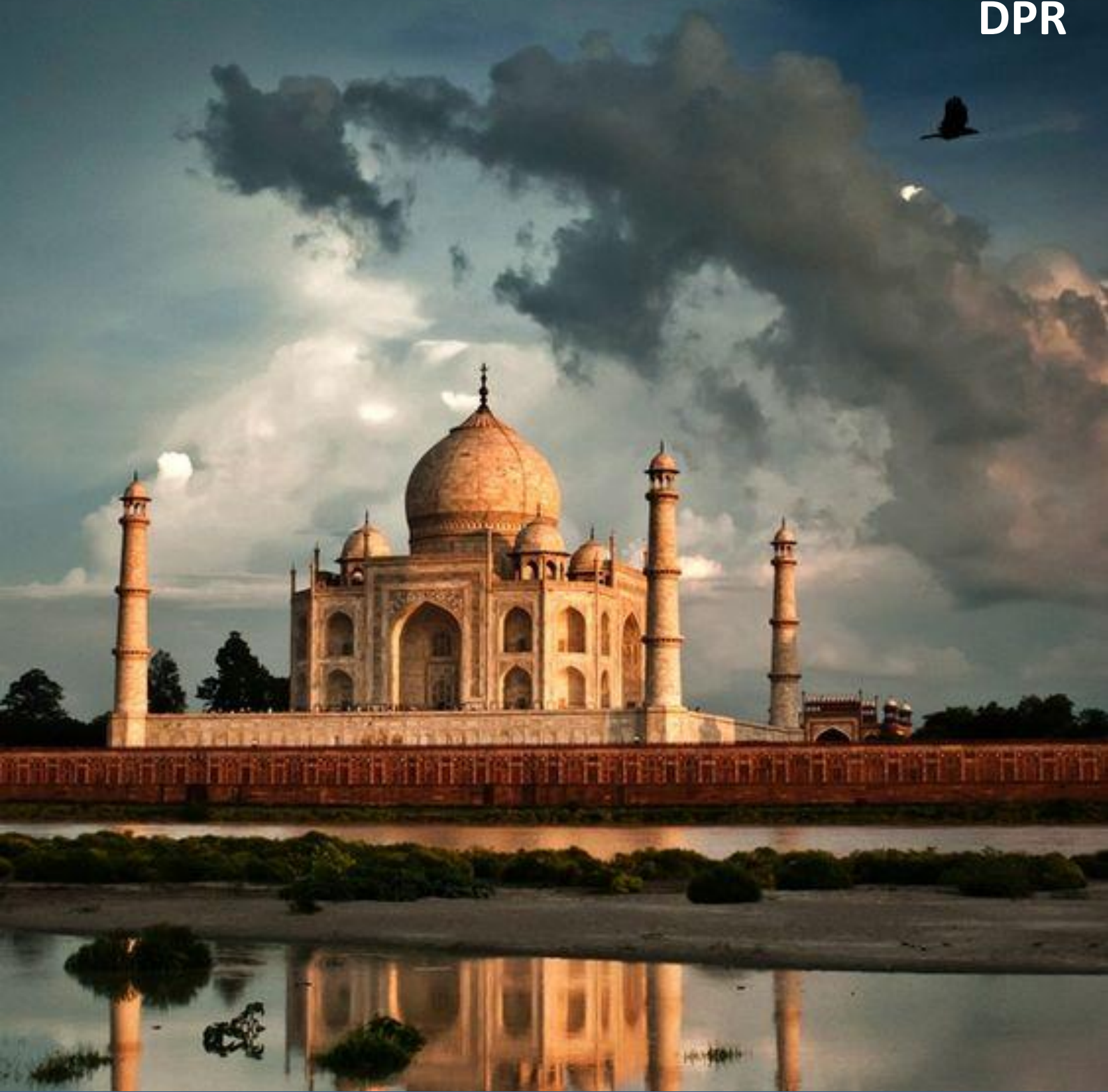


# Agra Smart City Mission

## Beautification and Streetscaping of Fatehabad Road

DPR



*Submitted by:*

**DARASHAW**  
1926  
ALL ABOUT TRUST

**gaia**  
smart cities



*Submitted to:*



**Agra Smart City Limited**

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# Chapter 1. Executive Summary

## PROVISION OF TOURIST AND MOBILITY FACILITIES REDESIGNING OF FATEHABAD ROAD

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.

### SCOPE OF THE PROJECT

The proposed project includes the development of existing Fatehabad road, the 45 MT wide master plan road which is also a part of State highway 62, links Taj Mahal from east to south to west, houses Handicraft showrooms, Restaurants, Hotels, Café, paying guest accommodations, Marts, Residential and Commercial houses which is crossed by domestic and international tourist in Agra. The Fatehabad road has more significance than merely serving as a connecting road to the city. As per Project Area Boundary under Agra Smart City, the stretch of 7.5 km starts from Shastri Crossing to Tajview Crossing to Hotel ITC Mughal to Hotel Trident to Hotel Jaypee to Proposed Entrance Gateway and ends at Expressway.

The prime scope of the proposed section of the Fatehabad 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.



# 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.

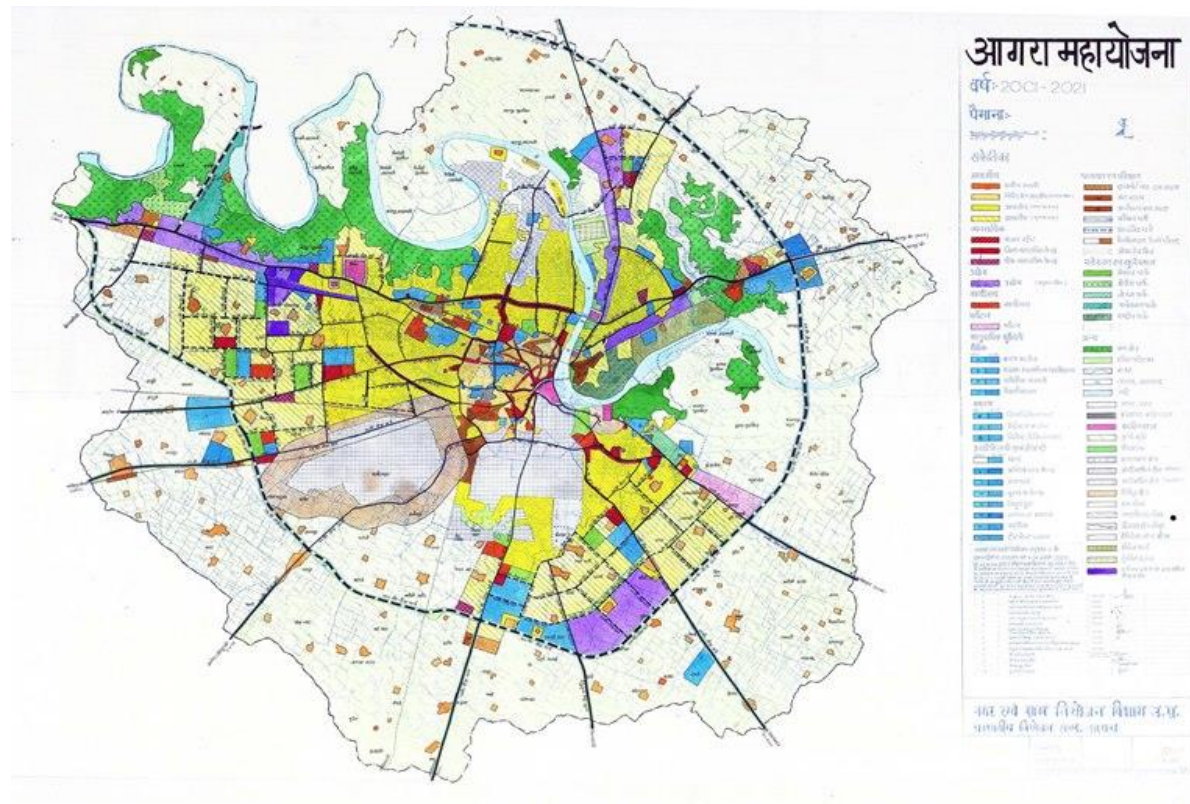


Figure 1: Agra Master Plan 2021

### Landuse as per Master Plan 2021

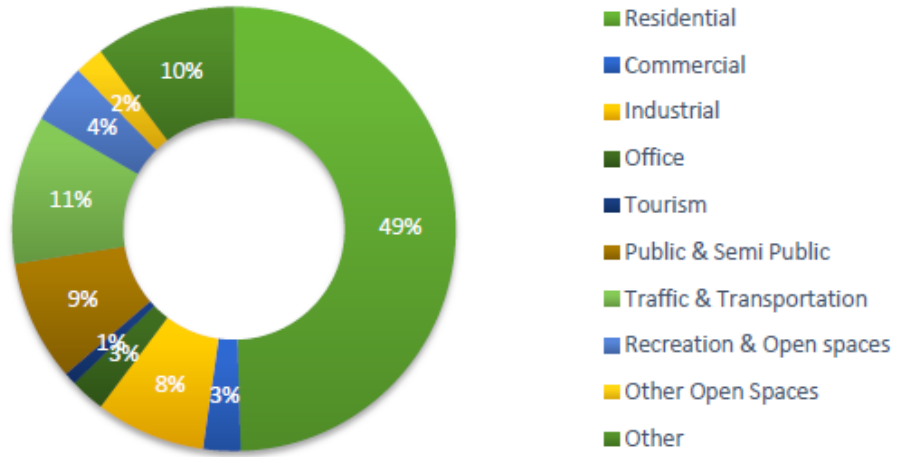


Figure 2: Land use as per Master Plan 2021



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.

**Table 1: Distance from Agra to different cities**

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



**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 population 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)	Growth Rate (%)
1961	4.62	-
1971	5.91	27.92
1981	7.81	32.15

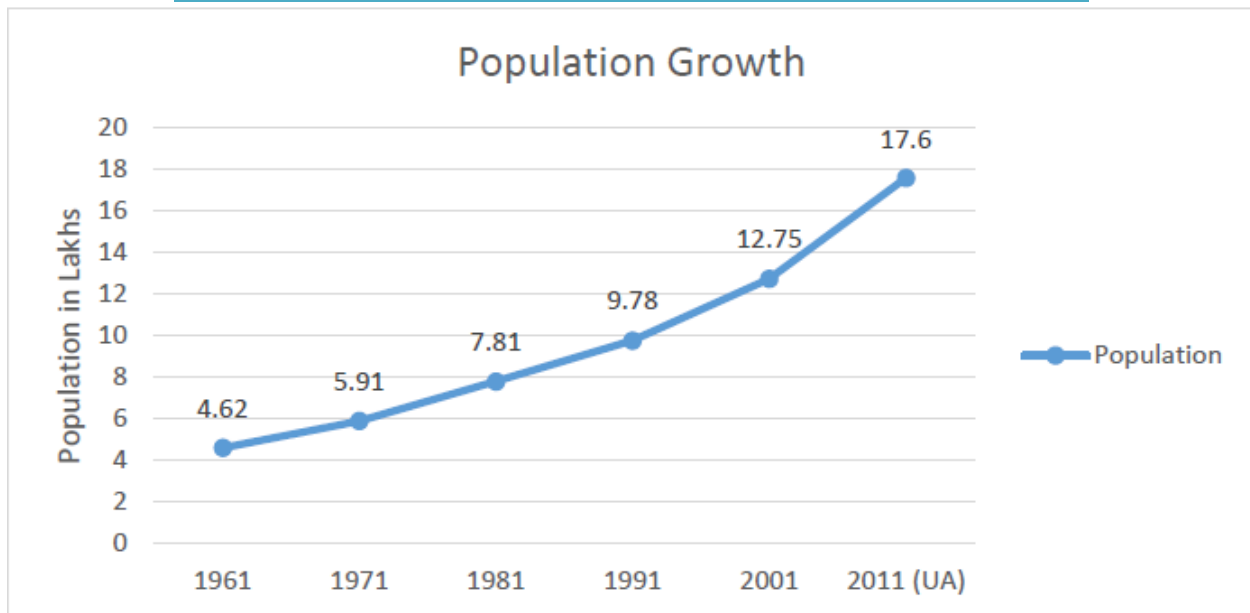


Figure 5: Decadal Population Growth Agra City

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 small-scale 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

Table 3: Number of Tourist visit to Agra

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

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 ROB 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

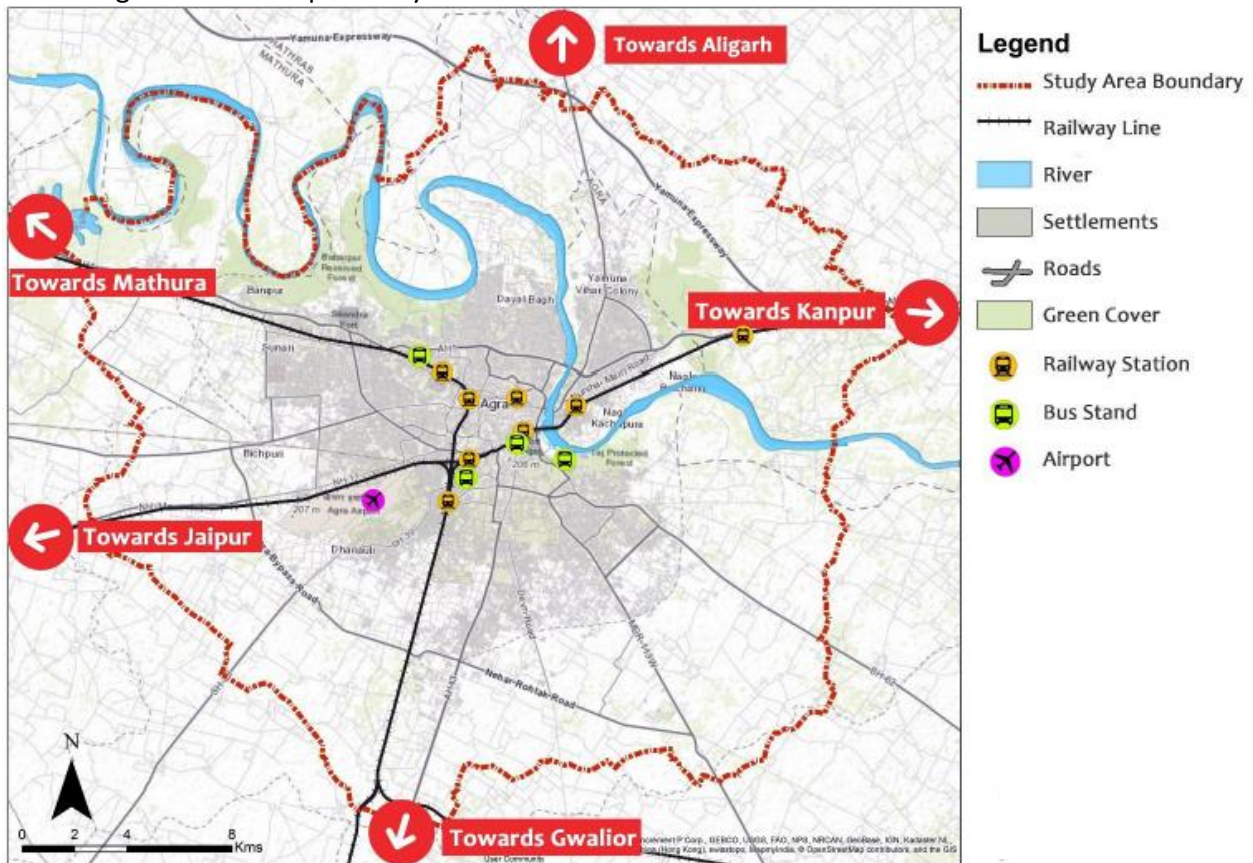


Figure 7: Existing Connectivity and Transport Setting Area

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
- 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.

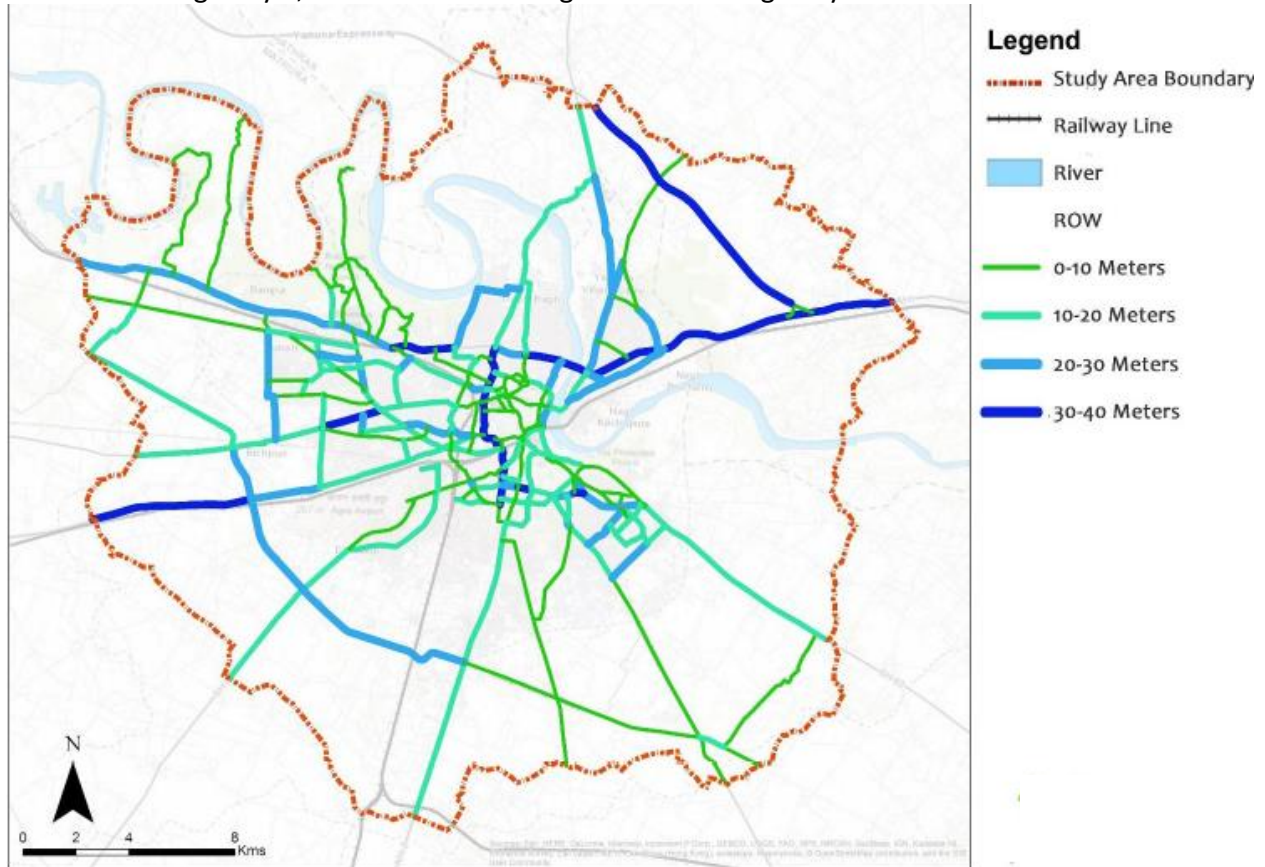


Figure 9: Road Network Inventory

## 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% share 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.

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. Out of this all major connected roads Fatehabad road is more important.

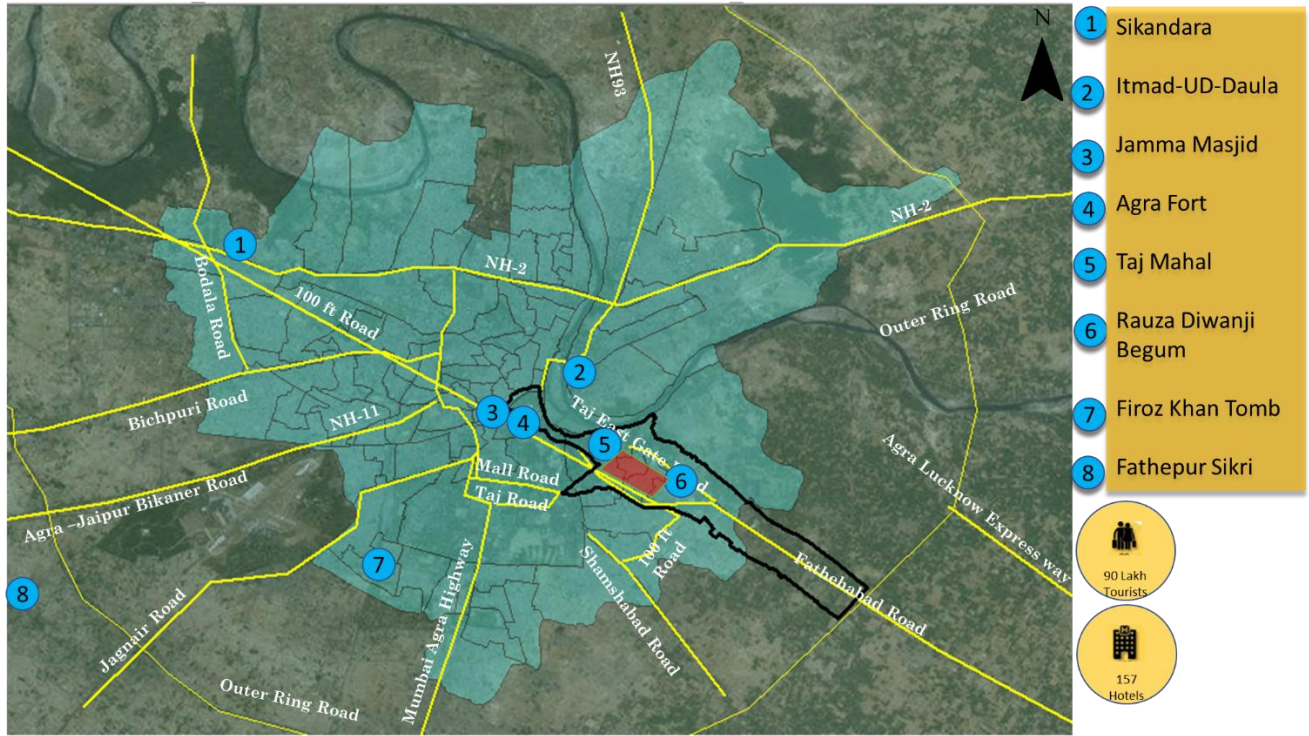


Figure 10: ABD Area and Regional connectivity map

## 2.10 Scope of Project

### Main task:

Preparation of a Detailed Concept Plan and redesign of Fatehabad road to enhance the experience of accessing Taj Mahal and other monuments as well as pedestrian-friendly design. Total Length of this road stretch is 7.5km from Shashtri chowk for Agra under smart city mission for the ABD area (Area based development).

### Main Components of Fatehabad 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 Fatehabad road has more significance than merely serving as a connecting road to the city. As per Project Area Boundary under Agra Smart City, the stretch of 7.5 km starts from Shastri Crossing to Taj view Crossing to Hotel ITC Mughal to Hotel Trident to Hotel Jaypee to Proposed Entrance Gateway and ends at Expressway.

The prime scope of the proposed section of the Fatehabad 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 of Fatehabad road 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 Fatehabad road to enhance the experience of streets and Install or deploy street furniture, utilities, lightening, signages.



## 2.11 Methodology

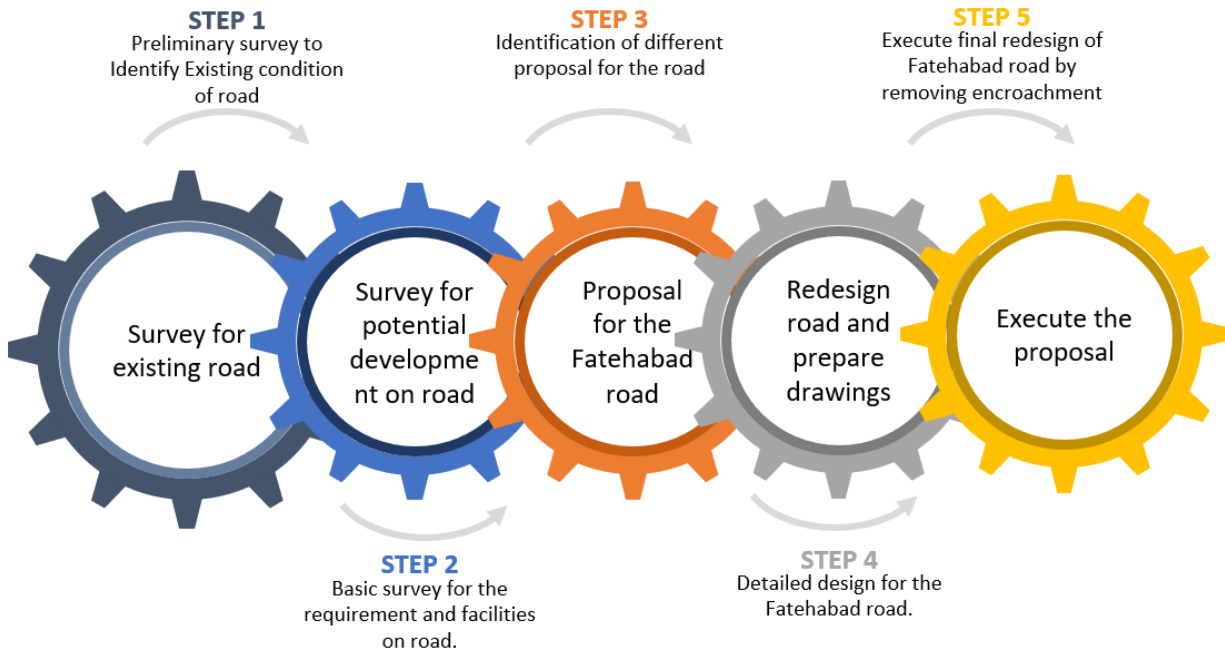


Figure 11: Methodology for Project

# 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:

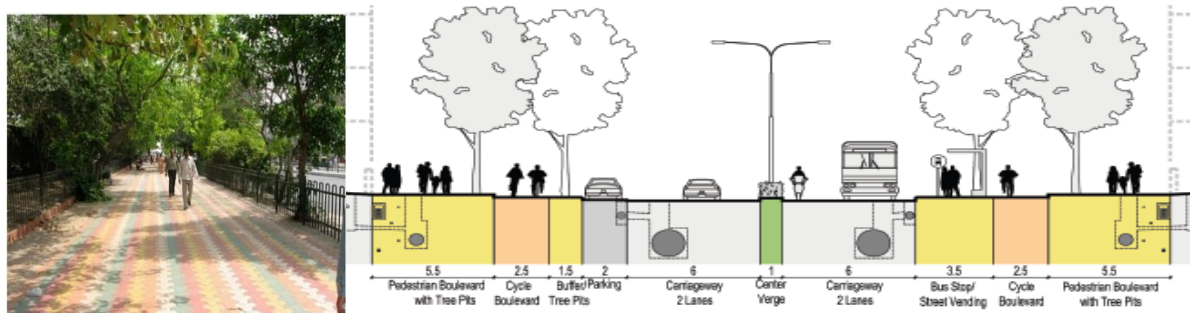
Roads + NMT	Public transport	LUTI
<ul style="list-style-type: none"> <li>ITDP- Better streets, better cities</li> <li>Sustainable Urban Transport Project- Walking and cycling</li> <li>Urban design guidelines for Pune</li> <li>Glenelg Road hierarchy</li> <li>Abu Dhabi Street Design Manual</li> <li>Complete Streets Chicago</li> </ul>	<ul style="list-style-type: none"> <li>BRT Planning Guide</li> <li><b>HiTrans:</b> Public Transport Planning and networks</li> <li>Public transport- Citizen requirements</li> <li>Public transport- Land use planning</li> <li>Bus semi rapid transit mode development and evaluation</li> <li>Public transport- Mode options and technical solutions</li> <li>Public transport and urban design</li> <li>Sustainable Urban Transport Project- Mass Transit Options</li> </ul>	<ul style="list-style-type: none"> <li>SUTP Land Use and Transport.</li> <li>Transit oriented development: Curtis Et al.</li> <li>TRB- Making transit work</li> </ul>



**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-

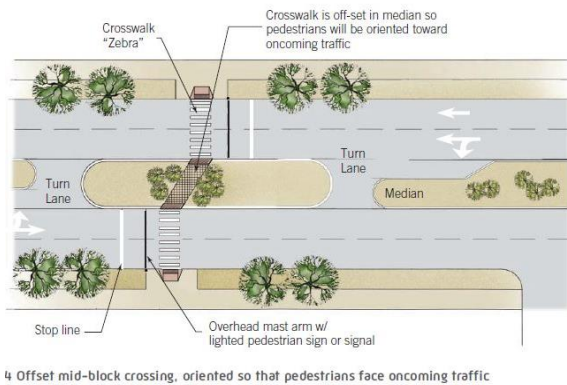
- Introduction and Context of USDG
- Goal and Design Principles of USDG
- Design Guidance

Implementation guidelines and recommendations

### Abu Dhabi Urban Street Design Manual



Driveway designed as a curb cut, not a minor junction, Washington, USA.



**Figure 15: Offset midblock crossing**

This document presents contest specific design for both pedestrian realm and vehicular traffic. It emphasizes on climate, geographical and cultural aspects of street design. It also gives the design process for the same.

### 3.1.1 45m ROW in context of Fatehabad road

#### 3.1.1.1 Typical Design

Based on the ITDP guidelines there will be two types of sections for 45M ROW with the different type of land use as shown in the table.

Table 4: Classification of ROW

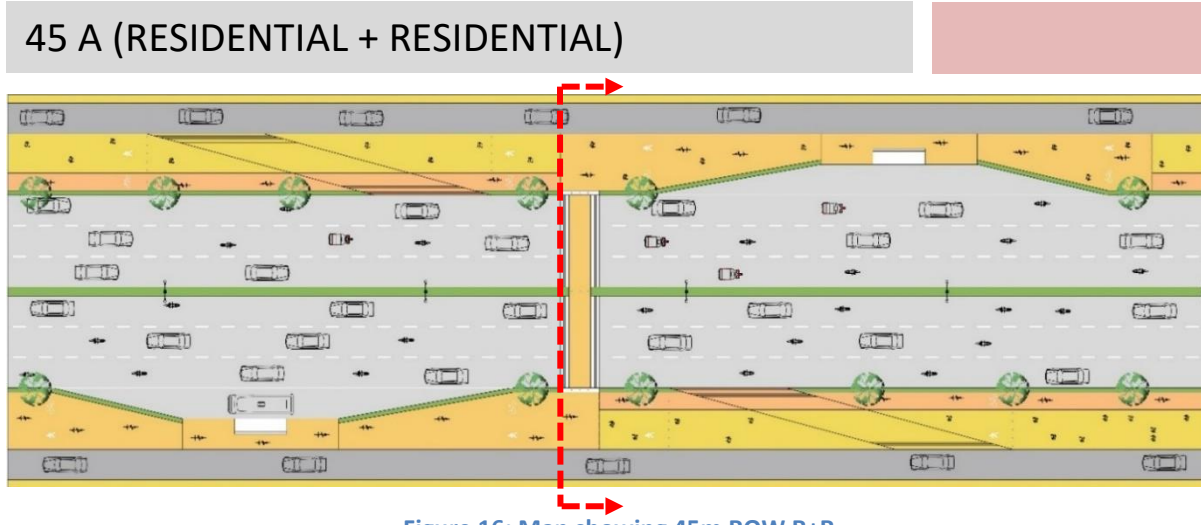


Figure 16: Map showing 45m ROW R+R

Type of section	Length of Road (km)	Land Use
45A	20.67	RR
45B	8.71	RC



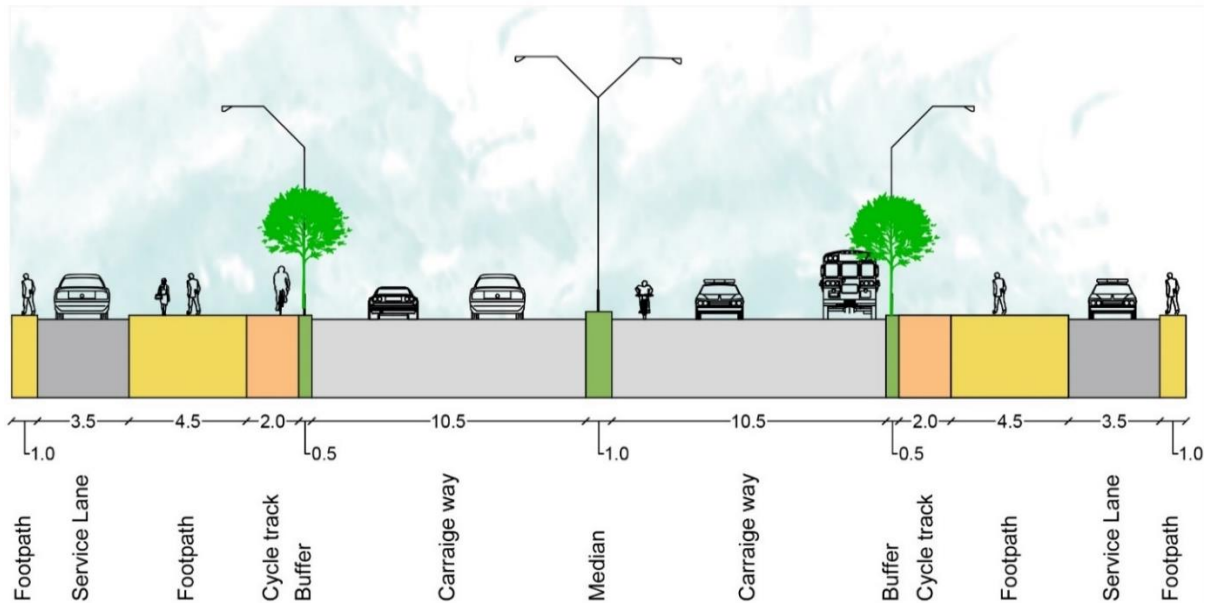


Figure 17: Plan and section of 45A road

This section has a residential land use on both sides. Considering this a service lane has been provided on either side of the road. A carriageway of 10.5m on both sides is provided.

An NMT zone of 4.5 m wide footpath and a 2m wide cycle track is elevated at a level of 150 mm from the carriageway level.

High-rise pedestrian crossing is provided near curbside bus stops for the safety of pedestrians. The High-rise pedestrian crossing can also be used by cyclists to cross the road. Cycle stands are provided in proximity to the bus stops to access the public transport easily.

A bus bay of 53 m has been provided for the city buses with a de-acceleration length of 20 m and an acceleration length of 15 m for the ease of movement of city buses on the carriageway.

## 45 B (RESIDENTIAL + COMMERCIAL)

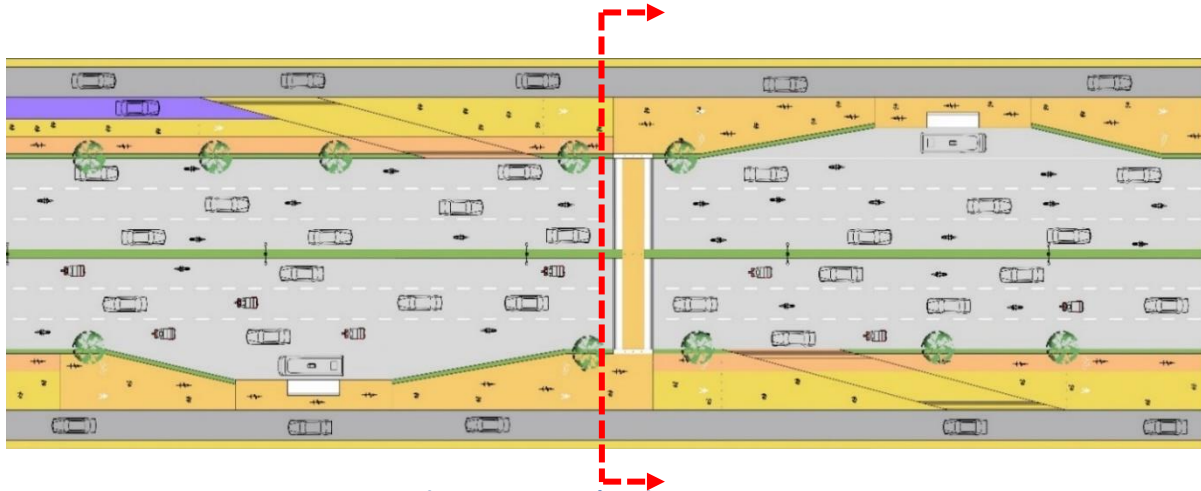


Figure 18: Map showing 45m ROW R+C

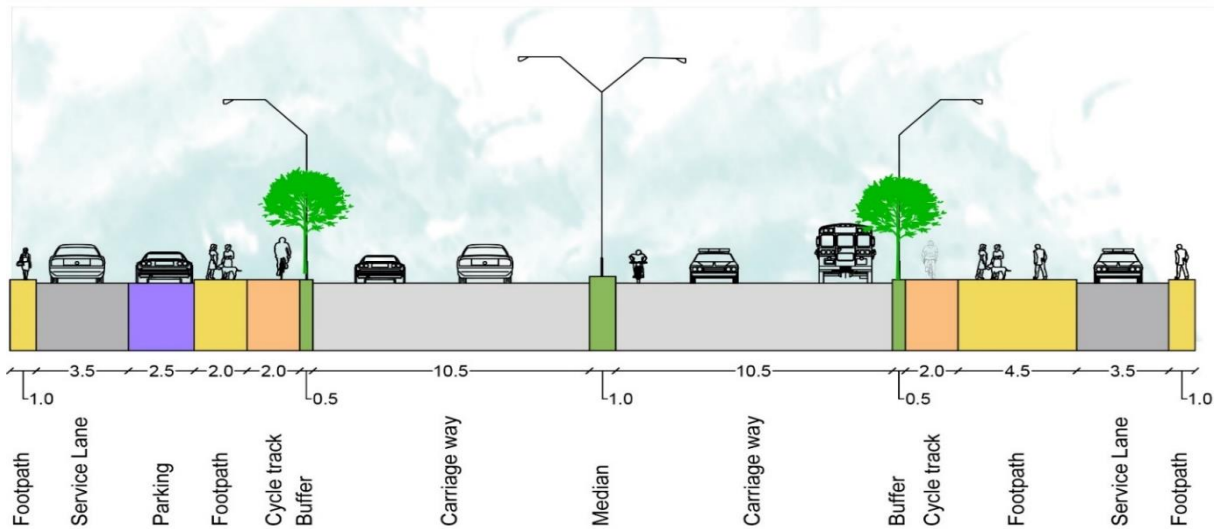


Figure 19: Plan and section of 45B road

This section has a residential land use on one side and commercial on the other. Considering this a service lane has been provided on either side of the road and parking pockets at certain areas on the commercial side. A carriageway of 10.5m on both sides is provided.

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An NMT zone of 2.0 m wide footpath and a 2m wide cycle track is elevated at a level of 150 mm from the carriageway level is provided on the commercial edge whereas 4.5 m footpath is provided along the residential edge.

High-rise pedestrian crossing is provided near curbside bus stops for the safety of pedestrians. The High-rise pedestrian crossing can also be used by cyclists to cross the road. Cycle stands are provided in proximity to the bus stops to access the public transport easily.

A bus bay of 53 m has been provided for the city buses with a de-acceleration length of 20 m and an acceleration length of 15 m for the ease of movement of city buses on the carriageway.

## Chapter 4. Survey and Proposal for Fatehabad road

### 4.1 Introduction Fatehabad road

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 handcraft 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 Tajmahal for the tourist.

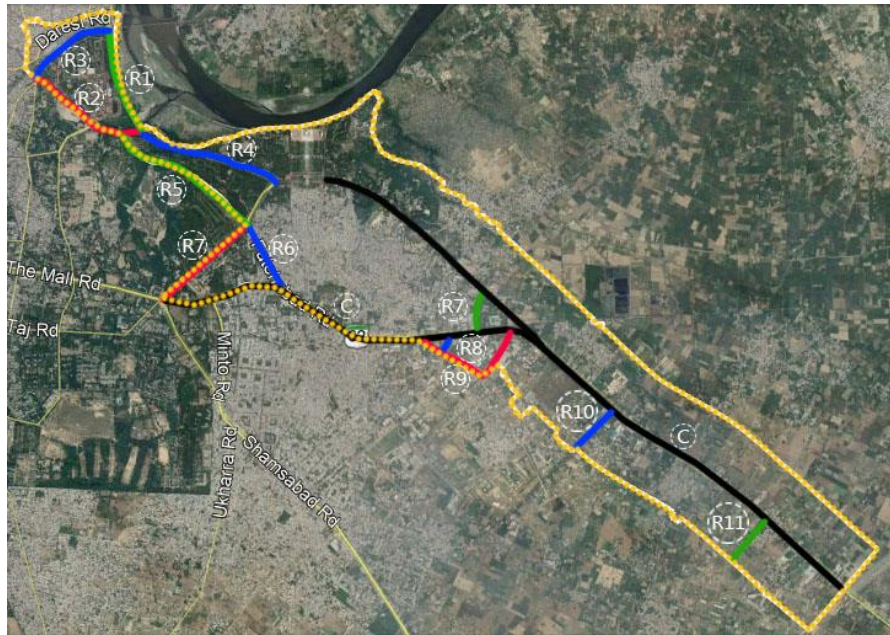
The proposed project includes the development of existing Fatehabad road, the 45 mt wide master plan road which is also a part of State highway 62, links Tajmahal from east to south to west, houses Handicraft showrooms, Restaurants, Hotels, Café, paying guest accommodations, Marts, Residential and Commercial houses which is crossed by domestic and international tourist in Agra. The Fatehabad road has more significance than merely serving as a connecting road to the city. As per Project Area Boundary under Agra Smart City, the stretch of 7.5 km starts from Shastri Crossing to Tajview Crossing to Hotel ITC Mughal to Hotel Trident to Hotel Jaypee to Proposed Entrance Gateway and ends at Expressway.

The prime scope of the proposed section of the Fatehabad 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.

### 4.2 Major Roads in ABD Area

There are total 12 Major Roads under ABD area out of that one of the most important and busiest road is Fatehabad road. The total length of redesign Fatehabad road is 7.5 km as shown in fig with all major roads.

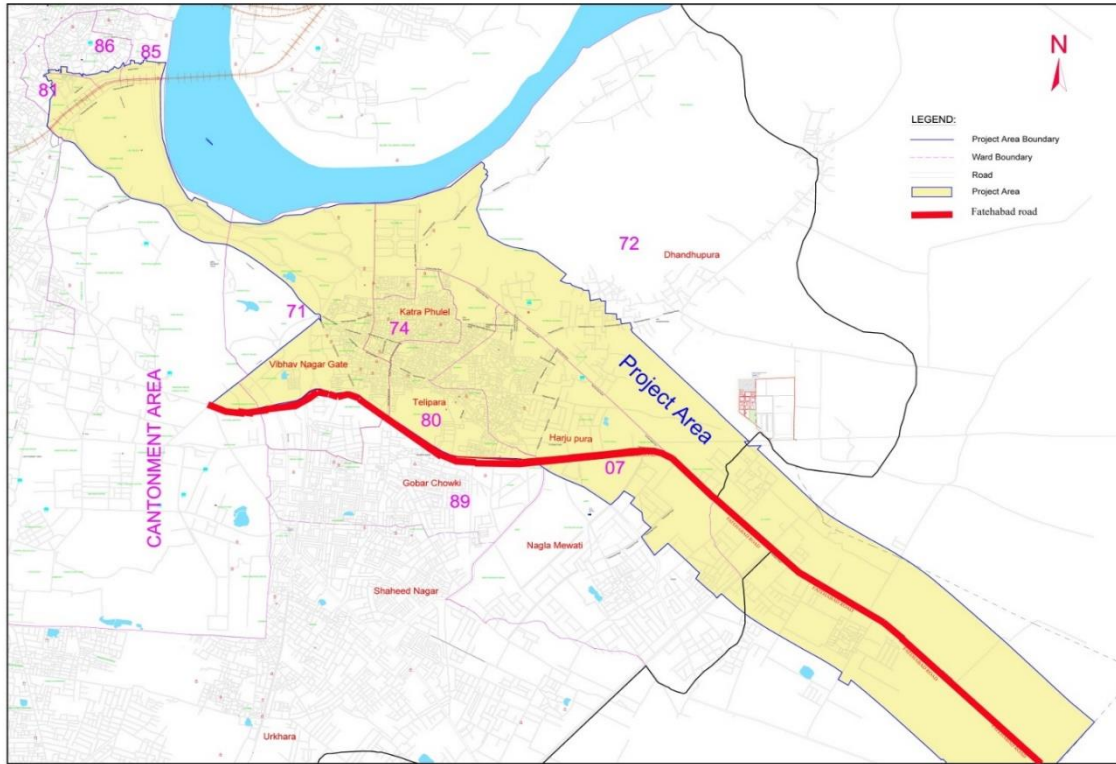


- R1 - YAMUNA KINARA ROAD (1.0 KM)
- R2 - RED FORT ROAD (1.0 KM)
- R3 - RED RAILWAY STATION ROAD (1.5 KM)
- R4 - TAJ WEST CORRIDOR (1.4 KM)
- R5 - SHAHJAHAN GARDEN ROAD (1.4 KM)
- R6 - PURANI MANDI ROAD (0.7 KM)
- R7 - TAJ ROAD/ POLICE LINE (0.4 KM)
- R8 - CNG STATION ROAD (0.1 KM)
- R9 - VISHAL MEGA MART ROAD (1.2 KM)
- R10 - TORA ROAD (0.5 KM)
- R11 - KALAL KHERIA ROAD (0.5 KM)
- C - COMPLETE
- ■ ■ ABD BOUNDARY

Figure 20: Major Roads in ABD Area

### 4.3 Existing Feature of The Project





**Figure 21: Location of Fatehabad Road in Project Area Boundary of Agra Smart City**

The redesigning of Fatehabad road is a part stretch and lies on 6 lanes road widening project of P.W.D Agra starting from Avanti Bai crossing (CH: 3.00 Km) to Inner Ring Road (CH: 11.00 Km), which is a state highway (SH 62) commonly known as Agra- Fatehabad highway.

Under Agra Smart City, the proposal of redesigning/ beautification of the Fatehabad road starts from Shastri Crossing(CH:5.00 Km) to Taj view crossing (CH: 6.00 Km) to Hotel ITC Mughal (CH:6.6 Km) to Hotel Trident (CH:8.5 Km) to Hotel Jaypee (CH:9.6Km) to Proposed Entrance Gateway (CH:10.3 Km) and ends at Expressway(CH:10.8 Km), a stretch of 7.5 Km, which broadly has twelve junctions (major and minor) namely:

Table 5: Different Junctions/crossings on Fatehabad Road



Shastri crossing



T crossing at Hotel Amar



Taj View crossing



Mughal pulia crossing



Zonal Park TajNagri Phase 2 crossing



Basai Police Chowki crossing



TDI Mall crossing



Hotel Marriot crossing





Taj East Road crossing



T Crossing after Hotel Jaypee



Expressway crossing

## 4.4 Challenges and Issues at Fatehabad Road

The said road does not have a stormwater drain, underground electrical utilities, cycle track, pedestrian path, median at few stretches of the road, public conveniences, unplanned crossings/junctions and illumination, parking lots, bus shelter, drinking water kiosk, health kiosk for first aid, landscape areas and badly encroach.

Table 6: Different Types of Challenges and Issues at Fatehabad Road



No Storm Water Drain



electrical utilities on road



No designated Cycle track



Lack of footpath





No Median available some of the portion



Unplanned crossings/junctions



No use of Bus shelter



Encroachments on footpaths

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## 4.5 Project Facilities / Amenities

The facilities will include different types of amenities, utility duct, cycle track, street furniture, pedestrian-friendly Fatehabad road.

### 4.5.1 Essential Goals for Integrated Street

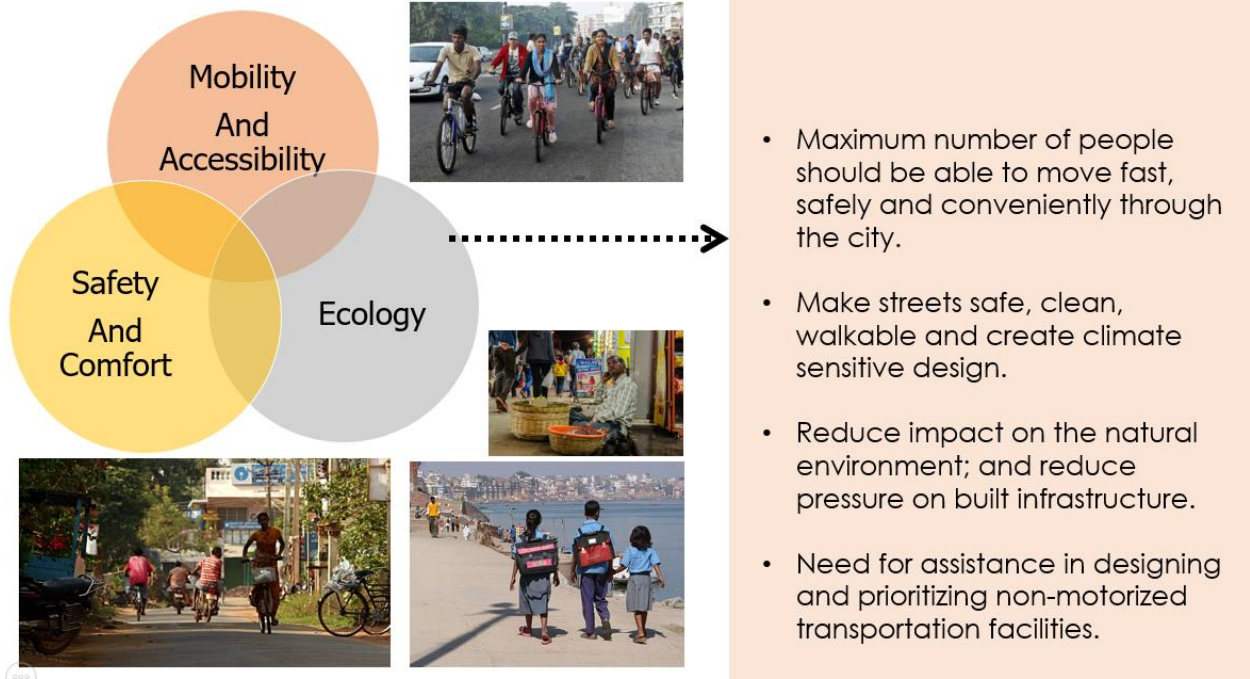


Figure 22: Essential Goals for Integrated Street

### 4.5.2 The different proposed facility at Fatehabad road

Table 7: Facilities/Amenities on Fatehabad Road

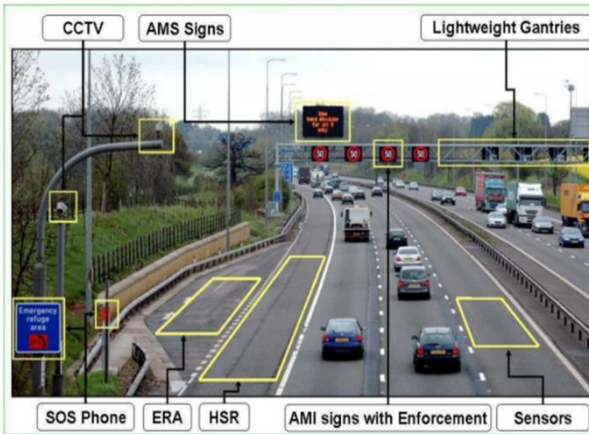


Utility Ducts: For Storm Water & Electrical Cables



Street Furniture





Traffic Management System



Street lighting



Street vending zone



E Toilets



Bus shelters



Landscaping: Pathways, Sculptures, Pergolas, Percolation pits, Tensile Umbrella, Feature wall, covered sitting, Open Gymnasium, Bollards, Plantation,





Pedestrian walkways



Parking lots



Cycle tracks



Entrance gate



Health kiosks



Drinking water kiosk



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## 4.6 Design Proposal for Fatehabad Road

After the topographical survey and another preliminary survey, a stretch of 7.5 Km design by dividing into different types of sections based on the ROW and land use. Detailed sections from A-A to P-P available for information as follow:

### 4.6.1 Facilities provide on Fatehabad road

- Entrance gate
- Utility Ducts: For Storm Water & Electrical Cables
- Street Furniture
- Street lighting/smart poles
- Pedestrian walkways
- Parking Lots
- Traffic Management System
- Street vending zone
- E Toilets
- Bus shelters
- Landscaping: Pathways, Sculptures, Pergolas, Percolation pits, Tensile Umbrella, Feature wall, covered sitting, Open Gymnasium, Bollards, Plantation,
- Healthcare kiosks
- Drinking water kiosk

#### 4.6.1.1 Entrance Gate Near Ramada plaza

This ate proposed at the entry to the fatehabad road when yamuna expressway ends. Its looks very beautiful and it seems to welcome all tourist and citizens to Agra.

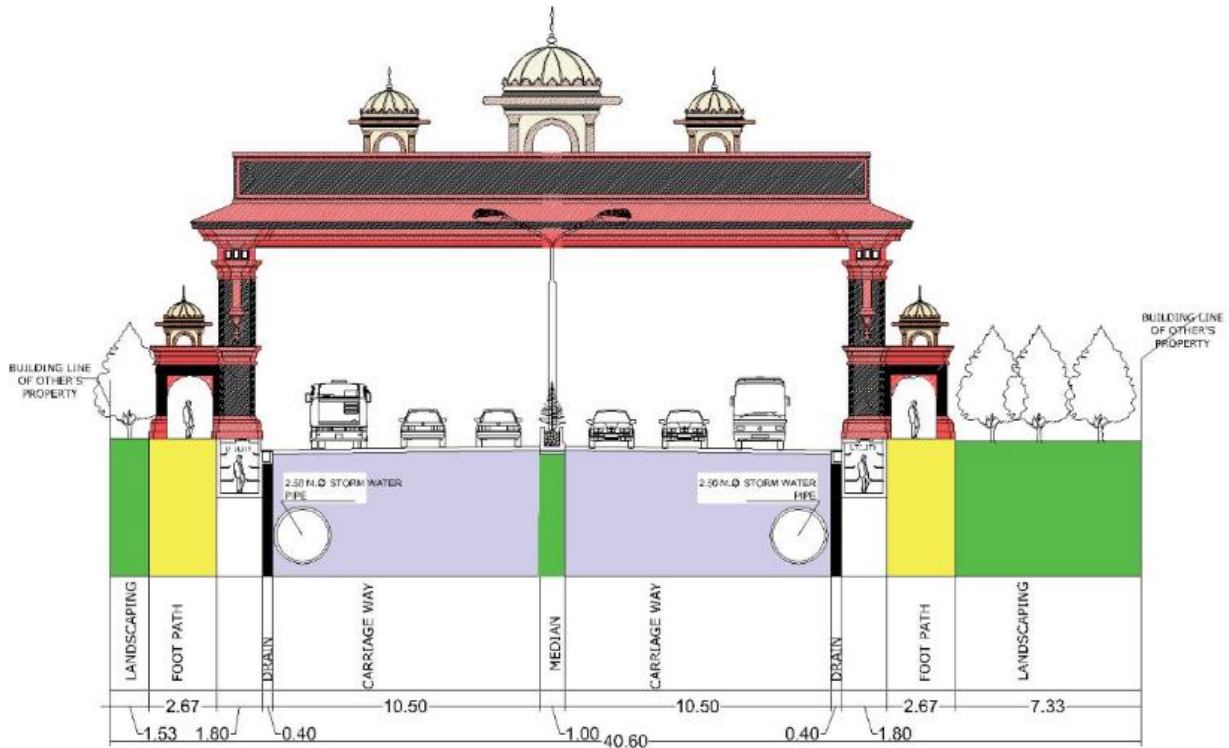


Figure 23: Entrance Gate

#### 4.6.1.2 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. Fatehabad 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 annexures available in this report.

**TIME OF CONCENTRATION** Time of Concentration is the time required for the rain water to flow over the ground surface from the extreme point of the drainage basin and reach the point under consideration. Time of concentration (tc) is equal to inlet time (t) plus the time of flow in the drainage pipe (tf). The inlet time is dependent on the distance of the farthest point in the drainage basin to the inlet manhole, the shape, characteristics and topography of the basin. The Kirpich's equation is used for calculating time of concentration for each length of drain design which is stated as follows:

$$t_c = 0.0195 L^{0.77} S^{-0.382}$$

tc = time of concentration in minutes S = Slope from critical point to drain level L = Distance of critical point to drain along the water course in m Tc generally vary from 5 to 30 minutes. In highly developed sections, the inlet time may be as low as 3 minutes (as per IRC: SP: 13). For the project area, the time of concentration of 10-30 min is used for different sub - catchments based on the calculations done considering the surface overflow time and travel time in plot drain. Following are the generalized tc (time of concentration) for various sizes of sub-catchments:

Table 8:Tc for variable sub-catchment i.e. plot sizes

Sr. No.	Sub – Catchment Area (ha)	Tc (Time of Concentration in mins)
1	< 1	7
2	1-3	15
3	3-4.5	20
4	>4.5	25

estimation of storm runoff the rational formula for relationship between peak runoff and rainfall is given below:  $Q = k * C * I * A$  Is a simple steady state water balance equation.

If, for, a catchment of A square kilometres, the intensity is I mm/hr, the I volumetric intensity is.  $A * I * 1000$  cubic meter per hour, or  $0.28 * A * I$  cubic meter per second. With a runoff coefficient of C, the runoff will be  $Q = 0.28 * C * I * A$  Whereas Q is in cubic meter per second. Runoff coefficient “C”, in CIA is the portion of the precipitation that makes its way to the drain, in storms. Its value depends on a large number of factors such as permeability of the surface, type of ground cover, the type of soils (curve number), the depth of the soil, , the topography, the geology, the antecedent conditions indicating the wetness of the soil structure from the earlier events, and duration of storm. For the design and planning of the storm water disposal arrangements, reasonably wet antecedent conditions are assumed. If full data of soils is not available, standardized values are assumed. The weighted runoff coefficient for the project site is estimated based on standard texts and literature.

HYDRAULIC DESIGN OF drain sections: Design formula Manning’s formula would be employed for design of gravity system

$$V_f = \frac{1}{N} \times R^{2/3} \times S^{1/2}$$

$$Q_f = V_f \times A$$

Where,  $Q_f$  - Flow rate when pipe flows full; in  $m^3/s$   $V_f$  - Velocity of the flow, in  $m/s$   $A$  - Cross sectional area of pipe in  $m^2$   $N$  - Manning's roughness coefficient when pipe is full.  $R$  - Hydraulic radius in  $m = A / P$ ; ( $P$  is Wetted Perimeter)  $S$  - Slope of Hydraulic Gradient All the drains are designed 85% full. Manning's  $n$  value for various materials is used as per CPHEEO Manual as shown in below.

**Table 9: Average Manning's coefficient roughness for various materials**

Type of surface	Manning's 'n'
Cement concrete pipes	
a) Good Condition	0.013
b) Fair Condition	0.015
Brick pitched drain	0.017
Plastered brick surface	0.015
Plastered brick surface with neat cement finish	0.013
Dry rubble masonry	0.033
Dressed ashler surface	0.015

Dry stone pitching	0.020
Kutchra drain	0.025
Earth	
a) in ordinary condition	0.025
b) with stones and weeds	0.030
c) in poor condition	0.035

(Source: IRC: SP: 50 Table-4.3 and CPHEEO, 2013 Table 3.11)

Component of STORM WATER DRAINAGE system the system will consist of: Inlets Junctions and manholes RCC rectangular drains on both side of road Outfall works Connection of the drain with Outfall nearby Disposal Points. Disposal Scheme the HFL of the trunk drain in which proposed drainage system (drains along the internal roads) is discharging should be lower than the IL of the incoming drain. The proposed layout of the storm water drainage scheme is planned along the sides of the main arterial roads and peripheral boundary. Individual plot developer is expected to connect their internal drains to these main drains planned for the project area. Detailed design available in annexure and plan



#### 4.6.1.3 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
  - 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 fatehabad road
- 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

#### **Benches:**

- Benches or seating will be provided at the building/ frontage edge of the footpath and ideally with provision of shade.
- Where seating is oriented parallel to the curb, it will face toward buildings when located in the furnishings zone, or away from buildings when located in the frontage zone.
- Where sidewalk width permits, seating in the furnishing zone will be perpendicular to the curb. As per the fatehabad road condition benches provide between footpath and property line which is called as furniture zones and Seating will be designed to encourage sitting and to discourage lying down. Street benches design can be change based on local market avability.

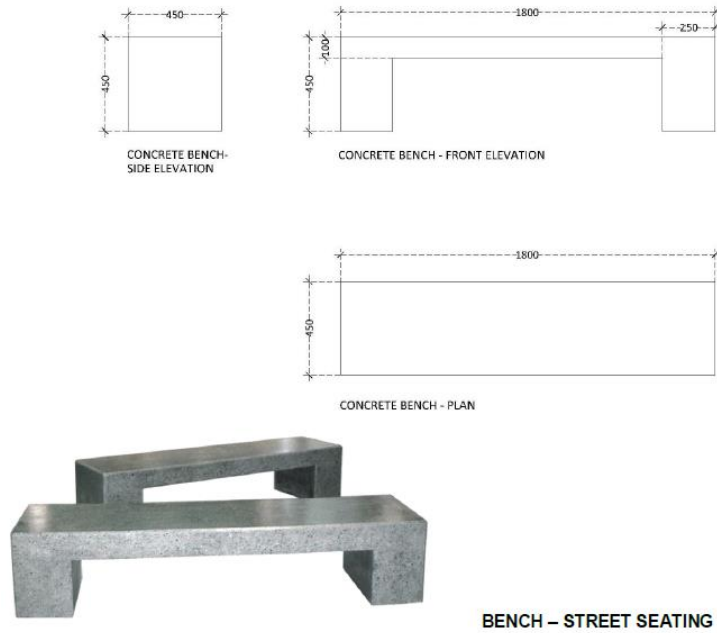


Figure 24: Benches

**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.

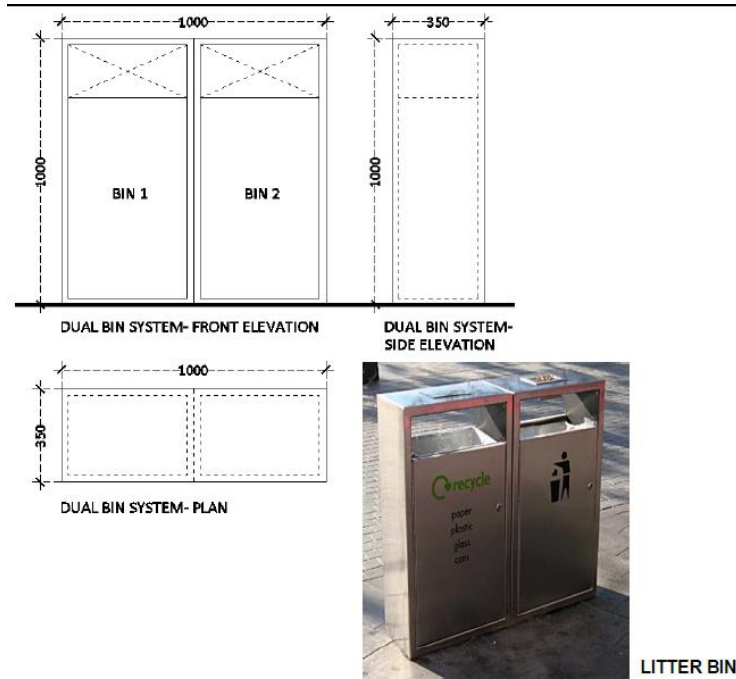


Figure 25:Dustbins

#### 4.6.1.4 Street lighting/smart poles

- 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 26:Types of Street Lights

#### **Smart Pole:**

Smart Pole offers multiple services to the city residents. The integral parts of the smart pole are as below:

- Smart pole has telecom tower infrastructure to match with city aesthetic and ready to accommodate upcoming technology as 4G and 5G
- Energy efficient and remotely controllable LED Street Lights
- Wi-Fi hotspot services for the city
- Surveillance cameras for safety and parking violation detection
- Environmental Sensors to monitor air quality, temperature and humidity
- Electric Vehicle charging points to promote use of electric vehicles in the city
- Mobile based application with functionality of SoS
- Centralizes Command and Control centre for monitoring the implementation of smart solutions
- Optical fiber for better bandwidth to the Wi-Fi users/providing backhaul to telecom operators

### **Street Light:**

Smart pole project is planned for some poles to be installed in the fatehabad road to cover the entire city area and in parallel to this LED street lights to be installed which will replace the conventional street lighting. The benefits of replacing conventional lighting with LED street lights are as below:

- LEDs have extremely long lives compared to conventional lamps
- LED luminaries don't have filaments that can quickly burn out and they don't contain toxic chemicals like mercury, unlike traditional high-pressure sodium lamps or mercury-vapor lamps
- LED luminaries can last 70,000 hours approx., also have reduced maintenance costs because of their long lives
- LED luminaries produce less heat than other bulbs. As it provides more lumens per watt than conventional lamps
- LEDs are suitable for places where replacing light bulbs is expensive, inconvenient or otherwise difficult.
- LEDs are highly energy efficient. While compact fluorescent lamps (CFLs) recently have been touted as the standard in green lighting, LEDs actually have double their energy efficiency
- LED use 15 percent of the energy of an incandescent bulb while generating more light per watt. LEDs produce approx. 80 lumens per watt, traditional streetlights can only muster 58 lumens per watt
- Energy efficient LED helps to reduce carbon emission.

### **Additional key financial benefits are:**

- Better governance and coordination through centralized command and control center
- Zero capital investment for Smart Street Lights
- Zero operation and maintenance cost for 15 years
- Leveraging investment of some amount for city infrastructure
- Annual premium on revenue sharing model
- Better and smart services to citizens

### **How it is works:**

Very easy to install, operate and maintain, poles can be installed by an engineer and two technicians in just seven hours - 4 hours for structure and 3 hours of internal connections. The monitoring of the

functions is done from a remote-Control Command Centre. Everything from streetlights to energy data analysis, WiFi signal connectivity, traffic management, advertising message, video recording to alarm systems can all be monitored and managed from the Control Command Centre, which is manned by well-trained personnel.

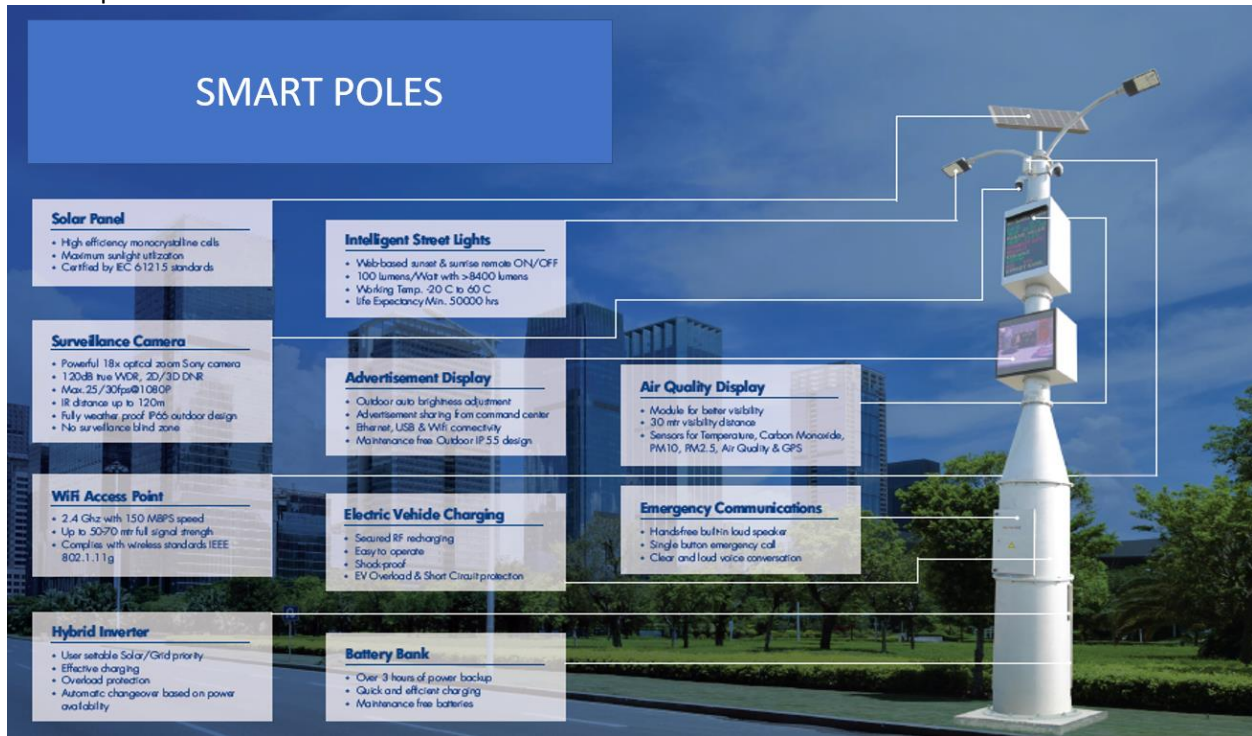


Figure 27: Smart Poles

#### 4.6.1.5 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

In Agra Fatehabad road as per ground level condition and pedestrian survey provision of 2-2.5m footpaths along the 7.5km stretch. Level of Footpath will be 150mm from the ground level and it is towards street storm water drain to avoid water accumulation. Also provide suitable ramps wherever required on fatehabad road. PWD traffic data available in Annexures. Typical sections available in this DPR.

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

**Table 10: Guidelines for Footpaths**

Clear walking zone of footpath (m)	Max. Number of persons per hour in both directions
1.8	1350
2	1800
2.5	2250
3	2700
3.5	3150
4	3600

For Fatehabad Road Pedestrian Survey Analysis based on the survey and ground level condition with geometric condition Footpaths varies between 1.8-2.5m throw-out the stretch. This foothpath width decided based on the IRC code as well as ground conditions and requirement because lots of trees available in this stretch so accordingly it will be executed on ground. Here Attached one PS for reference

**Table 11:one Pedestrian Survey**

<b>PADESTRAIN COUNT SURVEY</b>			
<b>Location Name: PS-01</b>		<b>Date: 10-04-2018</b>	
<b>Direction From:</b>	<b>Near TDI MALL</b>		
<b>Time</b>	<b>ALONG THE ROAD</b>	<b>ACROSS THE ROAD</b>	<b>Total</b>
	<b>IN</b>	<b>OUT</b>	
<b>700 - 0715</b>	25	12	<b>37</b>
<b>715 - 0730</b>	18	22	<b>40</b>
<b>730 - 0745</b>	35	20	<b>55</b>
<b>745 - 0800</b>	31	33	<b>64</b>
<b>800 - 0815</b>	38	34	<b>72</b>
<b>815 - 0830</b>	42	73	<b>115</b>
<b>830 - 0845</b>	51	78	<b>129</b>
<b>845 - 0900</b>	70	80	<b>150</b>
<b>0900 - 0915</b>	52	79	<b>131</b>
<b>0915 - 0930</b>	37	43	<b>80</b>
<b>0930 - 0945</b>	64	86	<b>150</b>
<b>0945 - 1000</b>	44	50	<b>94</b>
<b>1000 - 1015</b>	39	42	<b>81</b>
<b>1015 - 1030</b>	47	38	<b>85</b>
<b>1030 - 1045</b>	30	32	<b>62</b>
<b>1045 - 1100</b>	31	33	<b>64</b>
<b>1100 - 1115</b>	37	43	<b>80</b>
<b>1115 - 1130</b>	38	50	<b>88</b>
<b>1130 - 1145</b>	48	62	<b>110</b>
<b>1145 - 1200</b>	47	40	<b>87</b>
<b>1200 - 1215</b>	74	144	<b>218</b>
<b>1215 - 1230</b>	31	38	<b>69</b>
<b>1230 - 1245</b>	42	38	<b>80</b>
<b>1245 - 1300</b>	29	42	<b>71</b>
<b>1300 - 1315</b>	47	52	<b>99</b>
<b>1315 - 1330</b>	46	38	<b>84</b>
<b>1330 - 1345</b>	44	48	<b>92</b>

<b>1345 - 1400</b>	73	213	<b>286</b>
<b>1400 - 1415</b>	67	109	<b>176</b>
<b>1415 - 1430</b>	74	63	<b>137</b>
<b>1430 - 1445</b>	55	62	<b>117</b>
<b>1445 - 1500</b>	63	41	<b>104</b>
<b>1500 - 1515</b>	67	40	<b>107</b>
<b>1515 - 1530</b>	79	58	<b>137</b>
<b>1530 - 1545</b>	132	93	<b>225</b>
<b>1545 - 1600</b>	102	73	<b>175</b>
<b>1600 - 1615</b>	81	114	<b>195</b>
<b>1615 - 1630</b>	70	77	<b>147</b>
<b>1630 - 1645</b>	68	91	<b>159</b>
<b>1645 - 1700</b>	102	201	<b>303</b>
<b>1700 - 1715</b>	72	94	<b>166</b>
<b>1715 - 1730</b>	130	83	<b>213</b>
<b>1730 - 1745</b>	84	72	<b>156</b>
<b>1745 - 1800</b>	87	115	<b>202</b>
<b>1800 - 1815</b>	111	79	<b>190</b>
<b>1815 - 1830</b>	161	48	<b>209</b>
<b>1830 - 1845</b>	164	178	<b>342</b>
<b>1845 - 1900</b>	198	222	<b>420</b>
<b>Total</b>	<b>3177</b>	<b>3476</b>	<b>6653</b>

Based on the topography of Agra, PWD project proposal and availability of space cycle track is not feasible on the location. cycle tract will be provided edge of the carriage way with some paint and designated lane marking in future.

#### **4.6.1.6 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 Fatehabad Road condition

- 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. This type of parking provides on fatehabad road on street parking as well as nearby street vending zones. Detailed plan and sections available in annexures.**

#### *4.6.1.7 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:

**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.

**Informatory Signs:** These guide the road users regarding the distance and directions roadside facilities & destinations. These signs are on rectangular boards.

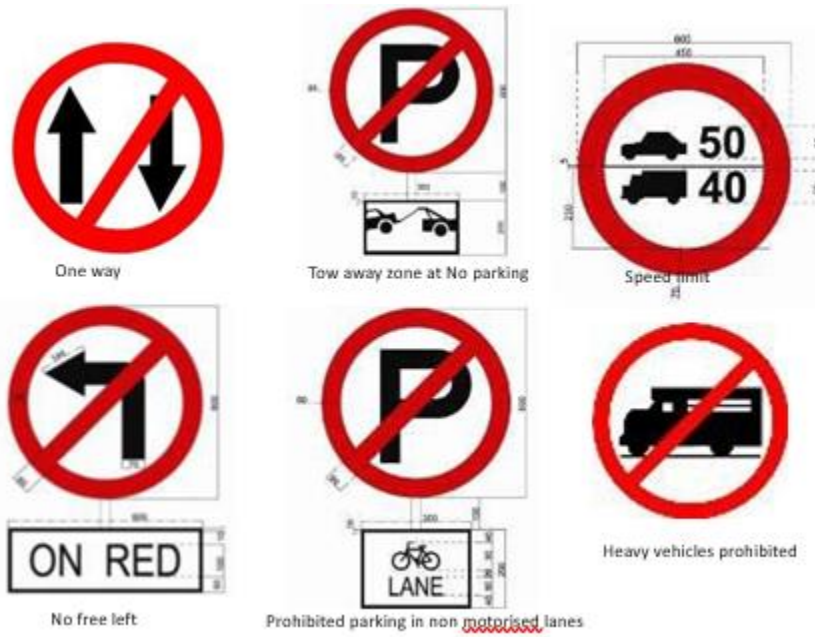


Figure 28: Prohibited Signages





Figure 29:Informative Signages

### Road Markings

Road Marking is an essential element which is required for improving efficiency of the street. Markings will strictly adhere to:

- IRC 35 – 1997 for road markings
- MoUD IUT Code of Practice for Road markings

Road Markings are done in following ways

- Line – Center line, Dotted line, Stop line etc

- Arrows – Straight, left, right, U-Turn, round about
- Word – STOP, BUS WAY, CYCLE LANE etc
- Diagram – Cycle, utility box, bus box etc.
  - Paint Markings: Paints used for road markings will be hot applied Thermoplastic paints instead of ordinary paints, for better visibility and long life. Visibility at nights is improved by the use of minute glass beads embedded in the pavement marking material to produce a retro reflective surface.
  - Plastics: Cold rolled or glued down plastic strips with adhesive at the back are used for cross walks / Zebra strips. This product is heavy-grade material with reflective beads embedded in the plastic. This method is used to mark the stop lines on bituminous roads in high density urban areas.
  - Epoxy technology has become more affordable and reliable. This material competes directly with plastic with respect to usage and cost.
  - Cats eye are reflectors which either reflect the light falling on them or can have a blinking mechanism at important locations.
  - Reflective Posts – These are plastic posts usually painted in red, fluorescent orange or yellow color and are fixed with bolts

Pavement marking, zebra crossing, all types of painting on road will be covered in Fatehabad road

### **Traffic signals**

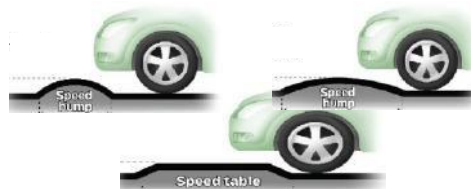
At major intersections, traffic signals grant right of way to various road users to move along or cross a street. This reduces chaos on roads and improves road safety. The decision of whether a given intersection needs a traffic signal or not will be taken based on warrants provided by IRC:93-1985, “Guidelines on Design and Installation of Road Traffic Signals” or any more recent prevailing guideline by IRC. These signals will integrate with command and control center and control center which is covered in junction improvement projects wherever required.

### **SPEED BREAKERS**

Speed Breakers are induced elements on the streets whose sole purpose is to reduce vehicle speeds.

They are ideally introduced where the surrounding land use expects low speed or where many accidents take place due to over speeding.

There are 3 types of speed breakers:



#### 4.6.1.8 Street vending zone

According to an estimate, about 25,000 families in Agra engaged in street vending for their survival. As per operational guidelines (support to urban street vendors), the street vendors are categorized as stationary, peripatetic/wandering, Mobile & others. Vending Zones are classified as restriction free, restricted and prohibited. Most of the street vendors are working in cluster identified during the random survey. Vendors are working in clusters in more than 200 locations and 10 to 15% of vendors are working in scattered manner within city.

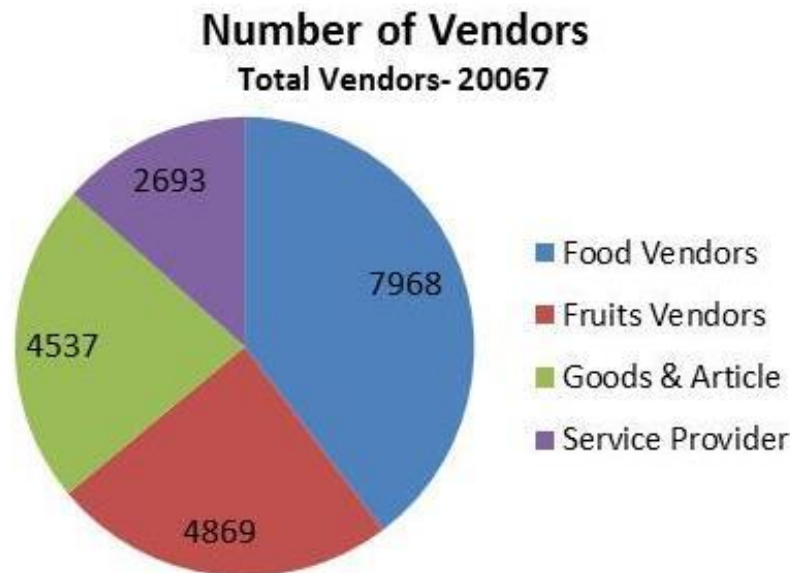


Figure 30: Number of Vendors in Agra

#### Space Occupancy Norms for Street Vending Units

- 1) A minimum of (2x2 )sq.m. area as vending area as static vendors.
- 2) Passage of 6x6 feet for mobile vendors

#### Restricted Vending Zones

- 1) No stationary vending is proposed on the roads with width 15 m (2-way traffic)- vending allowed on only one side
- 2) No vending for roads with width 10-15 mts only allowed if road is declared as one way.

#### Space Recommendation for Individual Vendor

- 1) A maximum of 4 sq.m. vending area
- 2) Passage of 1m width in front of stalls
- 3) A walkway of 2 m width shall be provided for pedestrian

#### Proposal of Vending Zone in ABD Area

**Proposal of vending zone in ABD Areas**

	<b>3.3 sq.m. Vending Area</b>	<b>4sqm Vending area</b>
<b>Basai Mandi</b>	34 nos.	16 nos.
<b>Fatehabad Road</b>		25 nos.
<b>Near Amar Hotel</b>	24 nos.	

**4.6.1.9 E Toilets**

Features:

1. Area of around 20 square feet
2. 2 doors -- a sliding door at the front, and a normal door ahead of the toilet.
3. The waste is treated and it is reduced to a sand-like material & it is removed physically once in three months.
4. Cost Rs. 3.5 -5.5 Lakhs (inclusive of bio-membrane reactor's price).
5. Bio-membrane reactor is a nano-technology- aided device that instantly recycles the used water and makes it ready for future use.
6. Manged at remote location and remote washing can be done through GPRS controls.
7. The average life of a unit is estimated to be around 7-10 years.
8. Automatic door, lights and exhaust fan starts at drop of coin.
9. When the user doesn't flush, the toilet flushes itself.



**Figure 31:Public E-Toilet**



#### 4.6.1.10 Bus shelters

##### TYPES OF BUS SHELTER

TYPE-I- Fully Fledged Bus Shelter with Kiosk

TYPE-II- Bus Shelter without Kiosk

Bus shelter will be tendered based on PPP model.



Figure 32:Bus Shelter

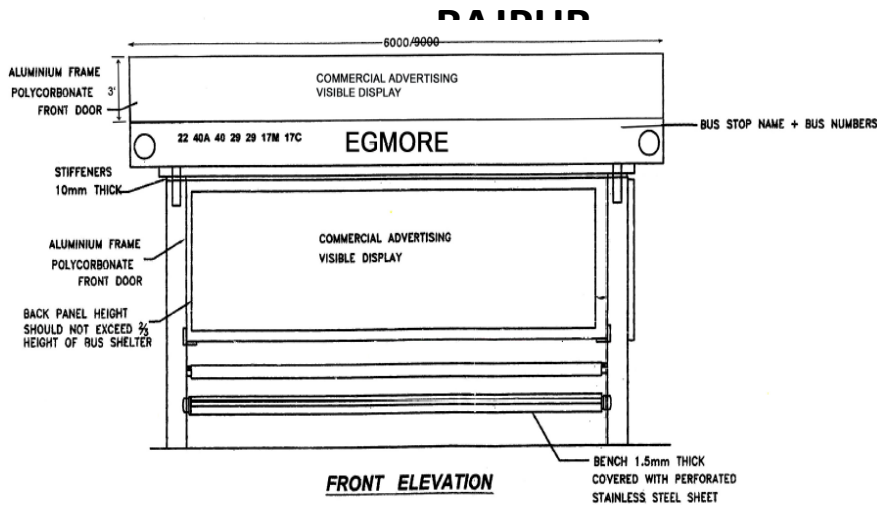




Figure 33Fatehabad Road Bus Shelter Locations

#### 4.6.1.11 Landscaping: Pathways, Sculptures, Pergolas, Percolation pits, Tensile Umbrella, Feature wall, covered sitting, Open Gymnasium, Bollards, Plantation,

##### PLANTATION

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 water 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.

Provision of Sculpture, opengym equipment and bollard wherever required as per the ground level condition of fathabad road.

**4.6.1.12 Healthcare kiosks**

Health kiosks are interactive device designed for self-service check-in and collection of patient’s health report. Kiosk interacts through touchscreen that does not require any expertise to navigate. It is a tool for providing patients health condition and monitors them between doctor visits. The independent,



Figure 34:Healthcare Kiosk

unassisted collection of information is clinically useful with a patient identifier. The health kiosk shall monitor and measures different physiological parameters of the body such as blood pressure, heart-rate, body-temperature and blood sugar level will be continuously transmitted through wireless technology. All the parameters are monitored using PC via WSN protocol and also updated in server (IoT). The patient can therefore approach with the results about his/her physiological parameters to the doctors and also with a suggestive prescription for necessary discussion. Welcoming this

application for the improvement of advanced check-up procedure comforts the limitation to make use of regular device for experimenting telemedicine. This healthcare kiosk project will be implemented as different tender.

#### **Common biometrics can be measured through a health kiosk**

- Weight
- BMI (with self-entered height)
- Body fat percentage
- Blood pressure (systolic and diastolic)
- Upload of glucose measurements (via USB-enabled glucometer)
- Upload of fitness and activity information from activity monitors/pedometers
- Kiosks can be interactive and display health education information or participant-specific information from trackers. Typically, if a user's biometrics are out of normal range, a recommended action is displayed. Industry leading vendors will then take the data recorded, upload it to the individual's Personal Health Record (PHR) and Health Assessment, and use it as a way to identify at-risk members for outreach to offer them lifestyle risk modification programs.

Here We proposed three option of smart healthcare kiosk. Out of these three options will go for the best economical and quality option based upon the community of the citizens. Options are smart health care kiosk look like ATM machine, Healthcare kiosk with medicine vending machine, cubical first aid kiosk for community centers as well as at different locations.

#### ***4.6.1.13 Drinking water kiosk***

Drinking water kiosk will be provided at major attraction places like malls,towards Taj east gate road and major tourist footfall at particular location.





Figure 35: Drinking Water Kiosk

## 4.7 Existing and proposed sections

### 4.7.1 Shastri crossing to Taj view crossing

This stretch covers institutional building and commercial land use with some existing encroachment. Satellite image from P-P section to N-N section available in map and proposal for this stretch shown in section manner detailed plan available in drawings for this stretch.

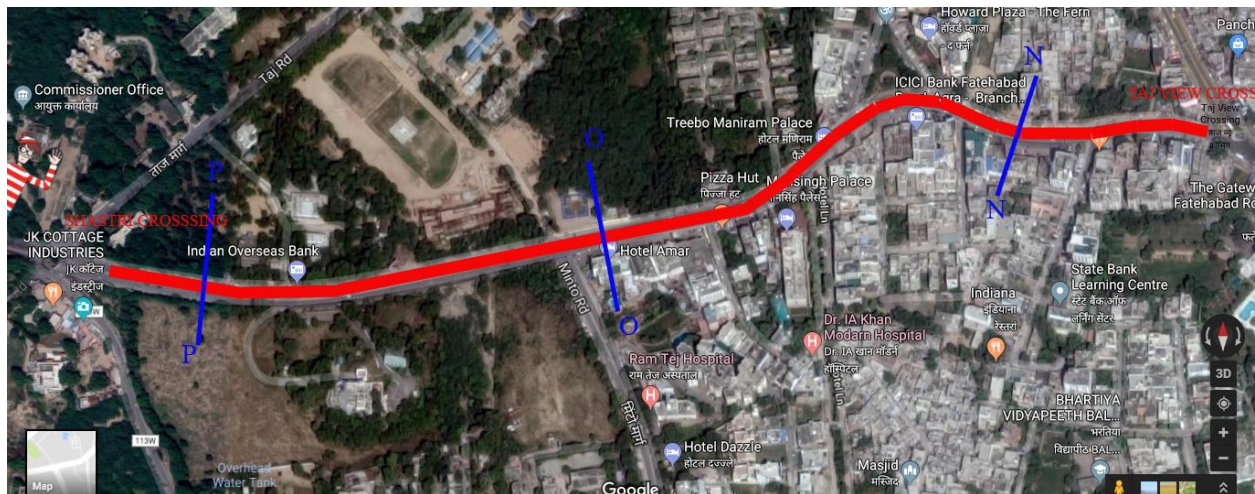


Figure 36: Satellite image of Shastri crossing to Taj view crossing with sections

#### 4.7.1.1 A detailed proposal for Shastri crossing to Taj view crossing

In this stretch majorly provide Storm water drain, Utility duct, and pedestrian path. Every section shows different types of facilities and detailed plan available in drawings.

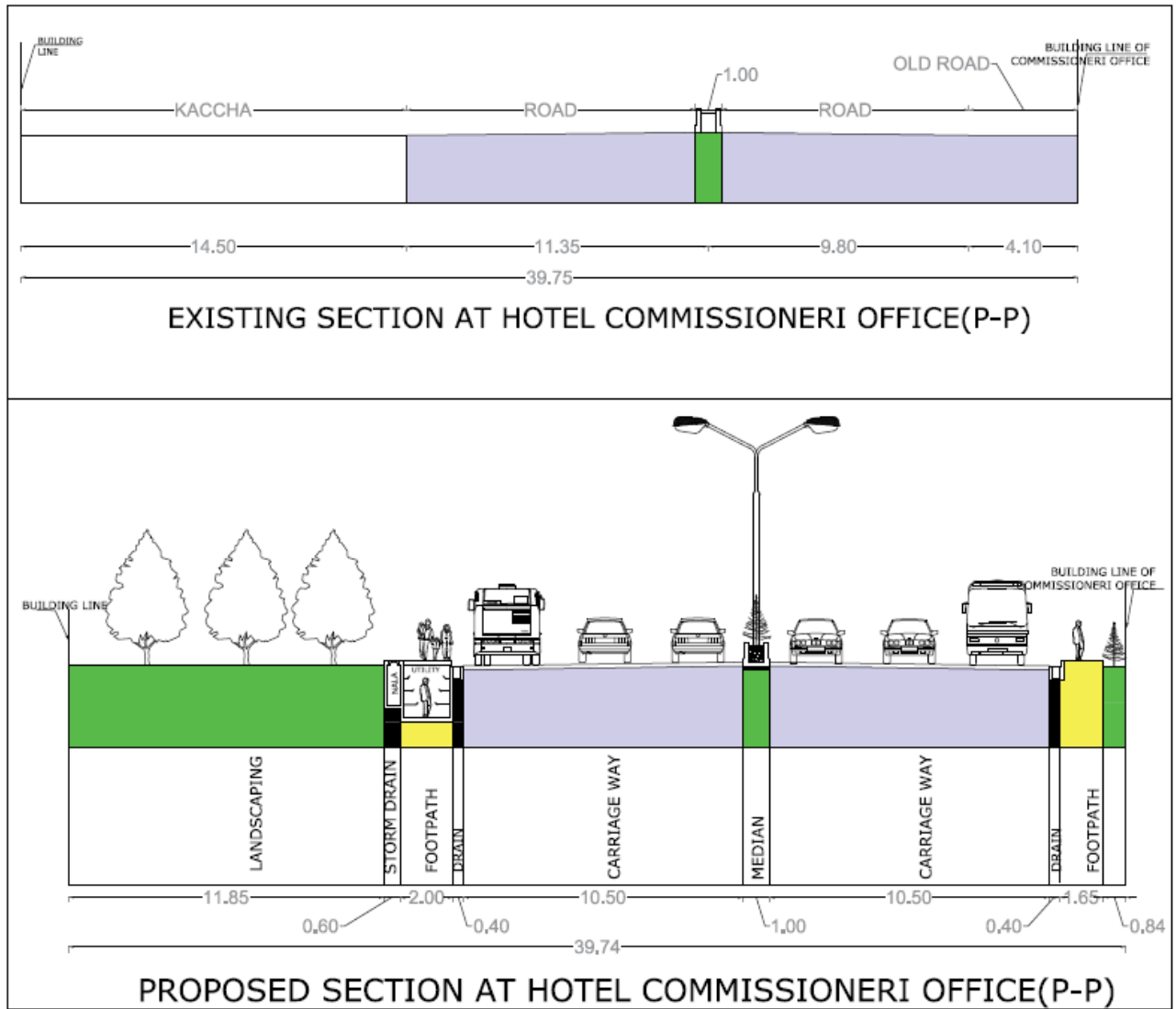


Figure 37: Section at Commissioner office

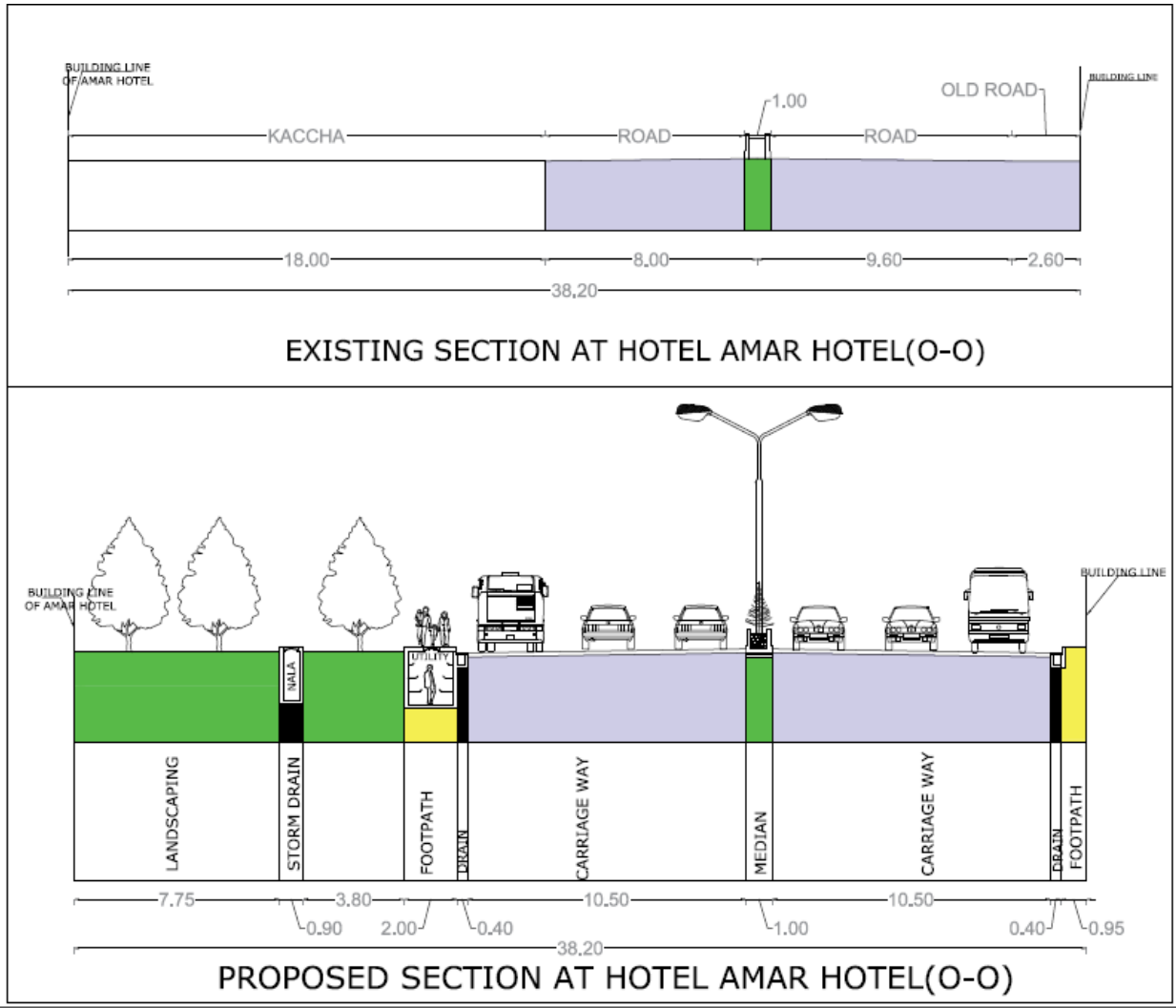


Figure 38: Section at Hotel Amar

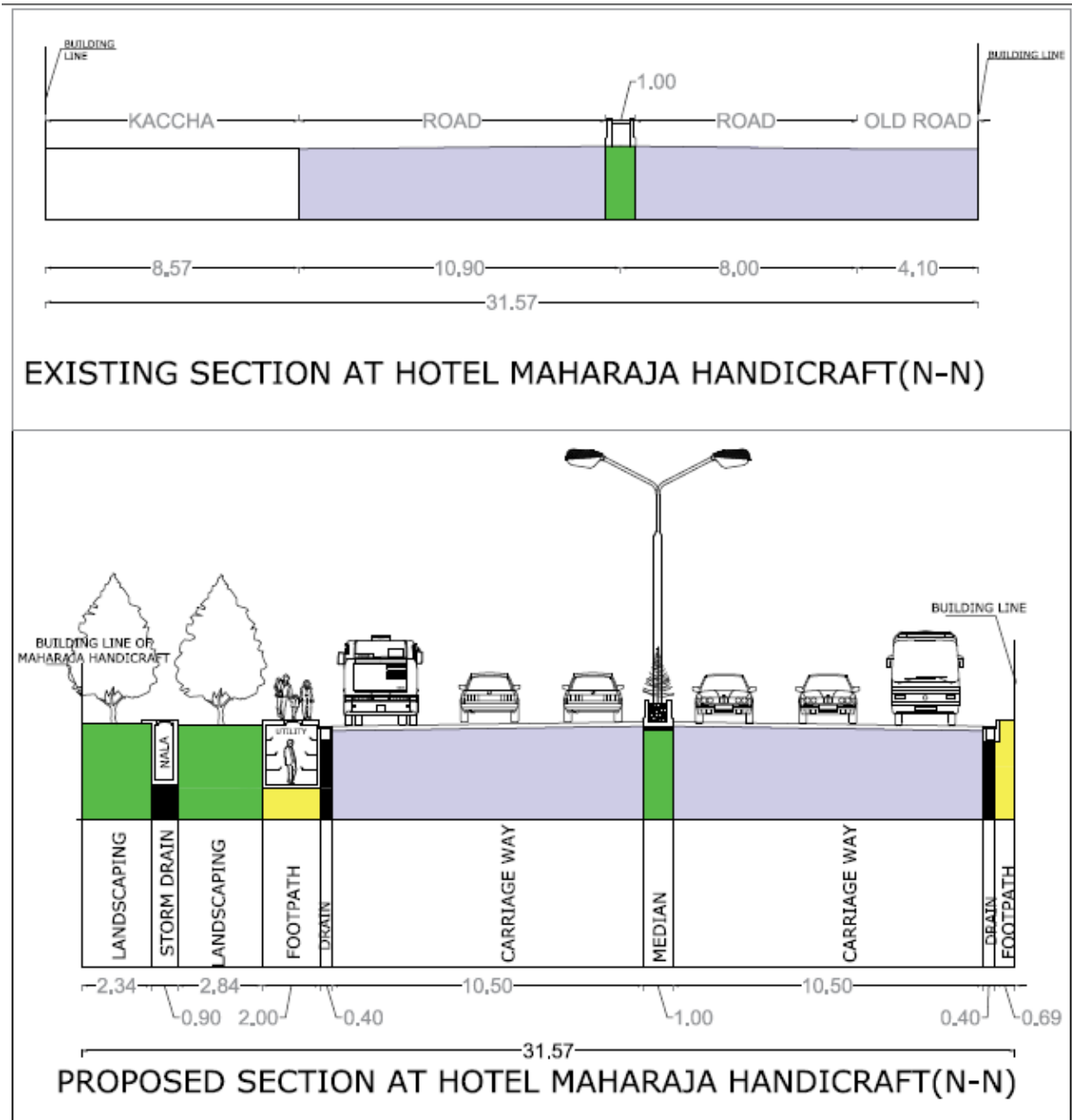


Figure 39: Section at Maharaja Handicraft

## 4.7.2 Taj view crossing to Hotel Trident

This stretch covers almost commercial land use on both sides with some existing encroachment. Satellite image from M-M section to F-F section available in map and proposal for this stretch shown in section manner detailed plan available in drawings for this stretch.

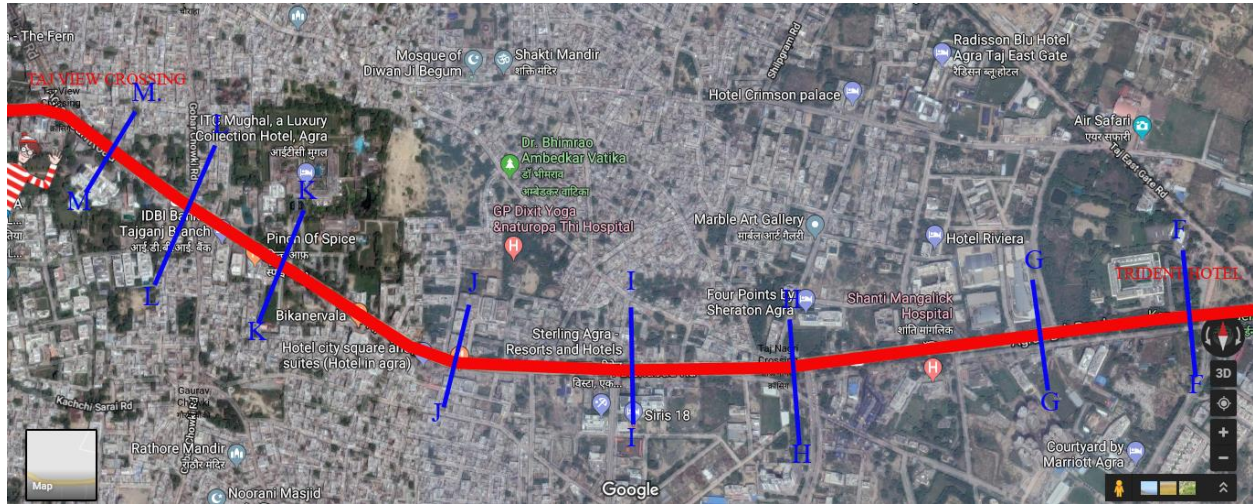


Figure 40: Satellite image of Taj view crossing to Hotel Trident with sections

### 4.7.2.1 A detailed proposal for *Taj view crossing to Hotel Trident*

In this stretch majorly provide cycle tracks, kiosk, smart bus shelter, street furniture Storm water drain, Utility duct and pedestrian path. Every section shows different types of facilities and detailed plan available in drawings.



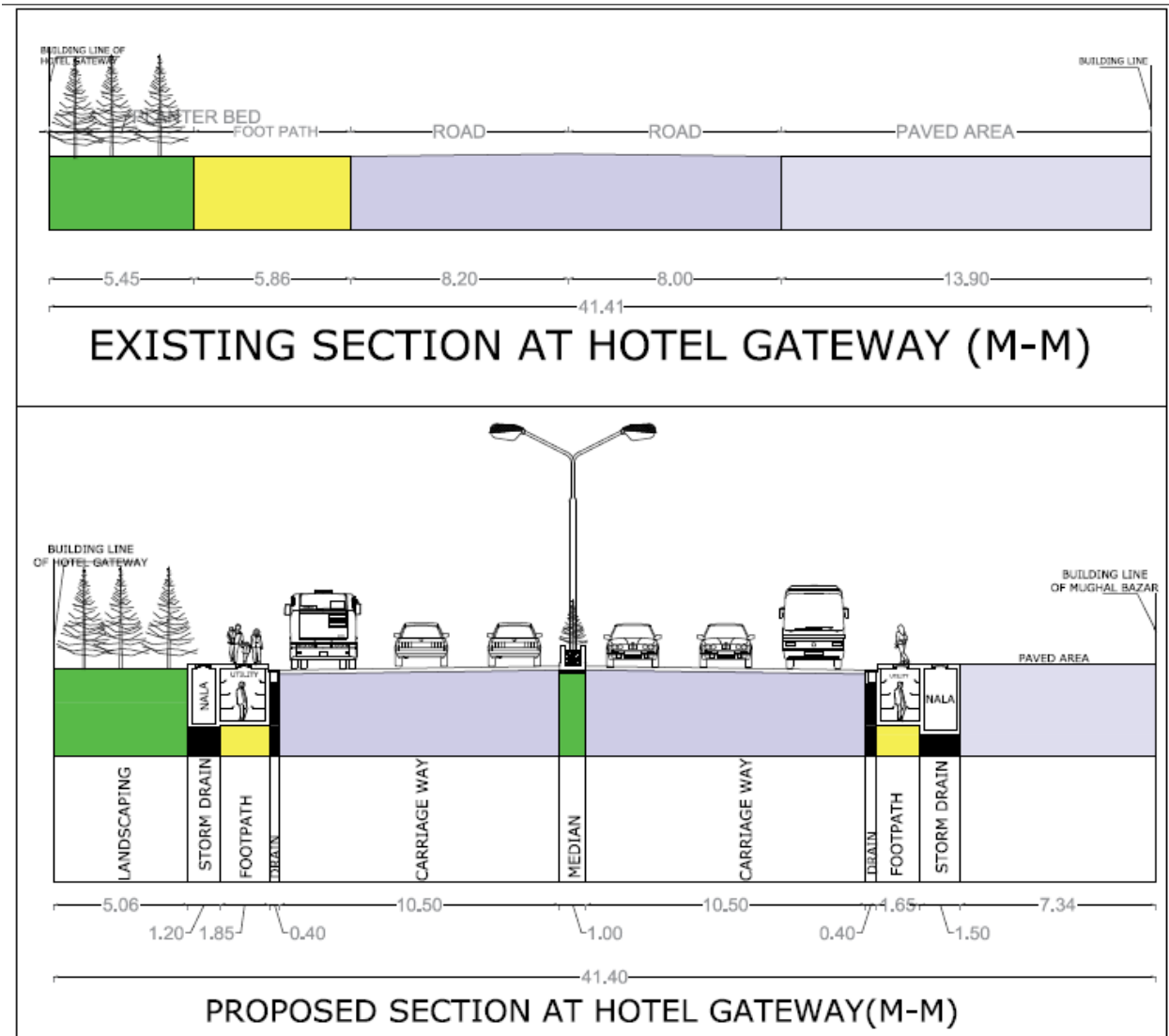


Figure 41: Section at Hotel Gateway

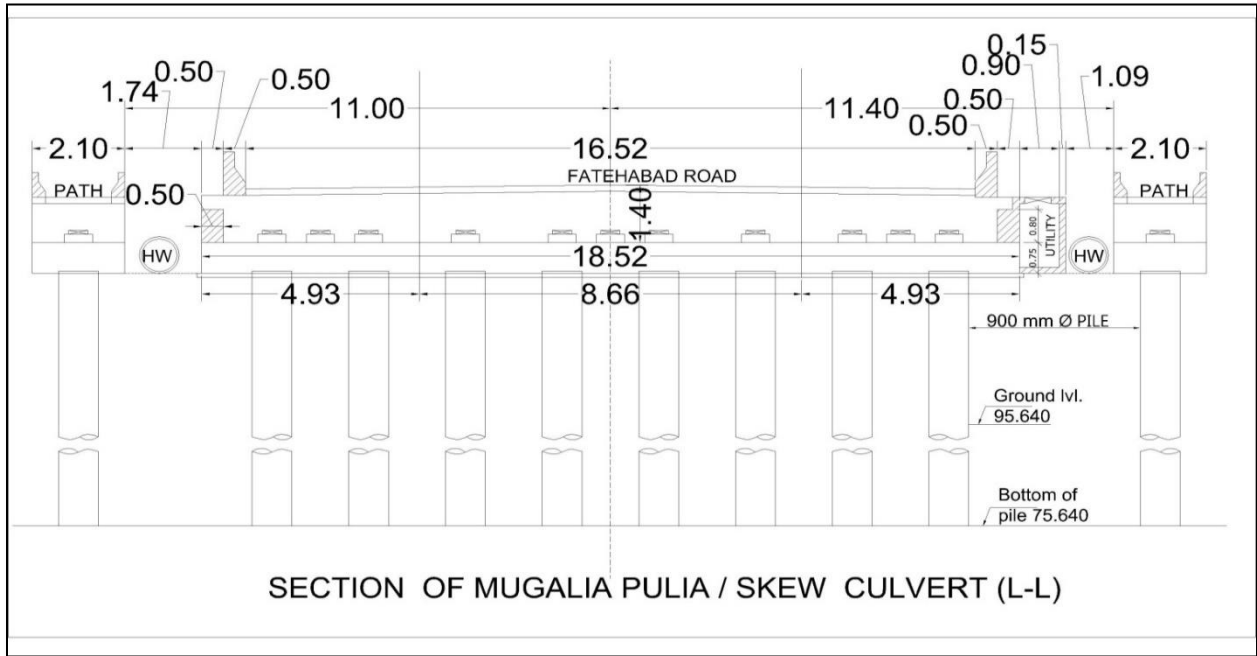


Figure 42: Section at Mughal Puliya

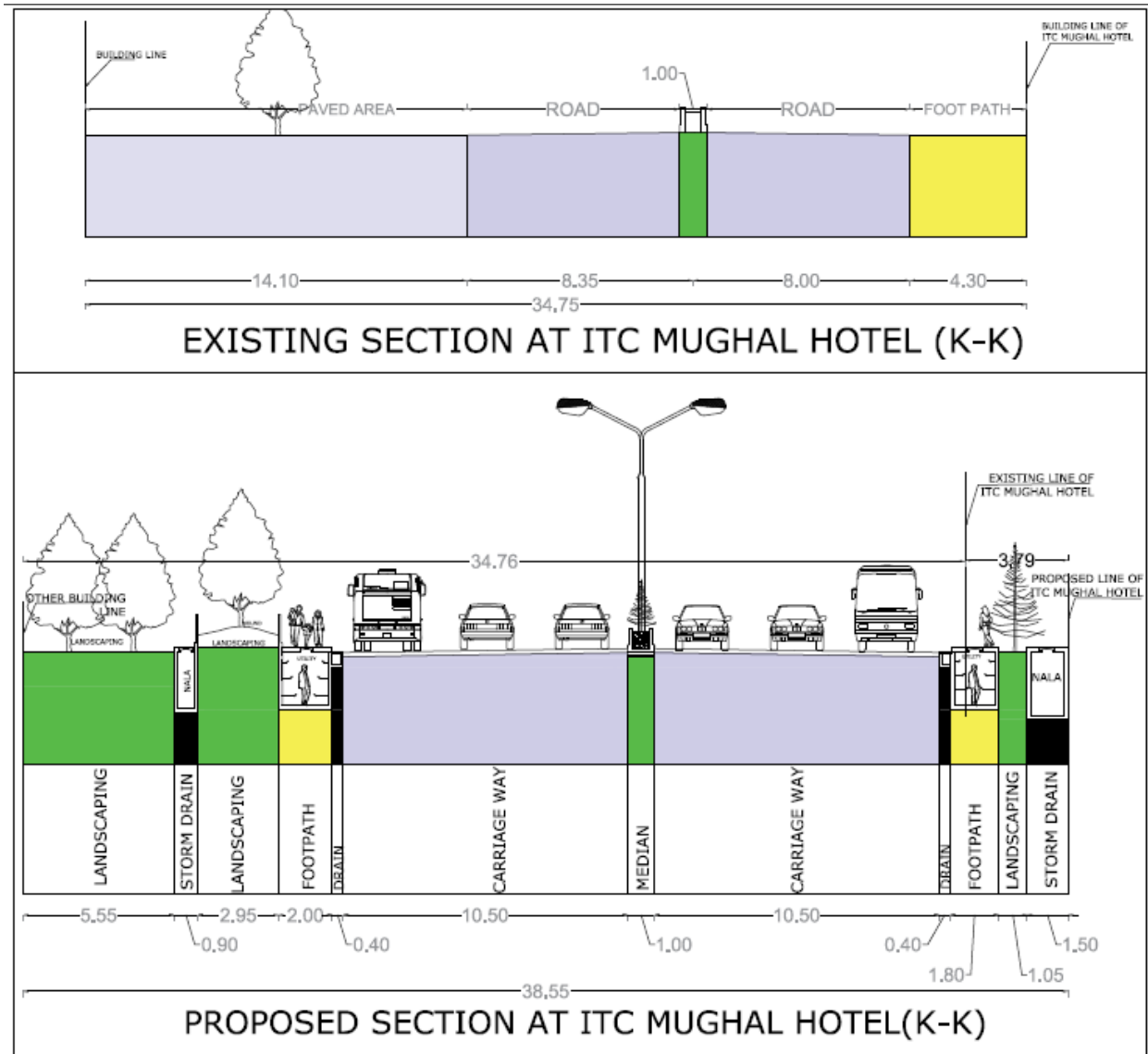


Figure 43: Section at ITC Mughal Hotel

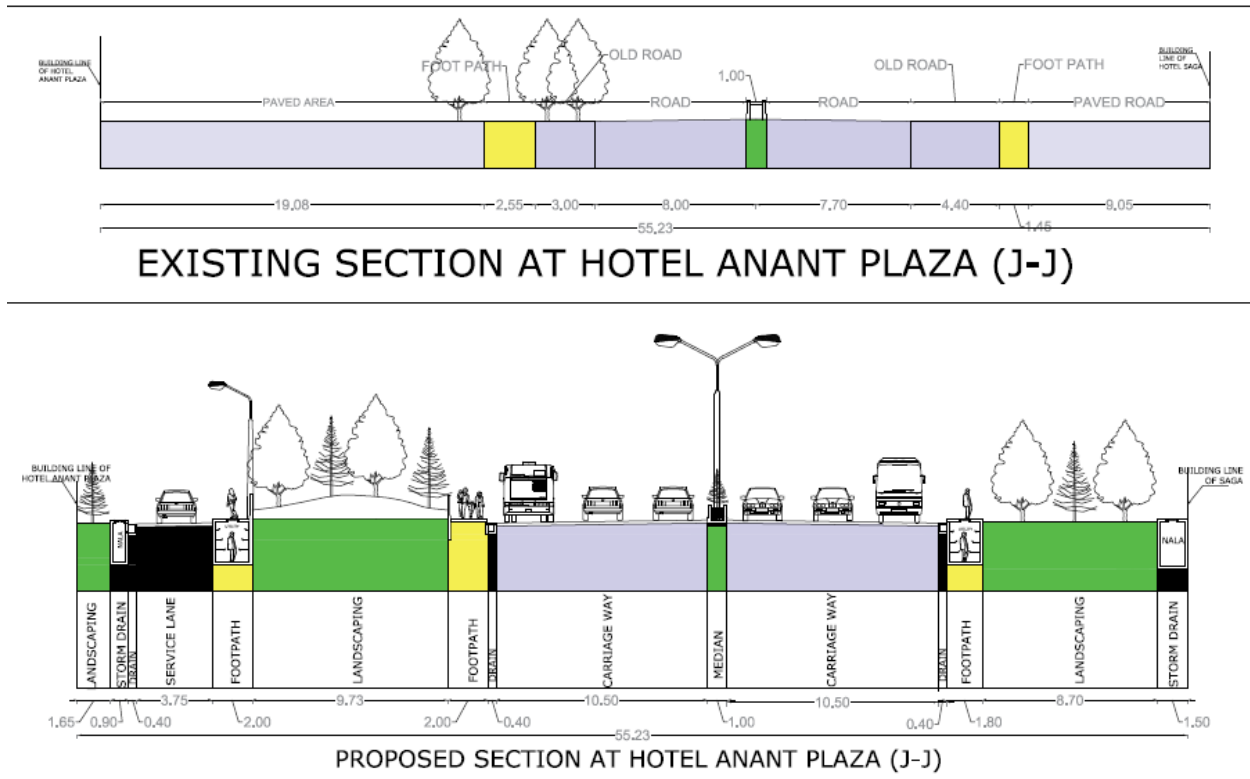


Figure 44: Section at Hotel Anant Plaza

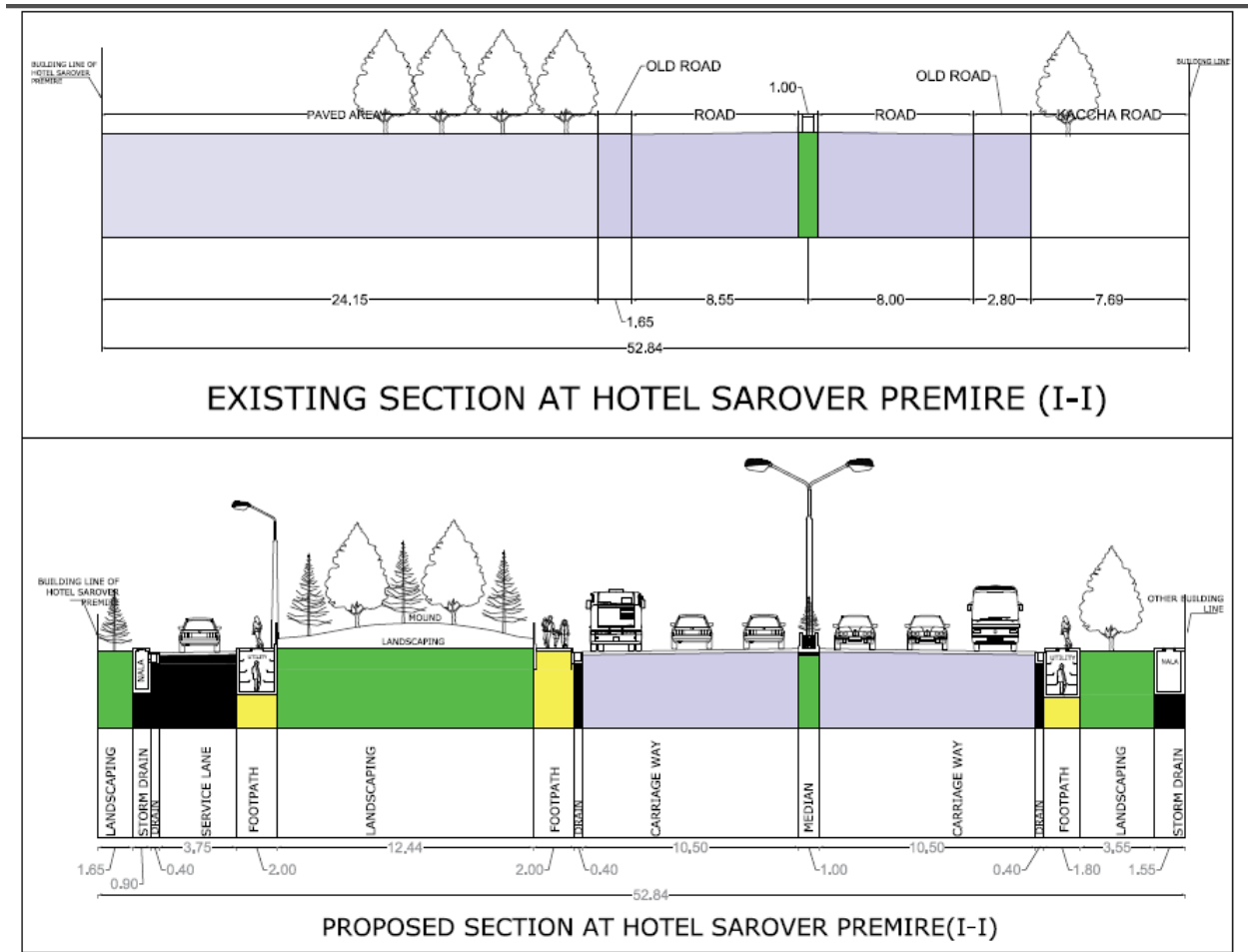


Figure 45: Section at Hotel Premium Sarovar



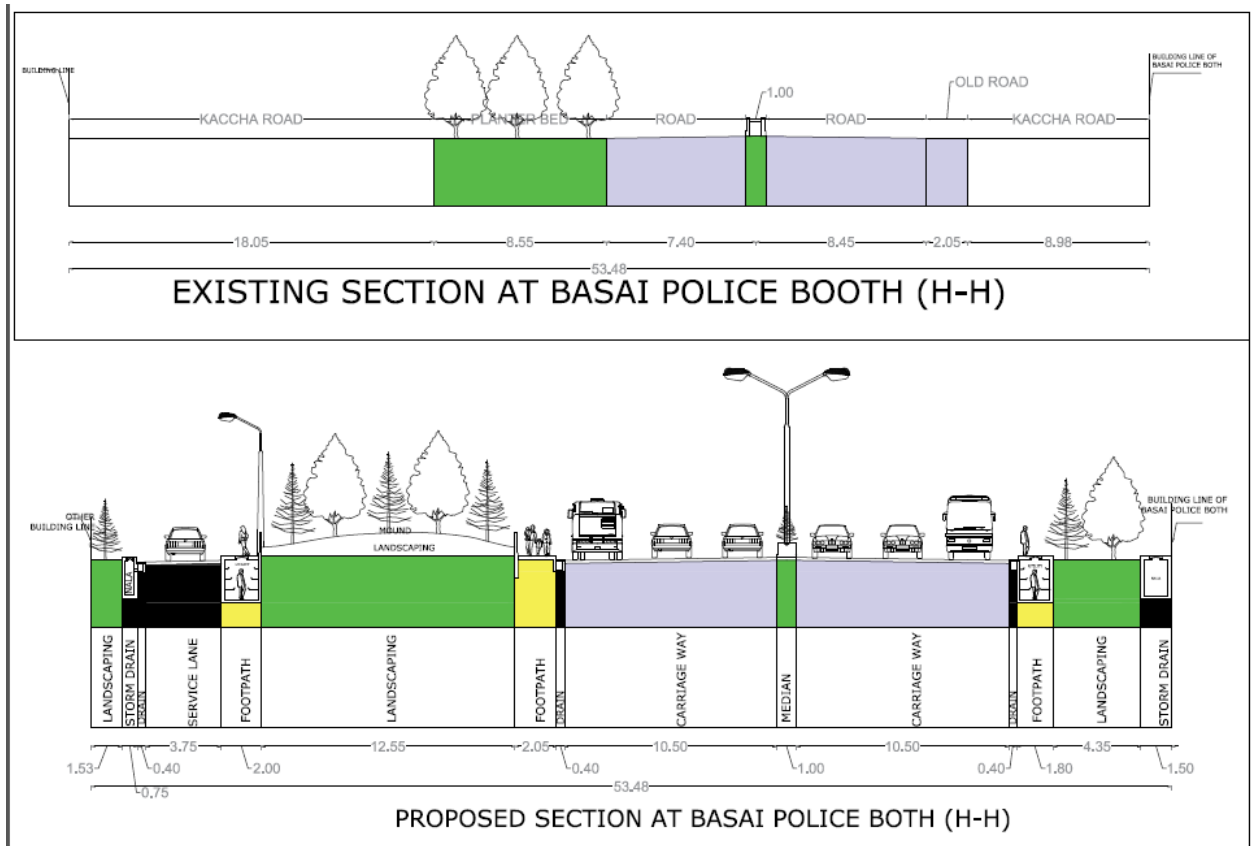


Figure 46: Section at Basai Police Chowki

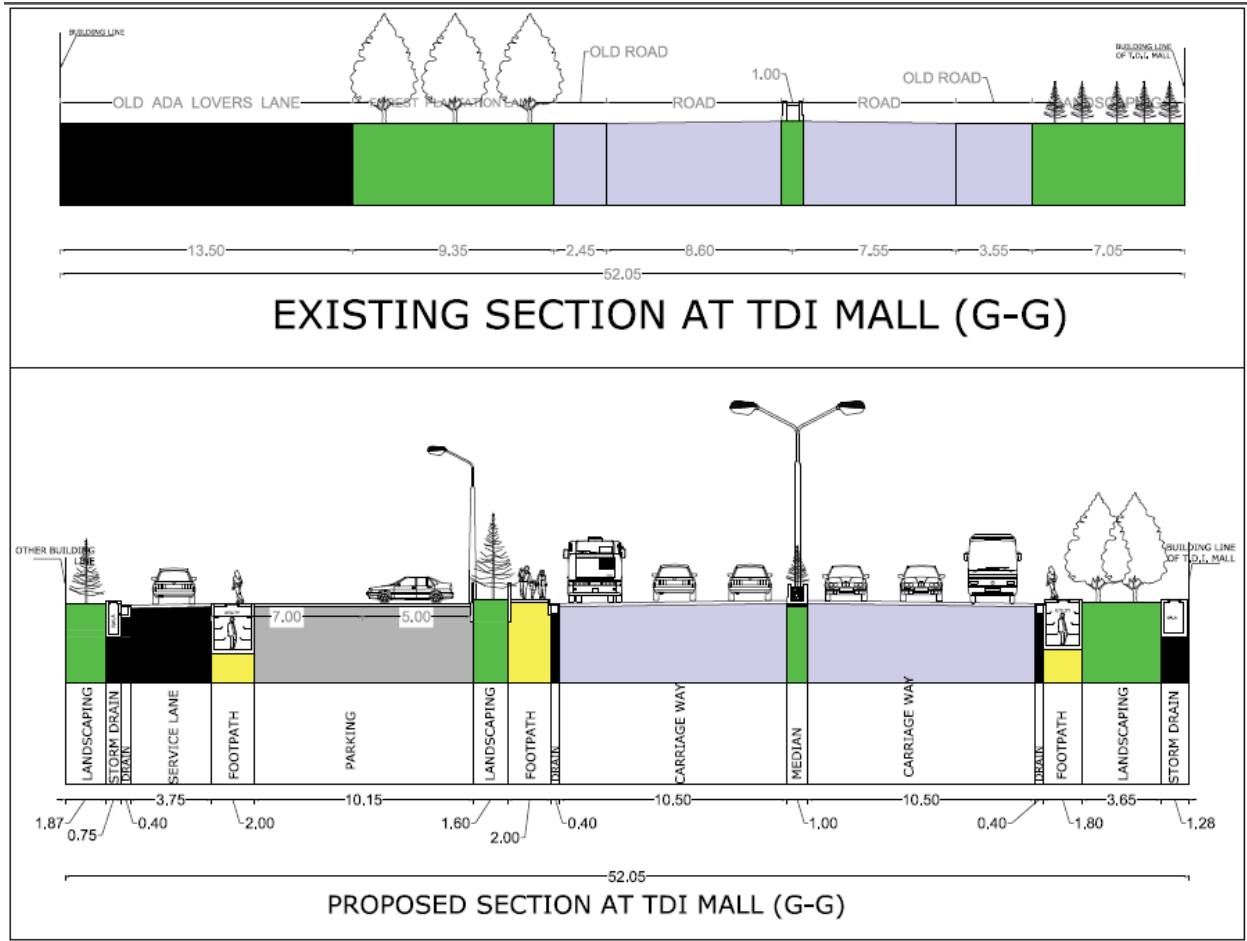


Figure 47: Section at TDI Mall

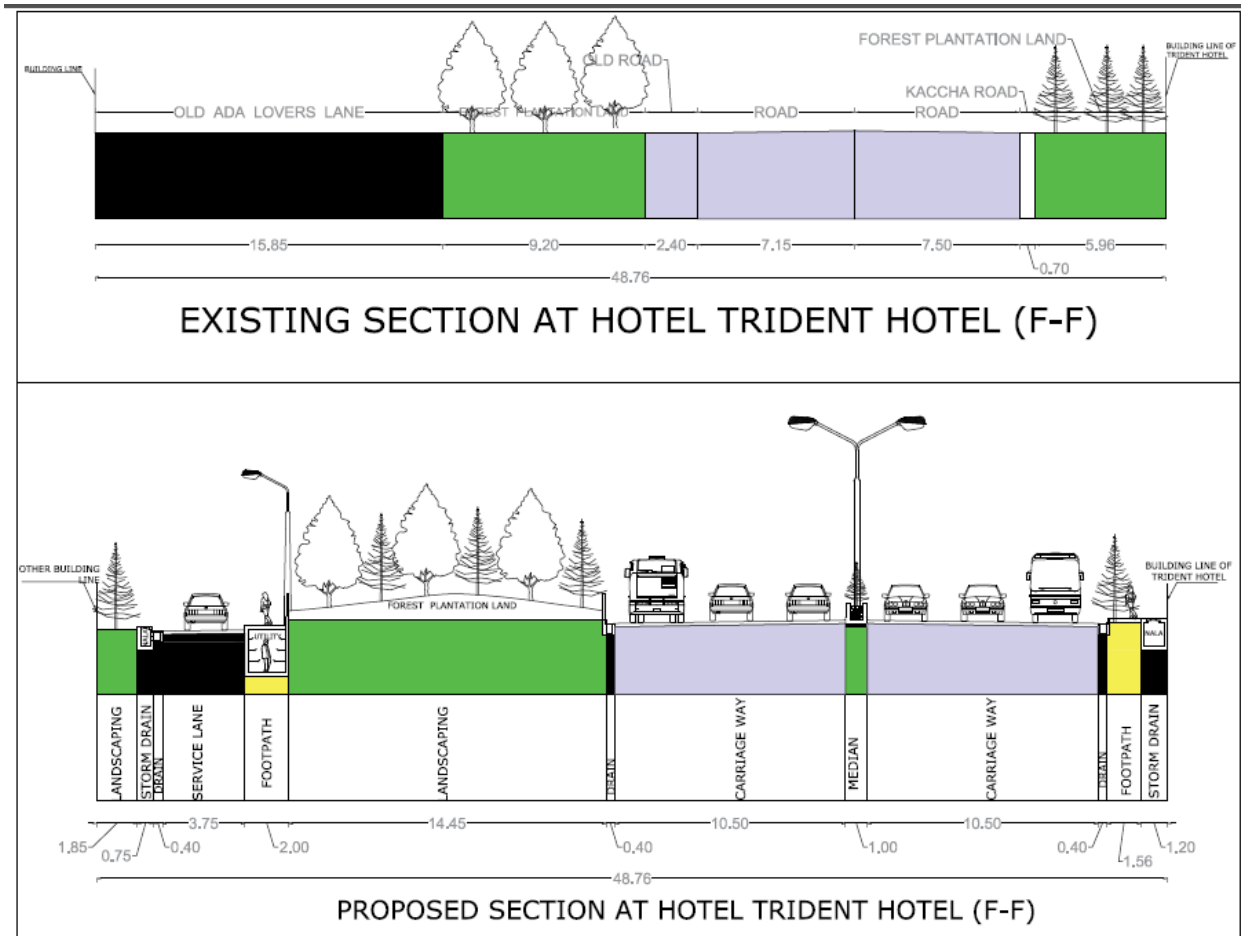


Figure 48: Section at Hotel Trident

### 4.7.3 Hotel Trident to Jaypee Hotel

This stretch covers almost commercial land use on both sides with. Satellite image from E-E section to B-B section available in map and proposal for this stretch shown in section manner detailed plan available in drawings for this stretch.



Figure 49: Satellite image of Hotel Trident to Jaypee Hotel

#### 4.7.3.1 A detailed proposal for Hotel Trident to Jaypee Hotel

In this stretch majorly provide cycle tracks, kiosk, smart bus shelter, street furniture Storm water drain, Utility duct and pedestrian path. Every section shows different types of facilities and detailed plan available in drawings.

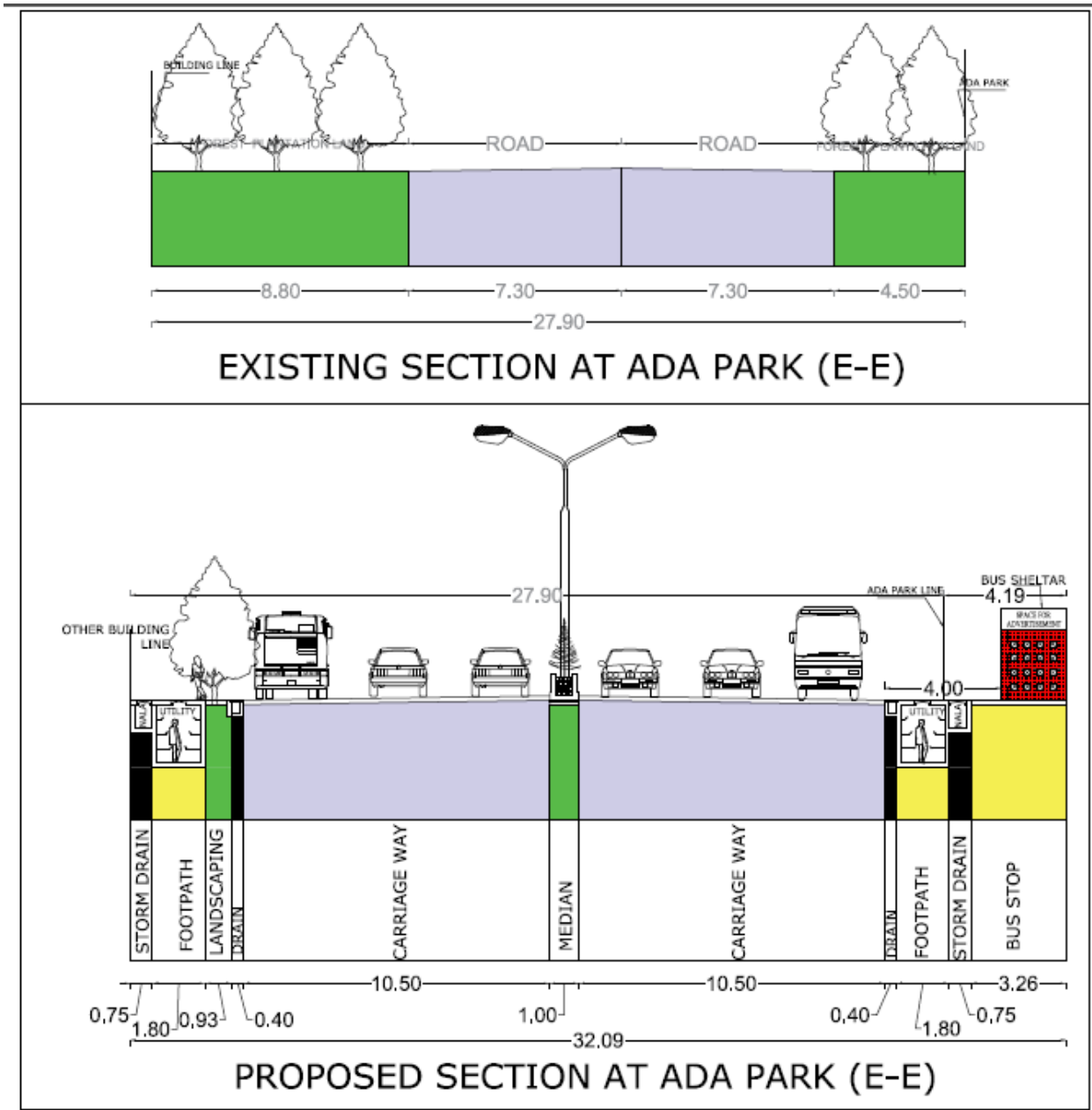


Figure 50: Section at ADA Park



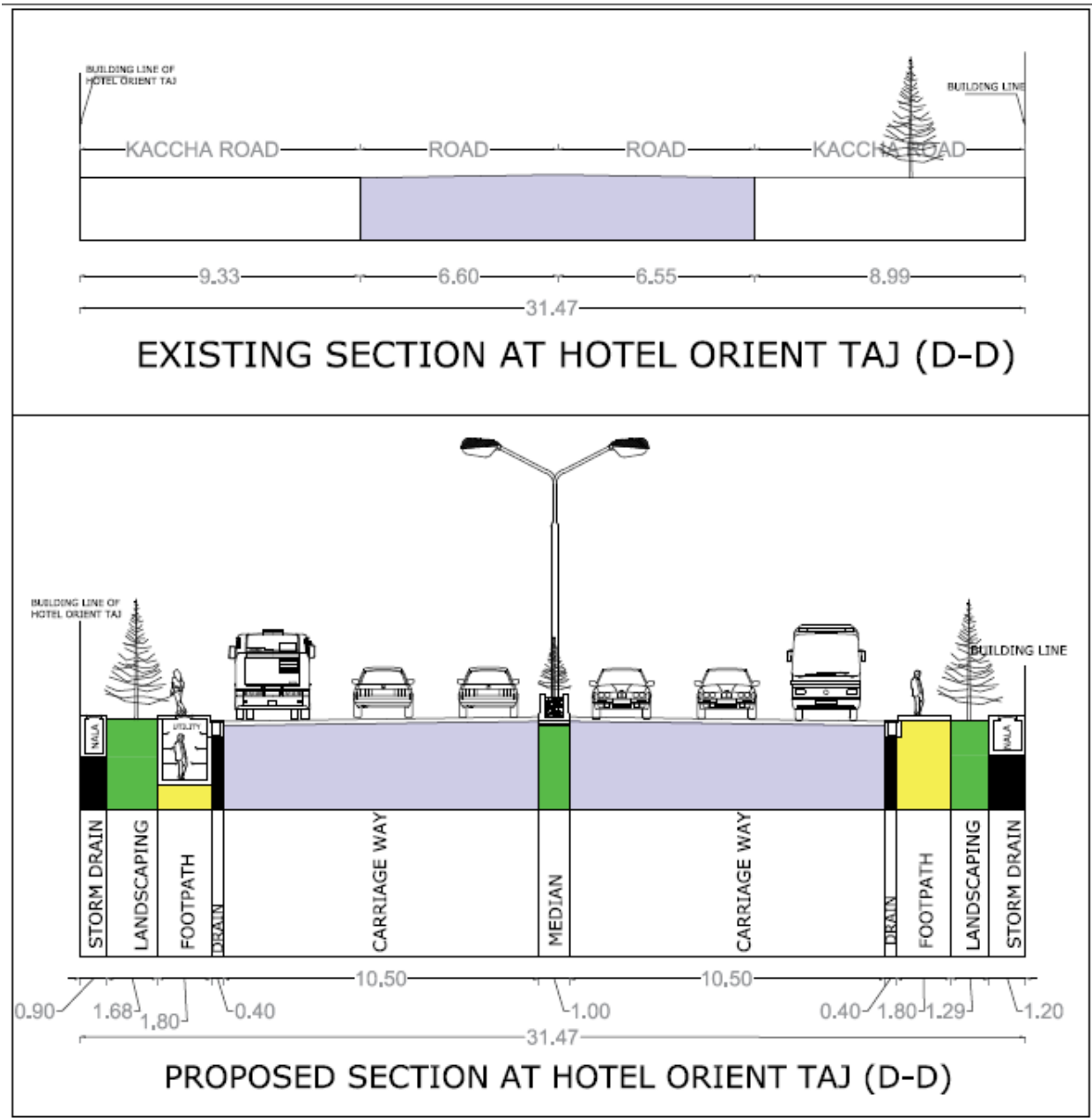


Figure 51: Section at Hotel Orient Taj

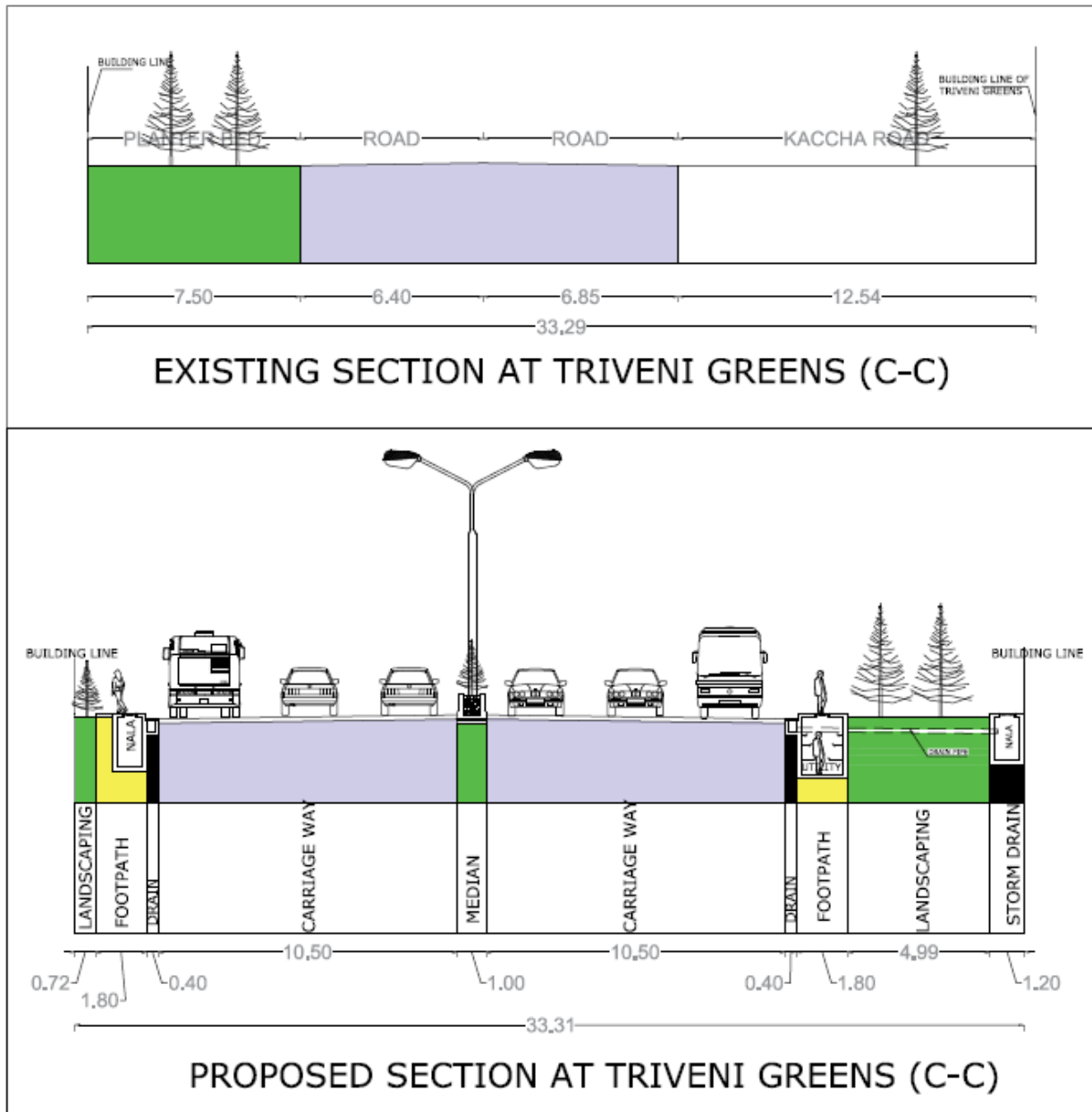


Figure 52: Section at Triveni Greens



Figure 53: Section at Jaypee Hotel

#### 4.7.4 Jaypee Hotel to Express Way

This stretch connects Yamuna express highway, it includes hotels and some small encroachment shops on both sides.

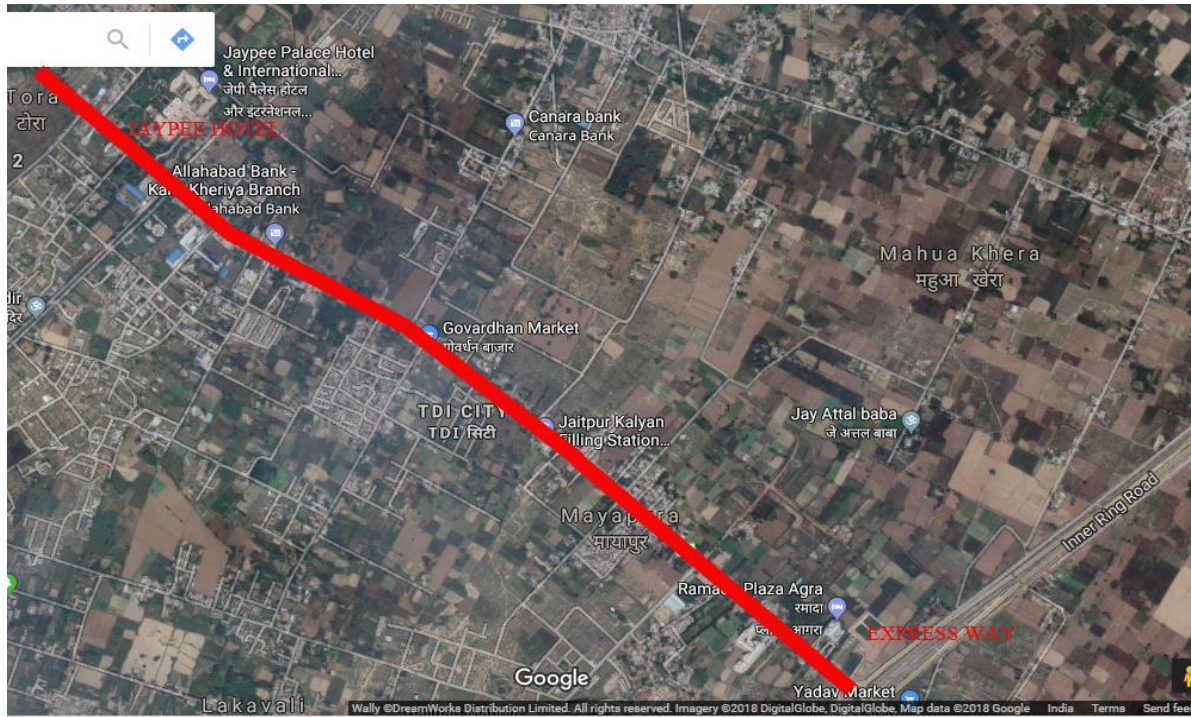


Figure 54:Satellite Image of Jaypee Hotel to Expressway

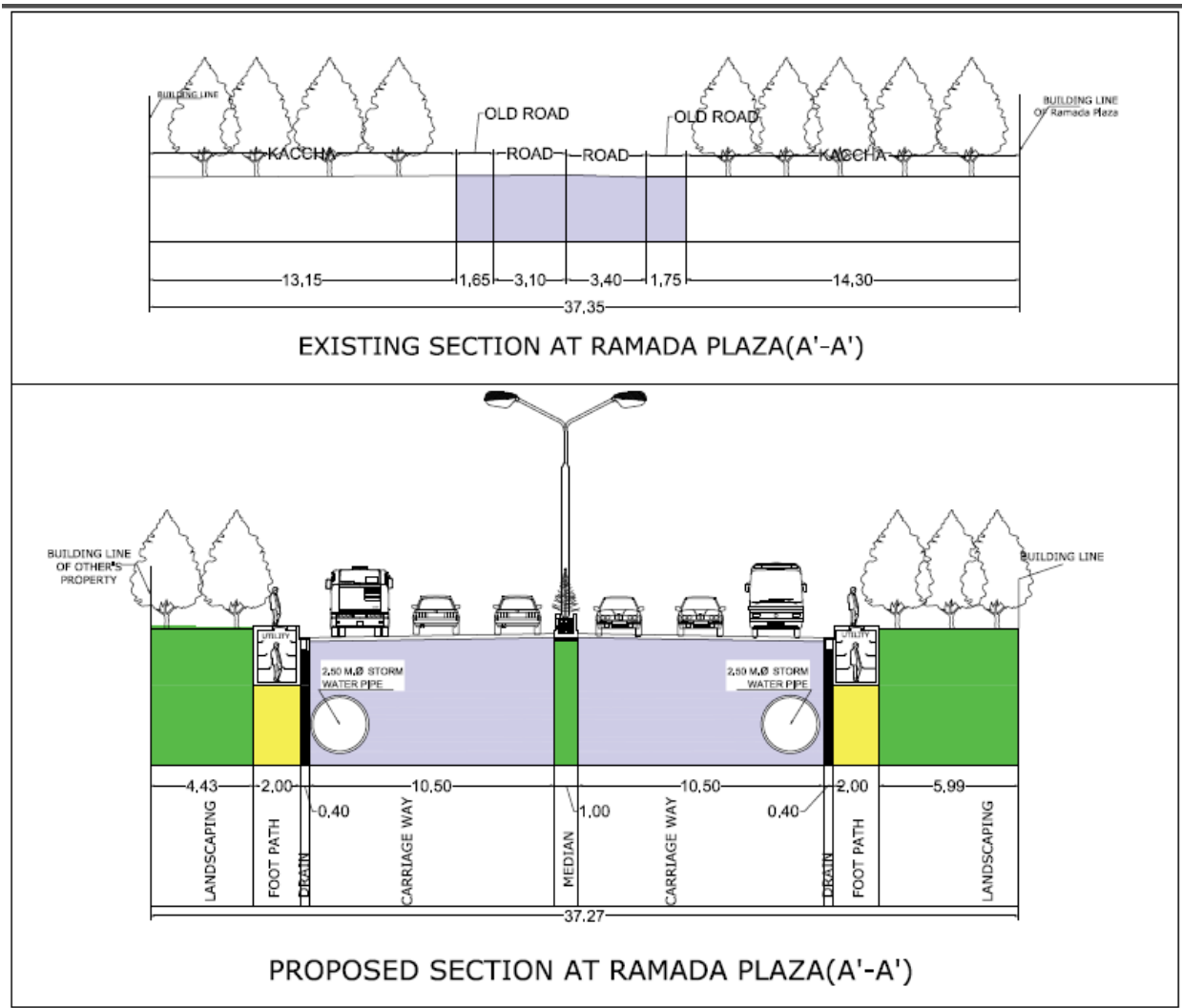


Figure 55:Section near Ramada Plaza



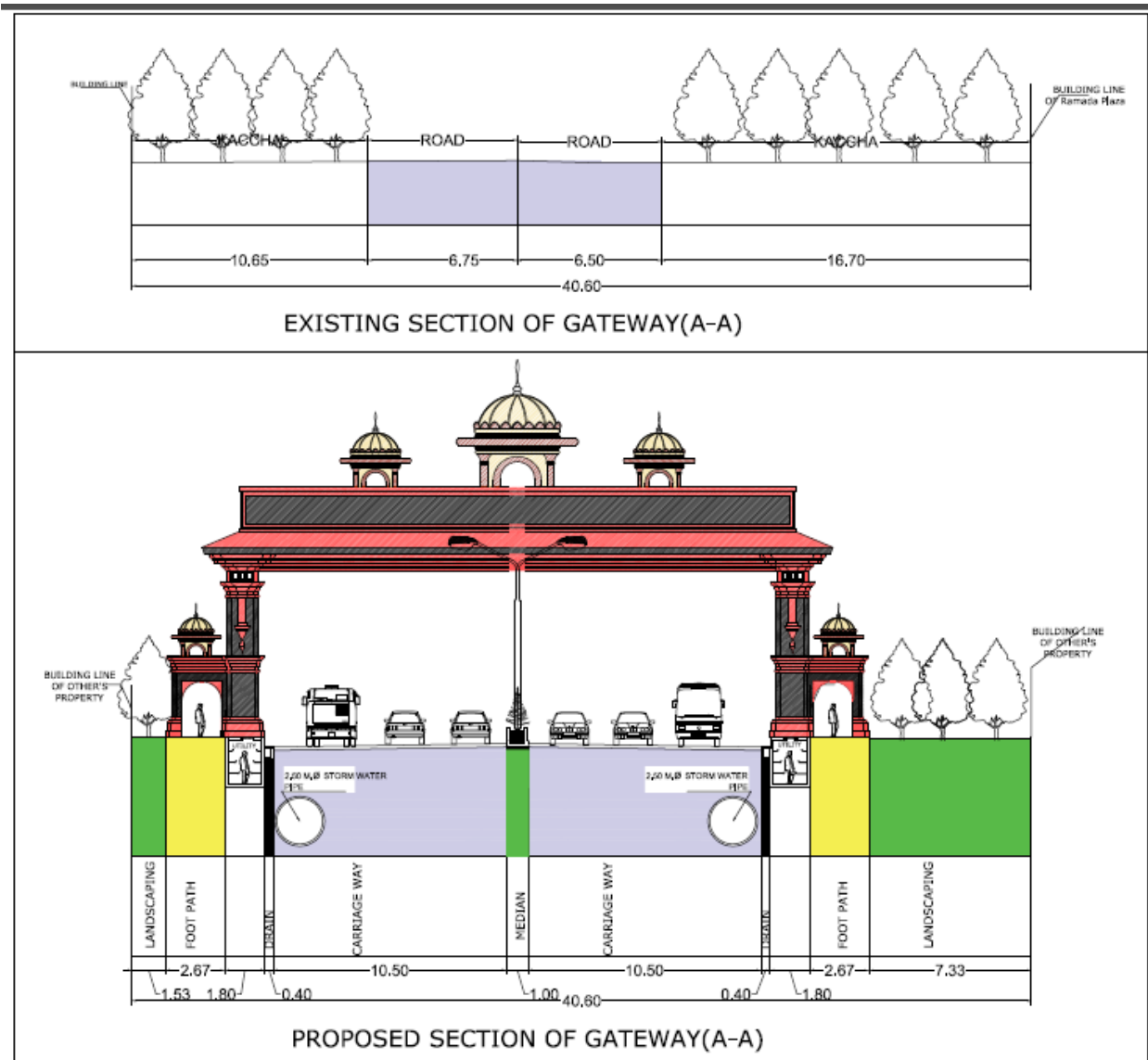


Figure 56:Section of Gateway near Ramada Plaza

### 4.8 The significance of This Proposal

The development of the said stretch 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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## 4.9 Financial Feasibility

The cost of the project of 6 lane road widening project of Fatehabad road by PWD, Agra majorly includes the facilities/ Amenities mentioned above. The amenities/ facilities not covered by PWD would be funded under convergence mode i.e. through Agra Smart city fund.

### **Annexures:**

All Annexures regarding this Project from different departments attached in this report. PWD annexures available for the reference.

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## Chapter 5. BOQs and Cost Estimates

### Annexures

**Typical Cross section of carriageway**

**Crust design of Road**

**PWD Topographic survey sections**

**Fatehabad Road X-sections**

**Line diagram for Road**

**Road Chainage Data**

**Traffic census**

**Topographic Survey drawings**

**Proposed Plan drawings**

**BOQ of Fatehabad Road**

**Storm water drain design**



**Darashaw & Co Pvt. Ltd.** 6<sup>th</sup> Floor, Express Building , 14<sup>th</sup> "E" Road, Near Government Law College, Churchgate  
(W), Mumbai -400 020 Tel +91 22 43022300