- Design process-explains the process from development of a vision to completion of a final design

USDG guidelines for Pune



Figure 14: Provision of street furniture for NMT zone

The guidelines define and initiate a process to ensure that appropriate street types and street design elements will be used to create better streets to support transportation objectives for the city considering the present and future needs. The manual is structured into 5 sections giving detail description on the relevant topics for the particular section-

- Introduction and Context of USDG •
- Goal and Design Principles of USDG

junction, Washington, USA.

Design Guidance, Implementation guidelines and recommendations •

Abu Dhabi Urban Street Design Manual



Figure 15: Offset midblock crossing





3.2 Essential Goals for Integrated Street



Figure 16: Essential Goals for Integrated Street

3.3 Street Elements

This section talks about street elements design recommendations based on standards and norms for all such street elements related to mobility aspect.

3.3.1 Introduction

Footpath or sidewalk is a portion of the street reserved only for pedestrians. It is provided on both edges of the street. Footpaths should be walkable, clean and safe for pedestrians and should be free from encroachments, parking and utility obstructions. Good footpaths are the most essential components of any good street in the city.

Attributes of good footpath design include:

- Accessibility by all users.
- Continuity and connectivity.
- Adjoining landscaping to create a buffer space between pedestrians and vehicles and also provide shade.
- Adjoining social space (area where pedestrians can safely participate in public life).



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Design recommendations Surface:

3.3.2 Footpath

3.3.2.1 Layout:

- Width of footpaths is to be determined based on the street hierarchy and ROW, land use and pedestrian traffic and as per the universal accessibility design. Footpath should provide clear and unobstructed minimum walking zone of 2m horizontally with 2.4m vertical clearance.
- In order to achieve min. 2m clear width of unobstructed walking zone, all such elements like trees, street lights and street furniture etc. should be accommodated within MUZ (Multi utility zone) wherever provided. Refer chapter no. 5 for more details on MUZ.
- Footpath should have guiding blocks and curb ramps for better accessibility to all.
- In case of obstructions that cannot be removed, footpath width should be suitably increased in that portion to ensure minimum clear width of walking zone. Appropriate markings on road, cats' eyes, signages should be provided for road safety.
- The entire width of footpath is never available for walking. At the side where there are shops, buildings, fence/compound wall etc. certain portion known as 'dead width' or 'frontage zone' is not available for pedestrians. Similarly, on the roadside edge of the footpath, certain portion from the edge known as 'edge zone' is not practically useful for walking. Frontage zone should be considered at least 1 m for shopping areas and 0.5 m for non-shopping areas with buildings or fence. The edge zone should be considered as 0.2m.
- Actual clear walkway is the width available between frontage zone and edge zone.

3.3.2.2 Surface

- Footpath should have tough and anti-skid surface.
- Consistency should be maintained for design, color, texture and level to provide clear visibility and visual continuity so as to get easily noticed by vehicular and pedestrian traffic.

3.3.2.3 Level

- Footpath should be above carriageway and separated by curb. Footpath should have uniform height of maximum 150 mm above road level.
- It should have gradual slope towards street storm water drain to avoid water accumulation.
- Suitable ramps should be provided at entry/exit of footpaths.
- Where raised footpath is not possible, railing or curbstone type separators should be provided to create walkway segregated from carriageway.
- Footpaths should continue at the same level at property entrances and at the junctions where side street meets the main street.



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3.3.3 Cycle Track

3.3.3.1 Width

- Clear unobstructed cycling zone at least of width 2m for one-way movement and at least 3m for two-way movement with vertical clearance of 2.4 m.
- Cycle tracks should have adequate clearances from the bollards plantation, parking areas for car door opening and street furniture.
- Cycle track should be at level +100 mm from carriageway. At grade cycle tracks segregated from carriageway with curbstones can also be considered to suit site conditions.
- Gentle ramp or raised driveway should be provided for motorized vehicles at entry points of properties or access to buildings whereas cycle tracks should continue at same level.
- The surface of cycle lanes/tracks should be leveled without any obstructions like utility covers, plantation etc.
- Asphalt or concrete is recommended surface material for cycle tracks. Paver blocks should not be provided.
- Colored surface treatment is recommended to improve the visibility of the bicycle operating area.
- Proper gradient should be maintained with provision of storm water drains to avoid water logging.



Continuity of cycle track Cycle track or providing a dedicated space for cyclists is an absolute need of time. Improving the quality of cycle infrastructure is imperative for providing respect, encouragement and safety to cyclists so that more and more people begin to use cycles. Intersections are places where the cyclist may need to change the direction. Cycle tracks should not abruptly end especially near intersections.







3.3.4 Bus Stops

3.3.4.1 General guidelines for bus stops

- Ideal minimum dimensions of bus stop are 10M X 1.5M X 2.2M ht. If passenger demand is high, longer bus shelters would be necessary.
- Multiple bus shelters of recommended size should be constructed at busy location along mobility corridors.
- Design should be such that it does not obstruct visibility of surroundings and pedestrian flow on footpath.
- The design should be compact, robust with anti-skid, levelled floor space and with preferably cantilever roof, sufficient shade and light.
- Seating if provided should be compact and minimal.
- Guard rails / railings at the curb edge should not be provided.
- It should have provision for display of route info maps, digital sign boards apart from advertisement boards. Advertisements should not obstruct route information display maps, statutory signage etc. The displays and advertisement boards should be placed on bus stop such that they are perpendicular to pedestrian and vehicular movement and not at the backside of the stop, because then it creates an opaque space behind the bus stop, which pedestrians do not use.
- Night illumination is a must on bus stops.



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- Bus stops should have emergency phone numbers/ police help line numbers/ PMPML numbers displayed.
- Ideally a tree should be located near uni-pole bus stop providing shade to the passengers.





Bus stop designed in parking bay keeping clear walkway undisturbed.

3.3.5 Carriageway

3.3.5.1 Width

- Width of carriageway should be uniform through-out the length of the street till it changes its hierarchy. Ideally Carriageway widths could be changed only at intersections.
- Carriage way on any street should be demarcated with yellow color lines and reflective cats eye on them. Internal lanes should be marked in white color dashed lines. Marking shall be with thermoplastic paint.

3.3.5.2 Surface quality and material:

- Carriageway should have well finished and plain surface with proper longitudinal gradient and camber to enable water drain off. The longitudinal slopes, super elevations and cambers should be designed as per IRC norms.
- While deciding the surface material of the carriage way PMC STAC committee report must be referred. Cross drains and utility ducting to be covered with compact paver blocks
- Utility services should not be placed on or beneath carriageways as they require digging of road for repairs and maintenance. This degrades the surface and disturbs the pedestrian and vehicular traffic flow. They should be shifted to shoulders and in Multi-utility zones demarcated on streets.
- Construction technology and material specification should comply with IRC and STAC committee report of PMC.
- Shoulder gives adequate support to the pavement besides safety and also drains off surface water from the carriage way to the side drains. Where side footpath is not constructed, normally a



shoulder exists which needs appropriate construction and maintenance for proper functioning of the road.

• Shoulder should be given proper outward slope for efficient draining of surface water from carriageway.

3.3.5.3 Shoulders

- The material density and compaction shall be as per the specification of sub grade, where it is earthen shoulder and the required cross fall should be maintained. Paved shoulders should have the specification consisting of sub base and surfacing course and conforming to the relevant specifications of corresponding items for pavement layers.
- The level of street and storm water drain in the shoulders should be so designed that water from the road does not enter into any adjoining property and easily enters the drain.



Figure 17 Carriageway Design





CHAPTER 4. SURVEY, ISSUES AND PROPOSAL FOR REHABILITATION OF MAJOR ROADS UNDER ABD, AGRA

4.1 Introduction

Almost every city in India has a legacy of its own. Many of these legacies, however, have been fading away with time. Agra city is no different. This old city has a lot of interesting history and culture hidden in its existing urban fabric. Heritage walks, concept-driven travels that are quite popular is one of the measures which aims to unearth the hidden essence of Agra and monuments and capture their intangible heritage. To enhance this experience approach towards the monuments by providing road facilities for the tourist as well as citizens. Agra is the third largest city of Uttar Pradesh and is a commercial city, having a small scale and household industries. Agra is known for handicraft work majorly marble, leather, carpet, brassware, artistic daring and jewelry craft which attracts a large number of domestic tourist and from all over the world.

Agra is located at the junction of four national highways namely Delhi Kolkata(NH-2), Agra Mumbai(NH-3), Agra Jaipur(NH-11) and Agra Aligarh(NH-93). It has two state highways namely Agra Fatehabad(SH-62) AND Agra Gajnair(SH-39). Agra Fatehabad(SH-62) lead to inner ring road which connects NH-2 and Yamuna Expressway forming not only spine of the city but provide improved access to Taj mahal for the tourist.

4.2 Major Roads in ABD Area and Common Design Proposals for all the major Roads (R1 to R12)

There are total 12 Major Roads under ABD area out of that one of the most important and busiest road is Fatehabad road which is already floated as individual project. The Major Roads identified under Agra smart city for Area Based Development are:

- R1- Yamuna Kinara- 1km x 20m
- R2- Fort- 1Km x 18m
- R3- Station- 0.8km x 12m
- R4- Taj West Gate Corridor- 1.4km x 18m
- R5- Golf Course- 0.4km x 13m
- R6- Mandi 0.7km- 17-35m
- R7- Police Line- 0.9km x 15m
- R8- Basai- 0.1km x 27m



- R9- Marriott- 1.2km x 15m
- R10- Tora- 0.5km x 39m
- R11- Kala Kheria- 0.5km x 18m
- R12- TDI- 1.5km x 17m



Figure 18 Major Roads in ABD Area

4.2.1 Common Design Proposals for all the Major Roads (R1 to R12)

4.2.1.1 Utility Ducts: For Storm Water & Electrical Cables

Streets are not just movement corridors for people and vehicle but they also carry infrastructural utilities. Utilities are the most crucial components of the street and require proper design, placement, & maintenance.

The entire health of the city depends on these utilities and hence these need to be studied in detail and dealt with properly. Streets carry number of utilities. Each utility service is installed & maintained by different departments and need to co-ordinate with the road department of Pune Municipal Corporation



for installation / up gradation or maintenance. Road covers all types of utilities with the facilities of civil works.

Each utility line has its peculiar requirements. These lines need to co-exist on streets in proximity but without affecting each other. The entire life cycle of the street depends on the design and placement of utilities. Utilities designed in such way that there will be less need for maintenance and future provision will be ensured. Sewer and Drainage lines require gravitational flow and are placed at substantial depth based on longitudinal slope.

Storm water drains also work on gravitational flow but are placed along edge of road and right edge of footpath. Water Supply, Electricity, telecom and Gas lines work on pressure so slope is not required but as they have interactive properties need to be away from each other. HT Electrical lines and telecommunication lines should not be close to avoid possible electrical interference due to induced voltage. Electrical cables – LT - 0.6 to 1 meters, HT - 1.5 to 2 meters. Telecommunication lines – directly laid – 0.6 to 1 meters, in concrete ducts – 2 to 3 meters

STORM WATER MANAGEMENT

Generally, storm water is collected across the edges of the carriageway by an inlet placed at regular intervals and directed into storm water drainage system.

At present, the water is collected by the SWD pipes along roads and discharged into the nallas which further discharge the water into the river. Detailed design of storm water will submit later separately in later stage

4.2.1.2 Street Furniture

- Purpose of street furniture is to cater to the comfort need of the road users especially pedestrian and cyclist
- Well designed and properly placed furniture inculcates sense of discipline among road users, acts as traffic calming measure and adds aesthetic value to the street.
- Following are the commonly used street furniture:
 - Seating/benches
 - o Trash bins
 - Bollards and railing
 - Signage/ info kiosks
- Street Furniture brings in life on the streets and improves its aesthetics and usability.
- As per the ground level condition and situation of Agra all furniture Will be of durable material, easy and cheap to maintain, safe to use, easily available in case of repairs and replacement and aesthetically pleasing.
- Will be placed such that it does not obstruct the pedestrian or vehicular flow of all the identified major roads.



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- Will be placed along all the streets. The location, type and quantity will be decided depending on the adjacent land-use of the roads and user activity and space availability.
- Street furniture will be convenient to use and have universal accessibility.
- All street furniture will be suitably placed to allow access for street cleaning.
- Street furniture is to be provided at all such locations having high public activity and pedestrian flow like commercial plazas public buildings, recreational areas, transit stations, parks and gardens, educational institutes, market areas, shopping malls etc.
- Street Furniture will be placed within pedestrian area wherever provided.
- This all street furniture cost taking into BOQ and Plans

Recommendations for Trash bins/Dustbins:

- Size of trash bins provides in such a way that it does not occupy more than 2 sq. m of space of any street.
- Trash bins will be located at intervals of not more than 200m.
- Trash bins will be located ideally on the edge zone or within verge between carriageway and footpath.
- Design of trash bins will be such that it conceals the litter bags, is covered, facilitates easy removal of litter and cleaning of bins.
- It is recommended to provide for separate bins for segregating the wet waste and recyclable waste.



Figure 19 Dustbins



4.2.1.3 Cycle Tracks- as per IRC Guidelines

BICYCLE IN INDIAN CONTEXT

Bicycle is used by all age groups and gender. NMT users can also be classified into two categories- one who bicycles by choice and the second who is captive cyclist who is bound by economic constraints and does not have a choice. Indian cities are dominated by the latter. The presence of an infrastructure will encourage choice and recreational use. High ownership of bicycle and low cost makes it a desirable mode of transport for the students and low-income workers.

	Arterial Roads	Sub Arterial Roads	Distributory Roads	Access Roads
CYCLE INFRASTRUCTURE	Segregated Cycle Track	Segregated Cycle Track	Cycle Lane	Mixed\traffic
Location	Between Carriageway or street parking and footpath on either edge of the carriageway	Between Carriageway or street parking and footpath on either edge of the carriageway	On the edge of the carriageway, adjacent to the footpath or parking.	
Gradient	1:12 – 1:20 (min)	1:12 – 1:20 (min)	1:12 - 1:20 (min)	1:12-1:20 (min)
Desirable Lane width	2.5 to 5.0 m	2.5 to 5.0 m	1.5 to 2.5 m	Mixed with motorized vehicular traffic
Level	+50 mm to +100 mm	+50 mm to +100 mm	0.0 m	0.0 m
Minimum Width	2.2 for a two lane cycle track and 3 m to 4 m for a common cycle track and footpath (not more than a length of 40 m).	.2 for a two lane cycle 1.2 m painted cycle lane rack and 3 m to 4 m for a common cycle track and footpath (not more han a length of 40 m).		Mixed condition

WIDTH, LOCATION AND HEIGHT OF CYCLE FACILITY

CAPACITY OF CYCLE TRACKS

The capacity of a bicycle lane depends on the number of effective lanes used by bicycles. A standard width of an effective bicycle lane mentioned in HCM is approximately 1.2m. the American associate of State Highway and Transportation Officials recommend off street bicycle paths of 3m wide.

Based on Field observation in segregated cycle facility in New Delhi, it has been seen that a 2.5m segregated cycle track can carry 3000 cyclists per hour at a reasonably good level of service and comfortable speeds.



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Figure 20 Area required for a common cycle track and footpath

4.2.1.4 Street lighting

- Lighting of streets is one of the most important and essential elements for safety of road users including pedestrians.
- Good quality light promotes safer environment by ensuring inter-visibility between users.
- Quality of lighting has major impact on perceptions of security especially for pedestrians and cyclists.
- Lighting will be designed to ensure that both the vehicular carriageway and pedestrian/cycle path are sufficiently illuminated.
- Street lights can have various designs and appearances depending on the type /theme or aesthetic significance of any street.





Figure 21:Types of Street Lights





4.2.1.5 Pedestrian Walkways/Footpaths

Footpath or sidewalk is a portion of the street reserved only for pedestrians. It is provided on both edges of the street. Footpaths will be walkable, clean and safe for pedestrians and will be free from encroachments, parking and utility obstructions. Good footpaths are the most essential components of any good street in the city.

Attributes of good footpath design include:

- Accessibility by all users.
- Continuity and connectivity.
- Adjoining landscaping to create a buffer space
- Footpath level will be maintained at entry to lanes / smaller roads meeting main road. Heavy duty paving blocks to be used in this portion. Suitable ramps to be provided outside footpath area for vehicle access. Footpath width shall not be reduced to provide ramps.
- Design of footpaths will be such that it provides convenience to pedestrian as well as provides for vehicular access to adjoining properties.
- A gentle ramp needs to be provided in parking bay or at road side edge of the footpath to give access to property entrances without altering the surface levels of the walkway. It is to be seen that such vehicular access ramp does not hamper clear walkway for pedestrians. Ramp can be provided at road side edge of footpath only when the clear walkway width is 2.5m or more. This makes it easy for the pedestrians since the levels are not disturbed at every property access gate.
- Ramp, steps at the property entrance and compound wall of property will be within the property premises without any encroachment on footpath. Footpath width shall not be reduced to provide ramps/steps.
- Gate of the property will be inside opening type without causing any obstruction on footpath

Pedestrians find it inconvenient to change the level frequently. Motorists tend to use the footpaths more often like a vehicular way or parking space and dominate the pedestrians making it unsafe for them the lowered access portion is bound to get sunk due to frequent vehicle movement. This causes its wear and tear causing water Bollards can be used to restrict the vehicular movement along footpaths.

Based on IRC Guidelines and pedestrian survey following width of footpath provide for the urban streets.

Clear walking zone of footpath (m)	Max. Number of persons per hour in both directions	
1.8	1350	
2	1800	
2.5	2250	

Table 4:Guidelines for Footpaths





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3	2700
3.5	3150
4	3600

4.2.1.6 Parking Lots

2-wheelers and cars are most common private vehicles parked on street. Autos, cabs, school buses are public and semipublic vehicles consuming road space for parking.

It is to be noted that provision of on-street parking is an additional facility provided by the municipal corporation and is not the right of the citizens. Based on the survey and ground level condition provisions of parking lots at major attraction tourist spots and availability of space along carriage way.

As per the all the Major Road conditions:

- Intersections and other critical locations are kept free from parking and other encroachments up to min 50m from junctions on all arms.
- Suitable curbside lengths are kept clear of parked vehicles near bus stops. Parking will not be allowed on footpaths and cycle tracks or other corridors meant
- exclusively for pedestrians and cyclists and vehicles thus parked will be penalized.
- In central areas, street parking may be permitted on one side of the road one day and on another side on another day depending on the site location. Some streets in the city could be declared as 'No parking' streets in consultation with traffic police.

Parallel parking for cars is the most efficient parking layout in terms of the number of vehicles relative to the area occupied. Parallel parking is recommended because it also takes away minimum road space from other road users. The same parking lane can be used as perpendicular parking for two-wheelers.

4.2.1.7 Traffic Management System

TRAFFIC SIGNS

Traffic signs have been prescribed in the Motor Vehicles Act 1988 for following:

- Road Safety Rules
- Permissible Speed and Access.
- Warning about potential hazards
- Directions and distances of destinations, landmarks and suburbs.

Commonly used road signs as per IRC 67-2012 are as follows:



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Mandatory/Regulatory Signs: In accordance with the Motor Vehicle Act, 1988, every driver of a motor vehicle shall drive the vehicle in conformity with any indication given by the mandatory signs and not obeying these signs is an offense. These signs are generally on circular boards.

Cautionary/warning Signs: Cautionary signs are meant for cautioning the driver about the hazards lying ahead on the road. These signs are on triangular boards.



Figure 22 Prohibited Signage

4.2.1.8 Landscaping <u>PLANTATION</u>

Trees play an important part in the design, function, and aesthetic success of the street scape. Trees are essential on streets for following reasons:

- To provide shade to road users especially, pedestrians and cyclists. To reduce local ambient heat and provide cooler atmosphere. Improve quality of air by absorbing pollutants.
- To reduce surface after, drain off.
- Make streets aesthetically pleasing.
- Trees along sides of the street are desirable to frame the street and enhance pedestrian movement.

Following are broad level recommendations for planting trees on streets:

- Trees should not obstruct the pedestrian flow or vehicular flow. Clear walkable footpath should be available depending on the road width.
- Street trees should typically be upright and branched above 2.4m to provide adequate walking clearance under branches.
- It is recommended to plant trees in Multi-utility zone as recommended by IRC codes. In case of narrow streets and in absence of Multi-utility zone, trees should be planted





- in parking zone / shoulder as it is advisable that trees utilize parking space instead of compromising walking space.
- It is mandatory to have tree pits which provide space for tree growth. Tree pits can be individual, elongated or connected. They may be surfaced with porous pavers, or grates that allow water to readily flow to the root zone. Minimum tree guard dimensions should be followed as per table mentioned in this chapter.
- Thorny plants should not be planted in the median.
- Plantation at edge of footpath (even within private premises) should not be of a type which would overgrow and spread on to the footpath blocking pedestrian path.

Trees should be only planted in following areas:

- Along the edge of the carriageway ideally within an unpaved areas (verge) between footpath and carriageway.
- MUZ wherever provided.
- Verge between footpath and cycle tracks. Within parking belts.
- Within frontage zones on commercial streets

Existing trees on carriage way:

At some locations it is seen that existing trees occupy space on carriage way. They are either on edge or in between the carriage way. These need to be highlighted with Chevron road marking, cats eyes and reflective posts so that they are visible in night. This way accidents can be avoided. If possible, they should be shifted to the edge making sure their life & growth is not hampered.

4.3 Major Roads (R1 to R12)- Traffic Studies and Survey, Issues and Existing and Proposed Road Sections

CURRENT TRAFFIC SCENARIO

Detailed traffic studies were carried out to assess the travel demand and supply prevailing in the study area. Classified Traffic Volume count, Parking Survey, Speed and delay studies and Roadside Interviews to know the existing travel pattern, were carried out. Outcome of analyses made and inferences drawn in the process are given in the following sections.



PEDESTRIAN COUNT IN AGRA SMART CITY

Pedestrian count was conducted at 6 different locations along the project road. The count was carried out manually in 12-hours on a day (From 07:00 am to 07:00 pm) by enumerators. The count data was recorded at 15-minute intervals and total pedestrians for each junction were computed. The processed hourly data has been compiled direction-wise. Peak hour pedestrian flow diagrams for the 6 different locations are summarized below.

PARKING ACCUMULATION

Parking accumulation is defined as the number of cars or 2 wheelers that are parked in each hour in the parking areas studied. It is defined as the number of vehicles parked at a given instant of time. Normally this is expressed by accumulation curve. Parking accumulation in an hour is the total number of registration plate numbers noted down in that particular hour.

4.3.1 R1- Yamuna Kinara Road- 1km x 20m

The Yamuna Kinara Road is 1km in length and is 20m wide. On one side along this road, there is the Red Fort and on other side along this road is Yamuna.

After a visual survey, the issues identified for this road stretch are as follows-

- there are open drains on both sides of the road,
- encroachment on the existing footpaths,
- lack of proper footpath design,
- No utility area
- Lack of storm water drains •

Various types of traffic surveys were also conducted on this road stretch, including-

- Traffic Volume count Survey
- Pedestrian Count Survey



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Chart 1 Hourly Volume (PCU) Graph of Agra Fort – Hathi Ghat Road on a Week day – Friday (Day 1)

The Chart 1 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 12.15 to 13.15 hours.



Chart 2 Vehicle Composition Graph of Agra Fort – Hathi Ghat Road on a Week day – Friday (Day 1)



The Chart 2 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Auto /Share auto with 31% to total vehicles formed the single largest mode. Two-wheeler accounted 27 % and Car/Van /Jeep had accounted to 18 %. While Bicycle/Others constituted 22%. The total volume of traffic during the morning and the evening peak hour were 1699 PCUs and 1777 PCUs respectively.



Chart 3 Vehicle Composition Graph of Agra Fort – Hathi Ghat Road on a Week day – Friday (Day 1)



AGRA FORT-HATHI GHAT ROAD – Day 2 (Week end – Saturday)

Chart 4 Hourly Volume (PCU) Graph of Agra Fort – Hathi Ghat Road on a Week end – Saturday (Day 2)



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The Chart 4 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.30 to 09.30 hours and the other in the evening at 18.00 to 19.00 hours.



Chart 5 Vehicle Composition Graph of Agra Fort – Hathi Ghat Road on a Week end – Saturday (Day 2)

The Chart 5 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Auto /Share auto with 31% to total vehicles formed the single largest mode. Two-wheeler accounted 27 % and Bicycles had accounted to 22 %. While bus, LCV and truck constituted 2%.

The total volume of traffic during the morning and the evening peak hour were 1659 PCUs and 2052 PCUs respectively.





Chart 6 Mid-block Flow Diagram of Agra Fort – Hathi Ghat Road on a Week end – Saturday (Day 2)

PEDESTRIAN COUNT SURVEY

PS-03 – Hathi Ghat – Day 1 (Friday)

Time	No. of Pedestrians
07:00 - 08:00	58
08:00 - 09:00	29
09:00 - 10:00	26
10:00 - 11:00	30
11:00 - 12:00	13
12:00 - 13:00	14
13:00 - 14:00	2
14:00 - 15:00	5



15:00 - 16:00	20
16:00 - 17:00	43
17:00 - 18:00	32
18:00 - 19:00	63
Total	335



Chart 7 Hourly Pedestrian Count at Hathi Ghat

PS-03 – Hathi Ghat – Day 2 (Saturday)

Time	No. of Pedestrians	
07:00 - 08:00	71	
08:00 - 09:00	38	
09:00 - 10:00	32	
10:00 - 11:00	63	
11:00 - 12:00	16	



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12:00 - 13:00	5
13:00 - 14:00	14
14:00 - 15:00	35
15:00 - 16:00	12
16:00 - 17:00	18
17:00 - 18:00	16
18:00 - 19:00	21
Total	341









4.3.1.2 Issues



Open drains on both side of the roads



Encroachment on the footpaths, No utility area



Figure 23 Google Earth image of Yamuna Kinara Road(R1)















4.3.1.4 Proposed Road section of R9- Marriott Road

The proposed components for this road stretch are as follows-





- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians along both sides of the road



Figure 26 Proposed Road section of Yamuna Kinara Road- R1(a)



Figure 27 Proposed Road section of Yamuna Kinara Road-R1(b)



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4.3.1.5 Before & After views of Yamuna Kinara Road- R1



BEFORE



4.3.2 R2- Fort Road- 1Km x 18m

The Fort Road is 1km in length and is 18m wide. On one side along this road, there is the Red Fort and on other side along this road is vacant land which is used for parking for the Red Fort.

After a visual survey, the issues identified for this road stretch are as follows-

- No cycle tracks along the Road •
- Lack of proper footpath design, •
- No utility area •
- Lack of storm water drains •

Various types of traffic surveys were also conducted on this road stretch, including-

- Traffic Volume count Survey
- Pedestrian Count Survey
- Parking Survey





4.3.2.1 Traffic Survey and Studies TRAFFIC VOLUME COUNT



Chart 9 Hourly Volume (PCU) Graph of Taj Parking-Red Fort Road on a Week day – Friday (Day 1)

The Chart 9 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.30 to 10.30 hours and the other in the evening at 17.00 to 18.00 hours.



Chart 10 Vehicle Composition Graph of Taj Parking-Red Fort Road on a Week day – Friday (Day 1)





The Chart 10 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Two-Wheeler with 36 % to total vehicles formed the single largest mode. Auto/Share Auto accounted 24 % and Car/Jeep/Van had accounted to 28 %.

The total volume of traffic during the morning and the evening peak hour were 3140 PCUs and 3197 PCUs respectively.



Chart 11 Mid-block Flow Diagram of Taj Parking-Red Fort Road on a Week day – Friday (Day 1)



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TAJ PARKING-RED FORT ROAD – Day 2 (Week end-Saturday)



The Chart 12 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 11.15 to 12.15 hours.



Chart 13 Vehicle Composition Graph of Taj Parking-Red Fort Road on a Week end – Saturday (Day 2)

The Chart 13 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Two-Wheeler with 33 % to total vehicles formed the single largest mode. Auto/Share Auto accounted



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23 % and Car/Jeep/Van had accounted to 31 %. The total volume of traffic during the morning and the evening peak hour were 3500 PCUs and 3433 PCUs respectively.



Chart 14 Mid-block Flow Diagram of Taj Parking-Red Fort Road on a Week end – Saturday (Day 2)

TAJ MAHAL PARKING-RED FORT ROAD – Day 1(Week day-Friday)



Chart 15 Hourly Volume (PCU) Graph of Taj Mahal Parking-Red Fort Road on a Week day – Friday (Day 1)



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The Chart 15 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 12.15 to 13.15 hours.





The Chart 16 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Auto /Share auto with 39% to total vehicles formed the single largest mode. Car/Jeep/Van accounted 28 % and Bicycles had accounted to 22%.

The total volume of traffic during the morning and the evening peak hour were 1048 PCUs and 1240 PCUs respectively.







Chart 17 Mid-block Flow Diagram of Taj Mahal Parking-Red Fort Road on a Week day – Friday (Day 1)

TAJ MAHAL PARKING-RED FORT ROAD – Day 2(Week end-Saturday)



Chart 18 Hourly Volume (PCU) Graph of Taj Mahal Parking-Red Fort Road on a Week end – Saturday (Day 2)





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The Chart 18 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 11.30 to 12.30 hours.



Chart 19 Vehicle Composition Graph of Taj Mahal Parking-Red Fort Road on a Week end – Saturday (Day 2)

The Chart 19 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Auto /Share auto with 33% to total vehicles formed the single largest mode. Two-wheeler accounted 25 % and Car/Jeep/Van had accounted to 22 %.

The total volume of traffic during the morning and the evening peak hour were 748 PCUs and 755 PCUs respectively.





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Chart 20 Mid-block Flow Diagram of Taj Mahal Parking-Red Fort Road on a Week end – Saturday (Day 2)

TAJ PARKING-WEST GATE – Day 1 (Week day-Friday)



Chart 21 Hourly Volume (PCU) Graph of TAJ PARKING –WEST GATE Road on a Week day – Friday (Day 1)



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The Chart 21 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.30 to 10.30 hours and the other in the evening at 14.00 to 15.00 hours.





The Chart 22 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Bicycles with 91% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 09%.

The total volume of traffic during the morning and the evening peak hour were 229 PCUs and 334 PCUs respectively.



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Chart 23 Mid-block Flow Diagram of TAJ PARKING –WEST GATE Road on a Week day – Friday (Day 1)

TAJ PARKING-WEST GATE – Day 2 (Week end-Saturday)



Chart 24 Hourly Volume (PCU) Graph of TAJ PARKING –WEST GATE Road on a Week end – Saturday (Day 2)





The Chart 24 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 12.15 to 13.15 hours.



Chart 25 Vehicle Composition Graph of TAJ PARKING – WEST GATE Road on a Week end – Saturday (Day 2)

The Chart 25 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 89% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 11%.

The total volume of traffic during the morning and the evening peak hour were 189 PCUs and 385 PCUs respectively.



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Chart 26 Mid-block Flow Diagram of TAJ PARKING –WEST GATE Road on a Week end – Saturday (Day 2)

PEDESTRIAN COUNT SURVEY

- y	r (r nady)	
	Time	No. of Pedestrians
	07:00 - 08:00	548
	08:00 - 09:00	647
	09:00 - 10:00	1055
	10:00 - 11:00	1714
	11:00 - 12:00	1926
	12:00 - 13:00	2016
	13:00 - 14:00	2283
	14:00 - 15:00	1783

PS-02 – Red Fort – Day 1 (Friday)





15:00 - 16:00	2075
16:00 - 17:00	1925
17:00 - 18:00	1160
18:00 - 19:00	1107
Total	18239





PS-02 – Red Fort – Day 2 (Saturday)

Time	No. of Pedestrians	
07:00 - 08:00	482	
08:00 - 09:00	374	
09:00 - 10:00	546	





10:00 - 11:00	887
11:00 - 12:00	1030
12:00 - 13:00	1581
13:00 - 14:00	1222
14:00 - 15:00	1066
15:00 - 16:00	991
16:00 - 17:00	1157
17:00 - 18:00	1385
18:00 - 19:00	1343
Total	12064



Chart 28 Hourly Pedestrian Count at Red Fort



-Ky 67

PARKING SURVEY

RED FORT

In Red Fort road, parking survey was conducted on both the directions (Left / Right), two wheelers formed major composition on both the days as mentioned in the chart below.



Chart 29 Vehicle Composition of Red Fort

23% of the vehicles parked were two wheelers and 77% of them were cars.

The parking accumulation on Friday and Saturday on either side of the road in Red Fort is tabulated below.

PARKING ACCUMULATION				
TIME	TWO-WHEELER	CARS	OTHERS	TOTAL
07.00 - 08.00	0	17	0	0
08.00 - 09.00	14	38	0	14
09.00 - 10.00	23	73	0	23
10.00 - 11.00	66	111	10	66
11.00 - 12.00	48	182	12	48
12.00 - 13.00	54	120	12	54
13.00 - 14.00	31	73	6	31





14.00 - 15.00	68	77	10	68
15.00 - 16.00	58	108	7	58
16.00 - 17.00	16	83	0	16
17.00 - 18.00	14	29	0	14
18.00 - 19.00	14	18	0	14
TOTAL	406	929	57	1392



Chart 30 Parking Accumulation at Red Fort – Day1

PARKING ACCUMULATION						
TIME	TWO-WHEELER	CARS	OTHERS	TOTAL		
07.00 - 08.00	5	7	0	12		
08.00 - 09.00	19	38	1	58		



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Chart 31 Parking Accumulation at Red Fort – Day 2



14.00 - 15.00

15.00 - 16.00

16.00 - 17.00

17.00 - 18.00

18.00 - 19.00

TOTAL

-Ky

4.3.2.2 Issues



No proper pathways

No cycle tracks



No buffer area along the drain



No utility area



Figure 28 Google Earth image of Fort Road(R2)



-Ky 71
4.3.2.3 Existing Road Section of R2- Fort Road



Figure 29 Existing Road section of Fort Road- R2(a)



Figure 30 Existing Road section of Fort Road- R2(b)

4.3.2.4 Proposed Road section of R2- Fort Road

The proposed components for this road stretch are as follows-



- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians along both sides of the road
- Cycle Tracks on one side of the roads.



Figure 31 Proposed Road section of Fort Road- R2(a)



Figure 32 Proposed Road section of Fort Road- R2(b)



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4.3.2.5 Before & After views of Fort Road- R2





BEFORE

AFTER





BEFORE



BEFORE



AFTER



ty

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BEFORE



4.3.3 **R3- Station Road- 0.8km x 12m**

The Station Road is 0.8km in length and is 12m wide. On one side along this road, there is the Red Fort and on other side along this road is vacant land which is used for parking for the Red Fort.

After a visual survey, the issues identified for this road stretch are as follows-

- No cycle tracks along the Road
- Lack of proper footpath design,
- No utility area
- Lack of storm water drains

Various types of traffic surveys were also conducted on this road stretch, including-

- Traffic Volume count Survey
- Pedestrian Count Survey





4.3.3.1 Traffic Survey and Studies

TRAFFIC VOLUME COUNT SURVEY



AGRA FORT -RAILWAY STATION ROAD -Day 2(Week end-Saturday)

The Chart 32 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 12.00 to 13.00 hours.





Chart 32 Hourly Volume (PCU) Graph of Agra Fort-Railway Station Road on a Week end – Saturday (Day 2)



Chart 33 Vehicle Composition Graph of Agra Fort-Railway Station Road on a Week end – Saturday (Day 2)

The Chart 33 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Auto /Share auto with 40% to total vehicles formed the single largest mode. Two-wheeler accounted 36 % and Bicycles had accounted to 11 %.

The total volume of traffic during the morning and the evening peak hour were 1633 PCUs and 2136 PCUs respectively.



Chart 34 Mid-block Flow Diagram of Agra Fort-Railway Station Road on a Week end – Saturday (Day 2)



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GHAATIA-RAILWAY STATION -T POINT -Day 1 (Week day-Friday)

Chart 35 Hourly Volume (PCU) Graph of Ghaatia to Railway station on a Week day– Friday (Day 1)

The Chart 35 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 15.15 to 16.15 hours.



Chart 36 Vehicle Composition Graph of Ghaatia to Railway station on a Week day- Friday (Day 1)



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The Chart 36 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 61% to total vehicles formed the single largest mode. Bicycles had accounted to 35%.

The total volume of traffic during the morning and the evening peak hour were 467 PCUs and 699 PCUs respectively.



Chart 37 Mid-block Flow Diagram of Ghaatia to Railway station on a Week day- Friday (Day 1)

GHAATIA- RAILWAY STATION -T POINT -Day 2 (Week end-Saturday)



Chart 38 Hourly Volume (PCU) Graph of Ghaatia to Railway station on a Week end – Saturday (Day 2)



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The Chart 38 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 10.45 to 11.45 hours and the other in the evening at 11.15 to 12.15 hours.





The Chart 39 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 64 % to total vehicles formed the single largest mode. Bicycles had accounted to 32%.

The total volume of traffic during the morning and the evening peak hour were 400 PCUs and 373 PCUs respectively.



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Chart 40 Mid-block Flow Diagram of Ghaatia to Railway station on a Week end – Saturday (Day 2)

PEDESTRIAN COUNT SURVEY

PS-01 – Agra Fort Railway Station – Day 1 (Friday)

Time	No. of Pedestrians
07:00 - 08:00	196
08:00 - 09:00	466
09:00 - 10:00	455
10:00 - 11:00	292
11:00 - 12:00	365
12:00 - 13:00	438
13:00 - 14:00	561
14:00 - 15:00	534
15:00 - 16:00	644



ty 81

16:00 - 17:00	804
17:00 - 18:00	737
18:00 - 19:00	1161
Total	6653



Chart 41 Hourly Pedestrian Count at Agra Fort Railway Station

PS-01 – Agra Fort Railway Station – Day 2 (Saturday)

Time	No. of Pedestrians
07:00 - 08:00	732
08:00 - 09:00	863
09:00 - 10:00	1255
10:00 - 11:00	722
11:00 - 12:00	794
12:00 - 13:00	883



13:00 - 14:00	719
14:00 - 15:00	800
15:00 - 16:00	859
16:00 - 17:00	1096
17:00 - 18:00	1999
18:00 - 19:00	2740
Total	13462



Chart 42 Hourly Pedestrian Count at Agra Fort Railway Station





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4.3.3.2 Issues



No footpaths on either side of the road



Absence of proper median on the road



No utility area



No cycle tracks







Figure 33 Google Earth image of Station Road(R3)

4.3.3.3 Existing Road Section of R3- Station Road



Figure 34 Existing Road section of Station Road- R3

4.3.3.4 Proposed Road section of R2- Fort Road

The proposed components for this road stretch are as follows-

• Designated Utility area along the road on both sides.





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- Dedicated Pathways for the pedestrians along both sides of the road
- Cycle Tracks on one side of the roads.



Figure 35 Proposed Road section of Station Road- R3

4.3.3.5 Before & After views of Station Road- R3



BEFORE





86 ty

4.3.4 R4- Taj West Gate Corridor- 1.4km x 18m

The Taj West Gate Corridor is 1.4km in length and is 18m wide. Along this road stretch, there is Shahjahan Garden on one side.

After a visual survey, the issues identified for this road stretch are as follows-

- No cycle tracks along the Road
- Lack of proper footpath design,
- No utility area
- Lack of storm water drains

Various types of traffic surveys were also conducted on this road stretch, including-

- Traffic Volume count Survey
- Pedestrian Count Survey

4.3.4.1 Traffic Survey and Studies

TRAFFIC VOLUME COUNT SURVEY

HATHI GHAT -- TAJ PARKING ROAD -- Day 1(Week day-Friday)



Chart 43 Hourly Volume (PCU) Graph of Hathi Ghat – Taj Parking Road on a Week day – Friday (Day 1)



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The Chart 43 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 12.15 to 13.15 hours.





The Chart 44 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Two-wheeler with 48% to total vehicles formed the single largest mode. Auto/Share Auto accounted 23 % and Car/Van/Jeep had accounted to 23 %.

The total volume of traffic during the morning and the evening peak hour were 4529 PCUs and 4622 PCUs respectively.







Chart 45 Hourly Volume (PCU) Graph of Hathi Ghat – Taj Parking Road on a Week day – Friday (Day 1)

HATHI GHAT -- TAJ PARKING ROAD -- Day 2(Week end-Saturday)



Chart 46 Hourly Volume (PCU) Graph of Hathi Ghat – Taj Parking Road on a Week day – Friday (Day 1)

The Chart 46 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 11.15 to 12.15 hours.



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Chart 47 Vehicle Composition Graph of Hathi Ghat – Taj Parking Road on a Week end – Saturday (Day 2)

The Chart 47 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Two-Wheeler with 50% to total vehicles formed the single largest mode. Auto/Share Auto accounted 23 % and Car/Van/Jeep had accounted to 21 %.

The total volume of traffic during the morning and the evening peak hour were 5138 PCUs and 5271 PCUs respectively.



90 ty



Chart 48 Mid-block Flow Diagram of Hathi Ghat – Taj Parking Road on a Week end – Saturday (Day 2)

TAJ PARKING-WEST GATE – Day 1 (Week day-Friday)



Chart 49 Hourly Volume (PCU) Graph of TAJ PARKING –WEST GATE Road on a Week day – Friday (Day 1)



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The Chart 49 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.30 to 10.30 hours and the other in the evening at 14.00 to 15.00 hours.





The Chart 50 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Bicycles with 91% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 09%.

The total volume of traffic during the morning and the evening peak hour were 229 PCUs and 334 PCUs respectively.





Chart 51 Mid-block Flow Diagram of TAJ PARKING –WEST GATE Road on a Week day – Friday (Day 1)

TAJ PARKING-WEST GATE – Day 2 (Week end-Saturday)



Chart 52 Hourly Volume (PCU) Graph of TAJ PARKING –WEST GATE Road on a Week end – Saturday (Day 2)

The Chart 52 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 12.15 to 13.15 hours.



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Chart 53 Vehicle Composition Graph of TAJ PARKING –WEST GATE Road on a Week end – Saturday (Day 2)

The Chart 53 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 89% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 11%.

The total volume of traffic during the morning and the evening peak hour were 189 PCUs and 385 PCUs respectively.



Chart 54 Mid-block Flow Diagram of TAJ PARKING –WEST GATE Road on a Week end – Saturday (Day 2)



PEDESTRIAN COUNT SURVEY

PS-05- West Gate- Day 1 (Friday)

Time	No. of Pedestrians
07:00 - 08:00	52
08:00 - 09:00	33
09:00 - 10:00	27
10:00 - 11:00	12
11:00 - 12:00	0
12:00 - 13:00	0
13:00 - 14:00	0
14:00 - 15:00	0
15:00 - 16:00	39
16:00 - 17:00	103
17:00 - 18:00	65
18:00 - 19:00	61
Total	392





Chart 55 Hourly Pedestrian Count at West Gate

PS-05– West Gate– Day 2 (Saturday)

Time	No. of Pedestrians
07:00 - 08:00	69
08:00 - 09:00	83
09:00 - 10:00	71
10:00 - 11:00	78
11:00 - 12:00	0
12:00 - 13:00	0
13:00 - 14:00	0
14:00 - 15:00	0
15:00 - 16:00	67
16:00 - 17:00	30
17:00 - 18:00	90



ty 96

18:00 - 19:00	73
Total	561



Chart 56 Hourly Pedestrian Count at West Gate

PS-06- Taj Parking Road- Day 1 (Sunday)

Time	No. of Pedestrians
07:00 - 08:00	70
08:00 - 09:00	15
09:00 - 10:00	20
10:00 - 11:00	25
11:00 - 12:00	65
12:00 - 13:00	80
13:00 - 14:00	160
14:00 - 15:00	65



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15:00 - 16:00	80
16:00 - 17:00	145
17:00 - 18:00	135
18:00 - 19:00	80
Total	940



Chart 57 Hourly Pedestrian Taj Parking Road

PS-06- Taj Parking Road- Day 2 (Monday)

Time	No. of Pedestrians
07:00 - 08:00	15
08:00 - 09:00	12
09:00 - 10:00	17
10:00 - 11:00	24
11:00 - 12:00	12
12:00 - 13:00	30



ty 98

13:00 - 14:00	40
14:00 - 15:00	27
15:00 - 16:00	75
16:00 - 17:00	45
17:00 - 18:00	70
18:00 - 19:00	15
Total	382



Chart 58 Hourly Pedestrian Taj Parking Road-Day 2



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4.3.4.2 Issues





Absence of proper construction of footpaths along the road

Open drains



Figure 36 Google Earth image of Taj West Gate Corridor(R4)





4.3.4.3 Existing Road Section of R4- Taj West Gate Corridor

Figure 37 Existing Road section of Taj West Gate Corridor- R4

4.3.4.4 Proposed Road section of R4- Taj West Gate Corridor

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians along both sides of the road
- Cycle Tracks on one side of the roads.



Figure 38 Proposed Road section of Taj West Gate Corridor- R4





4.3.5 R5- Golf Course Road- 0.4km x 13m

The Golf Course Road is 0.4km in length and is 13m wide. Along this road stretch, there is Shahjahan Garden on one side.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- No utility area
- Lack of storm water drains

Various types of traffic surveys were also conducted on this road stretch, including-

- Traffic Volume count Survey
- Pedestrian Count Survey

4.3.5.1 Traffic Survey and Studies

TRAFFIC VOLUME COUNT SURVEY

WEST GATE -RED FORT ROAD -Day 1(Week day-Friday)



Chart 59 Hourly Volume (PCU) Graph of Waste Gate -Red Fort Road on a Week day – Friday (Day 1)



102 ty

The Chart 59 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 16.00 to 17.00 hours.





The Chart 60 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 52% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 17%. Auto rickshaw and share autos constituted 26%

The total volume of traffic during the morning and the evening peak hour were 3124 PCUs and 3521 PCUs respectively.





Chart 61 Mid-block Flow Diagram of West Gate-Red Fort Road on a Week day – Friday (Day 1)



WEST GATE -RED FORT ROAD -Day 2(Week end-Saturday)

Chart 62 Hourly Volume (PCU) Graph of West Gate -Red Fort Road on a Week end – Saturday (Day 2)



104

The Chart 62 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.30 to 09.30 hours and the other in the evening at 12.00 to 13.00 hours.



Chart 63 Vehicle Composition Graph of West Gate -Red Fort Road on a Week end – Saturday (Day 2)

The Chart 63 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 56% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 13%. Auto rickshaw and share autos constituted 25%

The total volume of traffic during the morning and the evening peak hour were 3038 PCUs and 3270 PCUs respectively.



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Chart 64 Mid-block Flow Diagram of West Gate -Red Fort Road on a Week end – Saturday (Day 2)

WEST GATE -RED FORT ROAD -Day 1(Week day-Friday)



Chart 65 Hourly Volume (PCU) Graph of West Gate -Red Fort Road on a Week day – Friday (Day 1)

The Chart 65 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 16.00 to 17.00 hours.



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Chart 66 Vehicle Composition Graph of West Gate -Red Fort Road on a Week day - Friday (Day 1)

The Chart 66 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 53% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 16%. Auto rickshaw and share autos constituted 27%

The total volume of traffic during the morning and the evening peak hour were 3104 PCUs and 3376 PCUs respectively.



Chart 67 Mid-block Flow Diagram of West Gate-Red Fort Road on a Week day – Friday (Day 1)



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WEST GATE -RED FORT ROAD -Day 2 (Week end-Saturday)

Chart 68 Hourly Volume (PCU) Graph of West Gate -Red Fort Road on Week end – Saturday (Day 2)

The Chart 68 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 12.15 to 13.15 hours.



Chart 69 Vehicle Composition Graph of West Gate -Red Fort Road on a Week end – Saturday (Day 2)





The Chart 69 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 56% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 13%. Auto rickshaw and share autos constituted 26%.

The total volume of traffic during the morning and the evening peak hour were 2937 PCUs and 3158 PCUs respectively.



Chart 70 Mid-block Flow Diagram of West Gate -Red Fort Road on a Week end – Saturday (Day 2)

PEDESTRAIN COUNT SURVEY

PS-04 – (Shahjahan Park) Gate– Day 1 (Sunday)

Time	No. of Pedestrians
07:00 - 08:00	75
08:00 - 09:00	52
09:00 - 10:00	13
10:00 - 11:00	13



109 ty

11:00 - 12:00	47
12:00 - 13:00	37
13:00 - 14:00	32
14:00 - 15:00	38
15:00 - 16:00	22
16:00 - 17:00	30
17:00 - 18:00	35
18:00 - 19:00	38
Total	432



Chart 71 Hourly Pedestrian Count at (Shahjahan Park) Gate

PS-04 – (Shahjahan Park) Gate– Day 2 (Monday)

Time	No. of Pedestrians
07:00 - 08:00	49





08:00 - 09:00	37
09:00 - 10:00	22
10:00 - 11:00	14
11:00 - 12:00	27
12:00 - 13:00	17
13:00 - 14:00	12
14:00 - 15:00	8
15:00 - 16:00	12
16:00 - 17:00	13
17:00 - 18:00	13
18:00 - 19:00	37
Total	261



Chart 72 Hourly Pedestrian Count at (Shahjahan Park) Gate



ty

111

4.3.5.2 Issues



Absence of footpaths



Absence of storm water drains



Figure 39 Google Earth image of Golf Course Road(R5)



112 -Ky

4.3.5.3 Existing Road Section of R5- Golf Course Road



Figure 40 Existing Road section of Golf Course Road- R5

4.3.5.4 Proposed Road Section of R5- Golf Course Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians along both sides of the road
- Dedicated two-wheeler lane on both sides of the roads.



Figure 41 Proposed Road section of Golf Course Road- R5



113

4.3.6 R6- Mandi Road- 0.7km- 17-35m

The Mandi Road is 0.7km in length and is 17m to upto 35m wide at various points. Along this road stretch, there is residential and commercial land use on either side of the roads.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- No utility area
- Lack of storm water drains
- Lack of proper junction design

Various types of traffic surveys were also conducted on this road stretch, including-

- Traffic Volume count Survey
- Pedestrian Count Survey
- Parking Survey
- •

4.3.6.1 Traffic Survey and Studies TRAFFIC VOLUME COUNT SURVEY

WEST GATE-FATEHABAD City Road–Day 1 (Week Day -Friday)



114 -Ky



Chart 73 Hourly Volume (PCU) Graph of West Gate to Fatehabad City Road on a Week day - Friday (Day 1)

The Chart 73 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 11.15 to 12.15 hours.



Chart 74 Vehicle Composition Graph of West Gate to Fatehabad City Road on a Week day – Friday (Day 1)



115

The Chart 74 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 41% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 21%. Auto rickshaw and share autos constituted 28%

The total volume of traffic during the morning and the evening peak hour were 3269 PCUs and 3289 PCUs respectively.

			↑ ^ℕ	
1745 1620	1745 1620	towards Agra Fort	•	
towards 1525 Hathi Ghat	1525 1669			
	am	Peak Time	in Nos.	in PCU
	PM	11:15 - 12:15	1634	3289
		Total No. of Vehicles / day	29753	

Chart 75 Mid-block Flow Diagram of West Gate to Fatehabad City Road on a Week day - Friday (Day 1)

WEST GATE-FATEHABAD City Road–Day 2 (Week end -Saturday)



ty 116



Chart 76 Hourly Volume (PCU) Graph of West Gate to Fatehabad City Road on a Week end – Saturday (Day 2)

The Chart 76 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 10.15 to 11.15 hours and the other in the evening at 15.00 to 16.00 hours.



Chart 77 Vehicle Composition Graph of West Gate to Fatehabad City Road on a Week end – Saturday (Day 2)



117 ty

The Chart 77 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 38% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 25%. Auto rickshaw and share autos constituted 29%

The total volume of traffic during the morning and the evening peak hour were 3765 PCUs and 3921 PCUs respectively.



Chart 78 Mid-block Flow Diagram of West Gate to Fatehabad City Road on a Week end – Saturday (Day 2)

PARKING SURVEY

HOTEL KRISHNA

In Hotel Krishna road, parking survey was conducted on both the directions (Left / Right), two wheelers formed major composition on both the days as mentioned in the chart below.







Chart 79 Vehicle Composition of Hotel Krishna

37% of the vehicles parked were two wheelers and 63% of them were cars.

The parking accumulation on Friday and Saturday on either side of the road in Hotel Krishna is tabulated below.

TIME	TWO-WHEELER	CARS
07.00 - 08.00	0	4
08.00 - 09.00	2	8
09.00 - 10.00	5	4
10.00 - 11.00	4	2
11.00 - 12.00	3	3
12.00 - 13.00	3	3
13.00 - 14.00	2	4
14.00 - 15.00	2	2
15.00 - 16.00	4	3
16.00 - 17.00	4	6
17.00 - 18.00	1	9
18.00 - 19.00	1	4





TOTAL	31	52
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Chart 80 Parking accumulation at Hotel Krishna – Day 2

HAND CRAFT

In Hand Craft road, parking survey was conducted on both the directions (Left / Right), two wheelers formed major composition on both the days as mentioned in the chart below.







Chart 81 Vehicle Composition

79% of the vehicles parked were two wheelers, 14% of vehicles parked were cars and 7% of them were others.

The parking accumulation on Friday and Saturday on either side of the road in Hand Craft is tabulated below.

TIME	TWO-WHEELER	CARS	OTHERS
07.00 - 08.00	0	0	3
08.00 - 09.00	0	0	2
09.00 - 10.00	8	1	2
10.00 - 11.00	12	2	2
11.00 - 12.00	12	3	1
12.00 - 13.00	12	3	0
13.00 - 14.00	11	2	0
14.00 - 15.00	14	2	0
15.00 - 16.00	14	2	0
16.00 - 17.00	14	2	0



-Ky 121

17.00 - 18.00	11	2	0
18.00 - 19.00	10	2	0
TOTAL	118	21	10



Figure 42 Parking Accumulation at Hand Craft day 1

TIME	TWO- WHEELER	CARS	OTHERS
07.00 - 08.00	0	0	2
08.00 - 09.00	3	1	1
09.00 - 10.00	9	1	0
10.00 - 11.00	12	4	0
11.00 - 12.00	10	9	2
12.00 - 13.00	11	2	0
13.00 - 14.00	12	4	0



ty

14.00 - 15.00	13	5	0
15.00 - 16.00	12	3	0
16.00 - 17.00	12	3	1
17.00 - 18.00	12	3	0
18.00 - 19.00	12	3	0
TOTAL	118	38	6



Figure 43 Parking Accumulation at Hand Craft Day 2



-Ky 123

4.3.6.2 Issues



No pathways along the road



No proper junction design



Open drains along the road



No utility area







Figure 44 Google Earth image of Mandi Road(R6)

4.3.6.3 Existing Road Section of R6- Mandi Road



Figure 45 Existing Road section of Mandi Road- R6



ty 125

4.3.6.4 Proposed Road Section of R6- Mandi Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians on one side of the road



Figure 46 Proposed Road section of Mandi Road- R6

4.3.7 **R7- Police Line Road- 0.9km x 15m**

The Police Line Road is 0.9km in length and is 15m. Along this road stretch, there is Golf Course on one side of the road and Government Buildings on the other side.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- No utility area
- Lack of storm water drains

Various types of traffic surveys were also conducted on this road stretch, including-

• Traffic Volume count Survey



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4.3.7.1 Traffic Survey and Studies

SADAR-WEST GATE – Day 1 (Week day-Friday)



Chart 82 Hourly Volume (PCU) Graph of Sadar –West Gate on a Week day – Friday (Day 1)

The Chart 82 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.00 to 10.00 hours and the other in the evening at 14.00 to 15.00 hours.



Chart 83 Vehicle Composition Graph of Sadar –West Gate on a Week day – Friday (Day 1)





The Chart 83 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 42% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 32%. Auto rickshaw and share autos constituted 17%

The total volume of traffic during the morning and the evening peak hour were 777 PCUs and 1384 PCUs respectively.



Chart 84 Mid-block Flow Diagram of Sadar –West Gate on a Week day – Friday (Day 1)

SADAR-WEST GATE –Day 2 (Week end-Saturday)



Chart 85 Hourly Volume (PCU) Graph of Sadar –West Gate on a Week end – Saturday (Day 2)



128

The Chart 85 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 10.45 to 11.45 hours and the other in the evening at 16.00 to 17.00 hours.



Chart 86 Vehicle Composition Graph of Sadar –West Gate on a Week end – Saturday (Day 2)

The Chart 86 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that Cars/vans/jeeps with 40% to total vehicles formed the single largest mode. Two-Wheeler had accounted to 33%. Auto rickshaw and share autos constituted 22%.

The total volume of traffic during the morning and the evening peak hour were 1701 PCUs and 2362 PCUs respectively.





Chart 87 Mid-block Flow Diagram of Sadar –West Gate on a Week end – Saturday (Day 2)

4.3.7.2 Issues



No footpath along the road

No storm water drains







No cycle tracks



Figure 47 Google Earth image of Police Line Road(R7)



-Ky



4.3.7.3 Existing Road Section of R7- Police Line Road





Figure 49 Existing Road section of Police Line Road- R7(b)



132

4.3.7.4 Proposed Road Section of R7- Police Line Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians on one side of the road



Figure 50 Proposed Road section of Police Line Road- R7(a)



Figure 51 Proposed Road section of Police Line Road- R7(b)



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4.3.8 R9- Marriott Road- 1.2km x 15m

The Marriott Road is 1.2km in length and is 15m. Along this road stretch, there is residential and commercial land use on either side of the roads.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- Encroachment in sabzi mandi road
- Garbage all along the road
- No proper junction designs
- No median on the road
- No utility area
- Lack of storm water drains

Various types of traffic surveys were also conducted on this road stretch, including-

• Traffic Volume count Survey

4.3.8.1 Traffic Survey and Studies

SABZI MANDI – MARRUOOT HOTEL – Day 2 (Week end-Saturday)



Chart 88 Hourly Volume (PCU) Graph of Sabzi Mandi to Marriott Hotel on a Week day – Friday (Day 1)



134

The Chart 88 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.30 to 10.30 hours and the other in the evening at 11.15 to 12.15 hours.





The Chart 89 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 58% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 11%. Auto rickshaw and share autos constituted 17%.

The total volume of traffic during the morning and the evening peak hour were 11230 PCUs and 11940 PCUs respectively.



135



Chart 90 Mid-block Flow Diagram of Sabzi Mandi to Marriott Hotel on a Week day – Friday (Day 1)



SABZI MANDI – MARRIOTT HOTEL – Day 2 (Week end-Saturday)

Chart 91 Hourly Volume (PCU) Graph of Sabzi Mandi to Marriott Hotel on a Week end – Saturday (Day 2)



ty 136

The Chart 91 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.45 to 09.45 hours and the other in the evening at 13.00 to 14.00 hours.



Chart 92 Vehicle Composition Graph of Sabzi Mandi to Marriott Hotel on a Week end – Saturday (Day 2)

The Chart 92 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 56% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 13%. Bicycles constituted 11%.

The total volume of traffic during the morning and the evening peak hour were 280 PCUs and 446 PCUs respectively.







Chart 93 Mid-block Flow Diagram of Sabzi Mandi to Marriott Hotel on a Week end – Saturday (Day 2)



FATEHABAD ROAD-SABZI MANDI –Day 1 (Week day-Friday)

Chart 94 Hourly Volume (PCU) Graph of Fatehabad Road to Sabzi Mandi on a Week day – Friday (Day 1)



138 m

The Chart 94 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.00 to 10.00 hours and the other in the evening at 12.30 to 13.30 hours.





The Chart 95 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 44% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 38%. Auto rickshaw and share autos constituted 09%

The total volume of traffic during the morning and the evening peak hour were 349 PCUs and 450 PCUs respectively.







Chart 96 Mid-block Flow Diagram of Fatehabad Road to Sabzi Mandi on a Week day - Friday (Day 1)

FATEHABAD ROAD-SABZI MANDI –Day 2 (Week end Saturday)



Chart 97 Hourly Volume (PCU) Graph of Fatehabad Road to Sabzi Mandi on a Week end – Saturday (Day 2)

The Chart 97 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.30 to10.30 hours and the other in the evening at 12.15 to 13.15 hours.







Chart 98 Vehicle Composition Graph of Fatehabad Road to Sabzi Mandi on a Week end – Saturday (Day 2)

The Chart 98 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 43% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 39%. Auto rickshaw and share autos constituted 08%.

The total volume of traffic during the morning and the evening peak hour were 360 PCUs and 335 PCUs respectively.



Chart 99 Mid-block Flow Diagram of Fatehabad Road to Sabzi Mandi on a Week end – Saturday (Day 2)



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4.3.8.2 Issues



Encroachment in sabzi mandi road Garbage all along the road



No pathways along the road, and absence of utility area.



No median on the road.



No proper junction designs







Figure 52 Google Earth image of Marriott Road(R9)

4.3.8.3 Existing Road Section of R9- Marriott Road



Figure 53 Existing Road section of Marriott Road- R9(a)






Figure 54 Existing Road section of Marriott Road- R9(b)

4.3.8.4 Proposed Road section of R9- Marriott Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians on one side of the road
- Median on the road



Figure 55 Proposed Road section of Marriott Road- R9(a)



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Figure 56 Proposed Road section of Marriott Road- R9(b)

4.3.9 R10- Tora Road- 0.5km x 39m

The Tora Road is 0.5km in length and is 39m. Along this road stretch, there is residential and commercial land use on either side of the roads.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- No proper junction designs
- No utility area
- Lack of storm water drains

Various types of traffic surveys were also conducted on this road stretch, including-

• Traffic Volume count Survey





4.3.9.1 Traffic Survey and Studies

TORA CHOWK-BAROLI – Day 1 (Week day - Friday)



Chart 100 Hourly Volume (PCU) Graph of Tora Chowk to Baroli on a Week day – Friday (Day 1)

The Chart 100 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.30 to 10.30 hours and the other in the evening at 17.15 to 18.15 hours.



Chart 101 Vehicle Composition Graph of Tora Chowk to Baroli on a Week day – Friday (Day 1)



The Chart 101 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 43% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 39%. Auto rickshaw and share autos constituted 8%.

The total volume of traffic during the morning and the evening peak hour were 360 PCUs and 335 PCUs respectively.



Chart 102 Mid-block Flow Diagram of Tora Chowk to Baroli on a Week day – Friday (Day 1)

TORA CHOWK-BAROLI – Day 2 (Week end-Saturday)



Chart 103 Hourly Volume (PCU) Graph of Tora Chowk to Baroli on a Week end – Saturday (Day 2)



147

The Chart 103 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.15 to 09.15 hours and the other in the evening at 12.15 to 13.15 hours.



Chart 104 Vehicle Composition Graph of Tora Chowk to Baroli on a Week end – Saturday (Day 2)

The Chart 104 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 47% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 21%. Auto rickshaw and share autos constituted 11% while bus, lcv and truck constituted 11%.

The total volume of traffic during the morning and the evening peak hour were 856 PCUs and 883 PCUs respectively.



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Chart 105 Mid-block Flow Diagram of Tora Chowk to Baroli on a Week end – Saturday (Day 2)

4.3.9.2 Issues



No pathways

No Cycle Tracks



149 ty

REHABILITATION OF MAJOR ROADS, AGRA



No Utility Area



Figure 57 Google Earth image of Tora Road(R10)



ty 150

4.3.9.3 Existing Road Section of R10- Tora Road



Figure 58 Existing Road Section of Tora Road- R10

4.3.9.4 Proposed Road Section of R10- Tora Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians on one side of the road



Figure 59 Proposed Tora Road Section- R10



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Figure 60 Proposed Road Section of Tora Road- R10 (S2)



Figure 61 Proposed Road Section of Tora Road- R10 (S3)



4.3.10 **R11- Kala Kheria Road- 0.5km x 18m**

The Tora Road is 0.5km in length and is 18m. Along this road stretch, there is residential and commercial land use on either side of the roads.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- Plantation with median between carriageway
- No proper junction designs
- No utility area
- Lack of storm water drains
- No boundary wall along the road

Various types of traffic surveys were also conducted on this road stretch, including-

• Traffic Volume count Survey

4.3.10.1 Traffic Survey and Studies

GANPATI WORLD – TDI CITY – Day 1 (Week day-Friday)



Chart 106 Hourly Volume (PCU) Graph of Ganpati World to TDI City on a Week day – Friday (Day 1)



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REHABILITATION OF MAJOR ROADS, AGRA

The Chart 106 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 11.00 to 12.00 hours and the other in the evening at 16.45 to 17.45 hours.





The Chart 107 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 66% to total vehicles formed the single largest mode. Bicycles had accounted to 23%. Auto rickshaw and share autos constituted 5%.

The total volume of traffic during the morning and the evening peak hour were 88 PCUs and 96 PCUs respectively.







Chart 108 Mid-block Flow Diagram of Ganpati World to TDI City on a Week day - Friday (Day 1)

GANPATI WORLD – TDI CITY – Day 2 (Week end-Saturday)



Chart 109 Hourly Volume (PCU) Graph of Ganpati World to TDI City on a Week end – Saturday (Day 2)



ty 155

The Chart 109 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.00 to 10.00 hours and the other in the evening at 17.45 to 18.45 hours.





The Chart 110 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 63% to total vehicles formed the single largest mode. Bicycles had accounted to 24%. Auto rickshaw and share autos constituted 6%.

The total volume of traffic during the morning and the evening peak hour were 141 PCUs and 168 PCUs respectively.





Chart 111 Mid-block Flow Diagram of Ganpati World to TDI City on a Week end – Saturday (Day 2)

4.3.10.2 Issues



No pathways along the road



Plantation with median between carriageway





REHABILITATION OF MAJOR ROADS, AGRA



No median



No boundary wall along the road



Figure 62 Google Earth image of Kala Kheria Road(R11)



ty 158

4.3.10.3 Existing Road Section of R11- Kala Kheria Road



Figure 63 Existing Road Section of Kala Kheria Road- R11

4.3.10.4 Proposed Road Section of R11- Kala Kheria Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians on one side of the road
- Median on the road



Figure 64 Proposed Road Section of Kala Kheria Road- R11



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4.3.11 **R12- TDI Road- 1.5km x 17m**

The TDI Road is 1.5km in length and is 17m. Along this road stretch, there is residential and commercial land use on either side of the roads.

After a visual survey, the issues identified for this road stretch are as follows-

- Lack of proper footpath design,
- No utility area
- Lack of storm water drains
- No boundary wall along the road

Various types of traffic surveys were also conducted on this road stretch, including-

• Traffic Volume count Survey

4.3.11.1 Traffic Studies and Survey

BASAI GAON TO TDI MALL-Day 1 (Week day-Friday)



Chart 112 Hourly Volume (PCU) Graph of Basai Gaon to TDI Mall on a Week day –Friday (Day 1)

The Chart 112 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.45 to 09.45 hours and the other in the evening at 11.15 to 12.15 hours.







The Chart 113 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 49% to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 27%. Auto rickshaw and share autos constituted 13%

The total volume of traffic during the morning and the evening peak hour were 609 PCUs and 472 PCUs respectively.



Chart 114 Mid-block Flow Diagram of Basai Gaon to TDI Mall on a Week day –Friday (Day 1)



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BASAI GAON TO TDI MALL–Day 2 (Week end-Saturday)



Chart 115 Hourly Volume (PCU) Graph of Basai Gaon to TDI Mall on a Week end – Saturday (Day 2)

The Chart 115 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 09.00 to 10.00 hours and the other in the evening at 18.00 to 19.00 hours.



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Chart 116 Vehicle Composition Graph of Basai Gaon to TDI Mall on a Week end – Saturday (Day 2)

The Chart 116 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 60 % to total vehicles formed the single largest mode. Cars/vans/jeeps had accounted to 19%. Auto rickshaw and share autos constituted 09%

The total volume of traffic during the morning and the evening peak hour were 471 PCUs and 507 PCUs respectively.







Chart 117 Mid-block Flow Diagram of Basai Gaon to TDI Mall on a Week end – Saturday (Day 2)

35. TALIPADA -BASAI–Day 1 (Week day-Friday)



Chart 118 Hourly Volume (PCU) Graph of Talipada to Basai on a Week day – Friday (Day 1)

The Chart 118 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 08.45 to 09.45 hours and the other in the evening at 18.00 to 19.00 hours.



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The Chart 119 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 47% to total vehicles formed the single largest mode. Auto rickshaw and share autos constituted 24%. Cars/vans/jeeps had accounted to 17%.

The total volume of traffic during the morning and the evening peak hour were 826 PCUs and 924 PCUs respectively.



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Chart 120 Mid-block Flow Diagram of Talipada to Basai on a Week day – Friday (Day 1)





Chart 121 Hourly Volume (PCU) Graph of Talipada to Basai on a Week end – Saturday (Day 2)



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The Chart 121 shows the total volume of traffic handled over a period of 12 hours and the hourly variations. There are two pronounced peak hours one at the morning at 10.15 to 11.15 hours and the other in the evening at 13.00 to 14.00 hours.





The Chart 122 shows the composition of vehicles at the intersection over a period of 12 hours. It is evident that two wheelers with 45% to total vehicles formed the single largest mode. Auto rickshaw and share autos constituted 27%. Car/Van /Jeep had accounted 21%.

The total volume of traffic during the morning and the evening peak hour were 1496 PCUs and 1667 PCUs respectively.





Chart 123 Mid-block Flow Diagram of Talipada to Basai on a Week end – Saturday (Day 2)

4.3.11.2 Issues



No median on the road



No utility area along the road





REHABILITATION OF MAJOR ROADS, AGRA



No parking area



No street furniture



No pathways along the road on shilpgram road



No boundary wall along the road



Figure 65 Google Earth image of TDI Road(R12)







4.3.11.3 Existing Road Section of R12- TDI Road





Figure 67 Existing Road Section of TDI Road- R12(b)



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Figure 68 Existing Road Section of TDI Road- R12(c)

4.3.11.4 Proposed Road Section of R12- TDI Road

The proposed components for this road stretch are as follows-

- Designated Utility area along the road on both sides.
- Dedicated Pathways for the pedestrians on one side of the road



Figure 69 Proposed Road Section of TDI Road- R12(a)



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Figure 70 Proposed Road Section of TDI Road- R12(b)



Figure 71 Proposed Road Section of TDI Road- R12(c)



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4.4 The significance of This Proposal

The development of the major roads will come and ease the movement of the traffic entering the city Agra from Expressway. Since the city is visited by a large number of tourist, intrastate population, development of this stretch will help the local commuting needs, better linkages to internal roads which will create value to the adjacent lands and will expand the expansion and development of the city.



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CHAPTER 5. BOQS AND COST ESTIMATES

Booklet is attached separately





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