

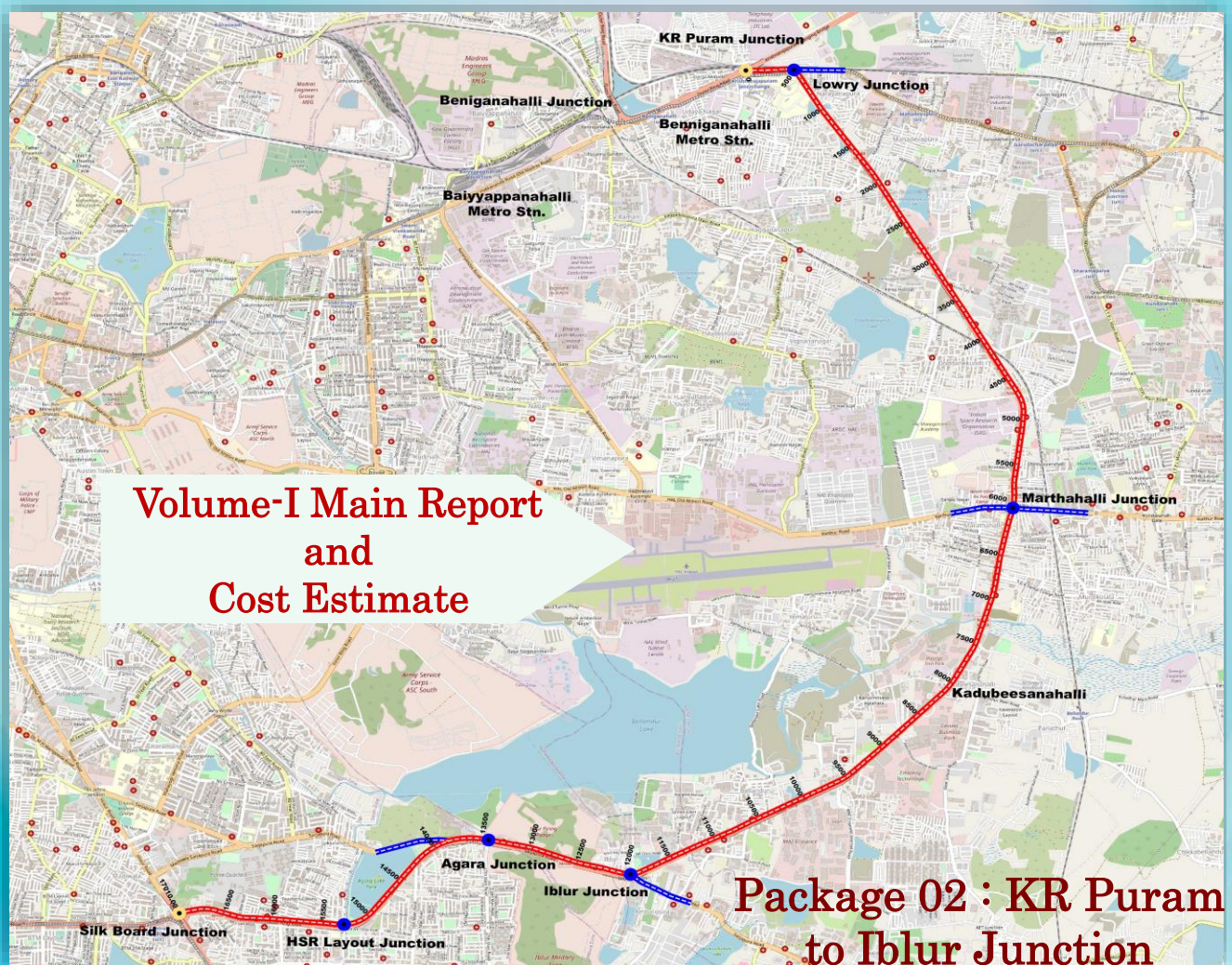
Preparation of Detailed Project Report for the Improvement of Outer Ring Road from KR Puram to Silk Board Junction



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DETAILED PROJECT REPORT



**Package 02 : KR Puram
to Iblur Junction**

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CHAPTER 1. INTRODUCTION

1.1 PROJECT BACKGROUND

Bengaluru, also known as **Bangalore**, is the capital and largest city of the southern Indian state of Karnataka. As per the 2011 census, the city had a population of 8.4 million, making it the third most populous city in India and the most populous in South India (the current population is estimated between 1.3 cr to 1.6 cr, based on different sources and estimation). It is located near the center of the Deccan Plateau, at a height of 900 m (3,000 ft) above sea level. The city is known as India's "Garden City", due to its parks and greenery.

Bangalore is one of the fastest growing cities in Asia and also one of the most sought - after cities in India by people, companies and multinationals. The massive growth that the city has witnessed in the last decade is a clear indication of this city being developed to be at par with the most modern cities in the world. The population of Bangalore has grown enormously on account of migration of people from all corners of India, neighbouring countries and from countries in the West. This rapid urban expansion has placed immense pressure on the city's infrastructure, including roads, water supply, sewage, and drainage. One of Bengaluru's most pressing challenges is traffic congestion, especially during peak hours, primarily due to the high number of vehicles and inadequate infrastructure.

As of 2023, the metropolitan area had an estimated GDP of \$359.9 billion, and is one of the most productive metro areas of India. The city is a major center for information technology (IT), and is consistently ranked amongst the world's fastest growing technology hubs. It is widely regarded as the "Silicon Valley of India", as the largest hub and exporter of IT services in the country. Manufacturing is a major contributor to the economy and the city is also home to several state-owned manufacturing companies. Bengaluru also hosts several institutes of national importance in higher education.

Bangalore, is now classified as a mega city. The last five decades have been a period of rapid growth for Bangalore with a proliferation of multinational companies choosing to locate their operations in the city and its environs in industrial products, consumer durables and more recently information technology.

Bengaluru holds a unique position on the global map, serving as a nucleus for business, education, science, and information technology, and is globally recognized as India's

foremost technology hub and “Silicon Valley of India.” Over the past five decades, the city has witnessed unprecedented urbanization and explosive population growth, driven by its thriving IT, biotechnology, aerospace, and startup ecosystems. This rapid transformation has propelled Bengaluru into a leading centre for research, innovation, and high-value industries, attracting a diverse talent pool from across the country and abroad. However, the city’s transition from a once serene, garden filled urban settlement to a bustling metropolitan agglomeration has brought significant challenges, including severe traffic congestion, pressure on civic infrastructure, environmental stress, and spatial expansion far beyond its core. As Bengaluru continues to expand both demographically and economically, strategic infrastructure planning particularly in mobility and transport has become critical to sustain its role as a global economic powerhouse while ensuring quality of life for its residents.

With an overall rapid increase in population coupled with the seemingly irreversible flow of people from rural to urban areas, Bangalore has been acquiring unplanned and uncontrolled squatter settlements from all over the country. The glass walled computer – ready office complexes, exclusive shopping malls and entertainment facilities that rival the best in the country contrast with the dense squatter settlements and their very poor services in central areas of the city.

Bengaluru has an extensive road network with about 14,000 km of roads as of 2024. The 10 km long Inner Ring Road connects Koramangala with Indira Nagar. The Outer Ring Road is a 60 km long peripheral road, developed between 1996 and 2002. The Peripheral Ring Road of 74 km, semi-circular road, connecting major arterial roads is in the proposal. The M G Road is the major arterial road in the central business district. Bengaluru is part of the Golden Quadrilateral highway network, and lies on the Chennai–Mumbai line. The National Highways that connect to the city include: NH-44, NH-48, NH-275, NH-75, NH-648, and NH-948. The Bengaluru–Mysuru Expressway, operational since March 2023, connects the city with Mysuru. The Bengaluru–Chennai Expressway is under construction since August 2019. Two other expressways - Pune - Bengaluru Expressway and Nagpur – Hyderabad - Bengaluru Expressway - have been proposed.

Bruhat Bengaluru Mahanagara Palike (BBMP) was the administrative body responsible for civic amenities and infrastructural assets of the Greater Bengaluru metropolitan area. It is the fourth largest Municipal Corporation in India and was responsible for an area of 741 km². Its boundaries expanded more than 10 times since the 1950s. BBMP was

replaced by the Greater Bengaluru Authority on 15 May 2025; Its roles and responsibilities included the "orderly development of the city" zoning and building regulations, health, hygiene, licensing, trade and education, as well as quality of life issues such as public open space, water bodies, parks and greenery.

In this context, the **Greater Bengaluru Authority (GBA)** has replaced the **Bruhat Bengaluru Mahanagara Palike (BBMP)** as the principal civic body overseeing urban infrastructure. To address long standing mobility challenges, GBA has initiated several infrastructure projects, including road widening, flyover construction, and white-topping works. To streamline project execution, **Bengaluru Smart Mobility Infrastructure Limited (BSMILE)** has been established under GBA to take charge of key mobility and transport projects.

Bengaluru Smart Mobility Infrastructure Limited (BSMILE) is a **Special Purpose Vehicle (SPV)** established by the Government of Karnataka to plan, finance, and implement large-scale mobility and transport infrastructure projects across the Bengaluru Urban district. Governed by a board chaired by a full-time IAS officer and comprising key civic officials and infrastructure experts, BSMILE has taken over major projects earlier handled by BBMP, including flyovers, underpasses, elevated corridors, tunnel roads, and roads along stormwater drains, while BBMP continues routine civic works. Operating on the lines of MMRDA, BSMILE's mandate covers strategic, high-impact projects such as the proposed 40 km tunnel road network, large flyover packages, and landmark infrastructure aimed at decongesting the city and improving connectivity. Notably, a ₹17,780 crore, 16.7 km **twin-tunnel** project from Hebbal to Silk Board is under global tendering as part of its flagship initiatives. In addition, DPR preparation for multiple **elevated corridor** projects is currently under progress. By consolidating high-value urban mobility projects under a single entity, BSMILE is positioned to deliver faster, more efficient, and technically robust infrastructure solutions for Bengaluru's growing transport demands.

Transport in Bengaluru consists of several intracity commute modes such as BMTC buses, Namma Metro rail services, taxis and auto rickshaws, as well as several intercity forms of transport: Government operated KSRTC, NWKRTC, KKRTC, other states RTC buses, Private bus operators, trains, and flights.

As of 2023, Bangalore had close to **10 million registered vehicles**, including over **7.5 million two-wheelers**. This rapid increase has outpaced the city's capacity to manage vehicular traffic, placing enormous strain on roads and junctions. An average of **1,530**

new vehicles are registered daily at Regional Transport Offices (RTOs). The Bengaluru Metropolitan Transport Corporation (BMTC) operates **6,340 buses** across **5,766 routes**, offering around **57,667 trips daily**. Although BMTC has introduced air-conditioned and electric buses to improve service, the current fleet is inadequate to fully meet the commuting needs of the growing population, resulting in increased dependence on private vehicles. The emergence of taxi-hailing services like **Ola** and **Uber** has increased the number of vehicles on the road. In 2022, Bangalore had **over 11 million registered vehicles**, including more than **251,000 taxis** (2020 figures). While these services improved accessibility, they have also added to overall congestion. The high vehicle count has also led to **severe air pollution**, especially from **diesel and two-stroke engines**. A 2016 study revealed that **36% of diesel vehicles** exceeded permissible emission standards. As of January 2019, the city had **1.94 lakh auto-rickshaws**, including over **25,000 two-stroke vehicles**, which were flagged for contributing disproportionately to air and noise pollution.

The **Outer Ring Road (ORR) stretch from KR Puram to Silk Board Junction** is a critical urban arterial connecting major residential, commercial, and industrial zones of Bengaluru. Over the years, this corridor has experienced **rapid traffic growth**, resulting in severe congestion, especially at key intersections like Silk Board, Marathahalli, and KR Puram, where average speeds drop significantly during peak hours. The existing carriageway shows **pavement distress**, including potholes, rutting, and uneven surfaces, which reduce ride quality and cannot adequately support the increasing number of heavy vehicles. Limited **road width and discontinuous service roads** restrict lane expansion and hinder smooth access to adjoining properties. Pedestrian and non-motorized transport (NMT) facilities are inadequate, with insufficient footpaths, cycle tracks, and safe crossings, contributing to safety hazards. Junctions suffer from **poor geometric design, suboptimal signal coordination, and lack of turning provisions**, leading to frequent vehicle conflicts and queuing. Public transport stops are poorly located and designed, resulting in stoppage-related congestion. The drainage infrastructure is often insufficient, causing waterlogging during monsoon periods, while unorganized utility lines present maintenance and safety challenges. Overall, the corridor faces operational inefficiencies due to a combination of **high traffic volumes, rapid motorization, urban sprawl, inadequate infrastructure, and limited integration with public transport and NMT networks**, highlighting the urgent need for comprehensive intervention.

Bangalore is going through a big infrastructure makeover in 2025. The Karnataka government has launched B-SMILE to improve the city's roads, flyovers, and drains. This is one of the largest upgrades in recent years.

B-SMILE has taken up an ambitious plan to upgrade the arterial, sub-arterial, and major roads in the city, with comprehensive development of the carriageway. These roads are important urban corridors connecting the city center with rapidly growing residential, commercial, and industrial areas in Bangalore.

The present proposal originally initiated under BBMP is now being implemented by **BSMILE**. In line with this, **BSMILE** has appointed **M/s Infra Support Engineering Consultants Pvt. Ltd.** through letter No. **BSMILE/SE/WO/03/2025-26** dated **12th September 2025** to provide **Consultancy Services for Preparation of Comprehensive and Detailed Project Report for the work of “Development of Outer Ring Road from Silk Board Junction to Byppanahalli Metro Station to International Standards including Main Carriageway and Service Roads in Bangalore City”**.

BSMILE has envisioned preparation of DPR with main objectives as follows.

1.2 OBJECTIVE OF THE PROJECT

The objective is to prepare a comprehensive detailed design and engineering report for the development of the project roads into well-defined urban corridors that ensure safe and efficient mobility for vehicles, public transport, and non-motorized traffic (NMT). The study will evaluate existing conditions and recommend necessary improvements, additional facilities, and infrastructure based on a thorough technical, social, and economic feasibility analysis.

The work will include engineering investigations, project design, cost estimation, preparation of bid documents, and all requisite surveys for effective planning and implementation. A corridor-wise assessment of traffic conditions, intensity, movement patterns, available road infrastructure, right of way, pedestrian and bicycle (NMT) demand, traffic signaling, road geometry, topography, utilities, and projected traffic growth will be conducted. This will enable a quantitative evaluation of corridor demand and the corresponding infrastructure requirements to develop an efficient, safe, and sustainable urban road network.

1.3 SCOPE OF THE PROJECT

The scope of work includes:

- i. Detailed Topographical Survey
- ii. Road inventory and pavement condition survey
- iii. BBD/FWD and subgrade soil investigations
- iv. Traffic volume counts and Pedestrian volume counts
- v. Traffic network flow mapping and Existing Signal Timings.
- vi. Existing R-o-W mapping (building to Building) – cross section detailing & strip plan with entry exit mapping
- vii. Identification of existing utility lines on survey drawing.
- viii. Design of alignment, median, kerbs, driveway and pedestrian walk way/sidewalk,
- ix. Pavement evaluation and design of white topping
- x. Proposal for Relocation of utilities and provision for utility ducts
- xi. Road side Storm Water drains designs
- xii. Detailed design of Junctions with plan, levels, drainage, islands, marking, etc.,
- xiii. Traffic flow diagrams and recommendations on change in traffic flow (one way, two ways, no right turn, etc.,) to improve the traffic efficiency
- xiv. Proposals for change in bus stop locations, design of bus lanes, bus stops, bus bays, auto bays, etc,
- xv. Design of non-motorized traffic movements
- xvi. Proposals for pedestrian subways/skywalks
- xvii. Proposals for Grade separators
- xviii. Cost Estimation and Bill of Quantities.
- xix. Traffic diversion plan for construction purpose.
- xx. Action plan for implementation and completion of project.
- xxi. Power Point Presentation, meetings and discussions on the project at various levels
- xxii. Preparation of Technical Specifications and tender documents

1.4 PROJECT CORRIDOR

The project corridor commences at **Silk Board Junction** on Hosur Road and extends eastward along the Outer Ring Road, passing through **HSR Layout, Agara, Iblur, Bellandur, Kadubeesanahalli, Marathahalli, Mahadevapura, and KR Puram**, The total length of the corridor is approximately **17.01 km**, and the scope of work includes

Package 02 : KR Puram to Iblur Junction

improvement of major junctions along the alignment to enhance traffic flow and safety. However, though the overall project extends from **Baiyappanahalli Metro Station to Silk Board Junction**, the stretch between **Baiyappanahalli Metro Station and KR Puram** (about **2.76 km**) is taken up under **other grants or upcoming projects**. Therefore, the **current project scope is restricted to the section between KR Puram and Silk Board Junction**, covering a total length of approximately **17.01 km**.

The overall project is divided into two packages based on the jurisdictional limits of the Greater Bengaluru Authority (South and East). This report pertains to **Package 02**, which covers a total length of **11.57 km**, extending from **KR Puram to Iblur Junction**, and falls within the **GBA East Zone**.

The scope of the project with respect to length with intended project improvement proposals is briefed in the below Table.

Table 1.1: Details of Project Corridors

Sl. No	Name of the Road / Junction	Project length considered in Km
1	“Development of Outer Ring Road to International Standards including Main Carriageway and Service Roads in Bangalore City” Package 02 : KR Puram to Iblur Junction	11.57
Total length, Km		11.57 Km

A sketch indicating the alignment as per the contract agreement is shown below:

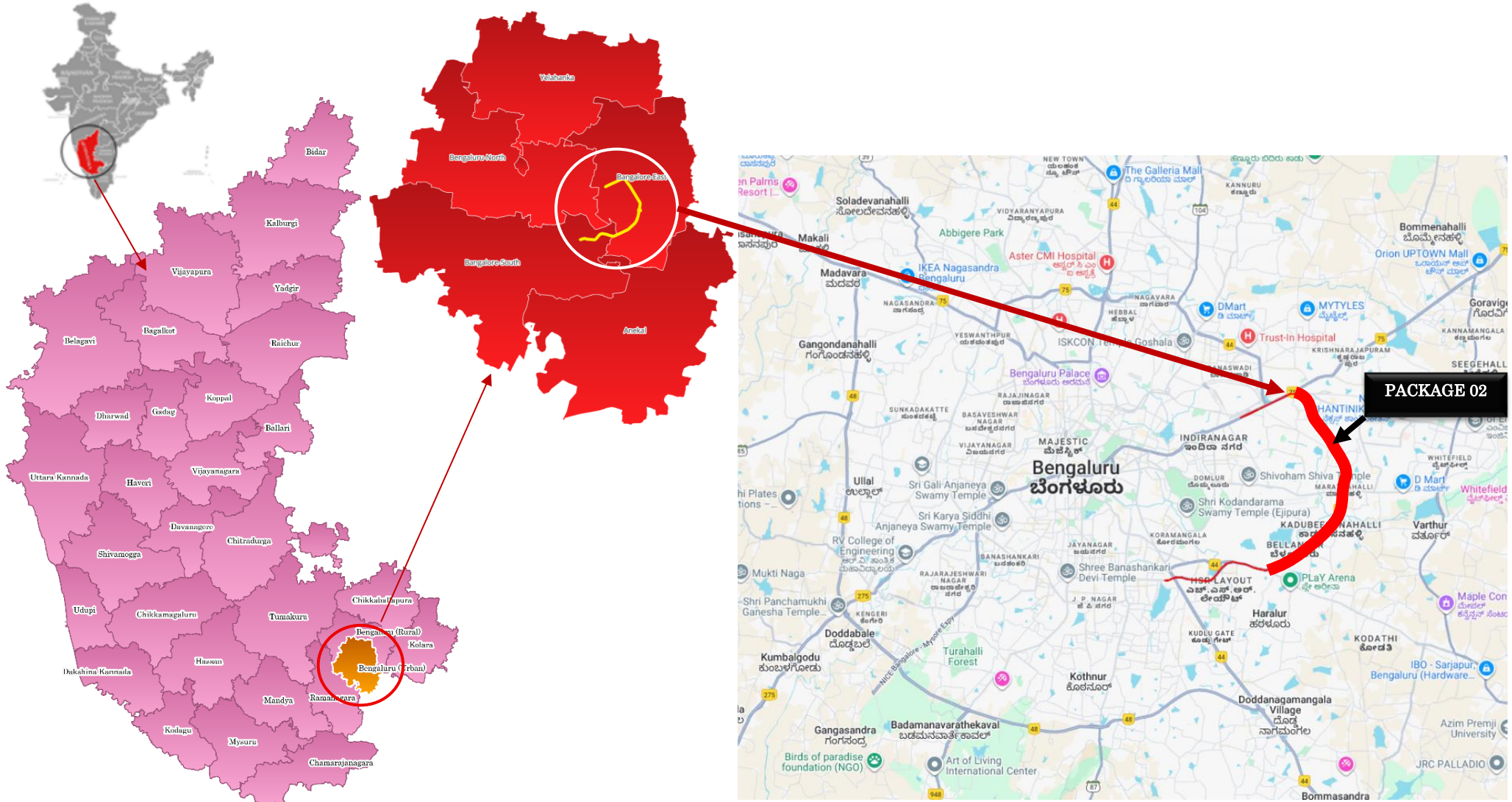


Figure 1.1 Location Map of Project

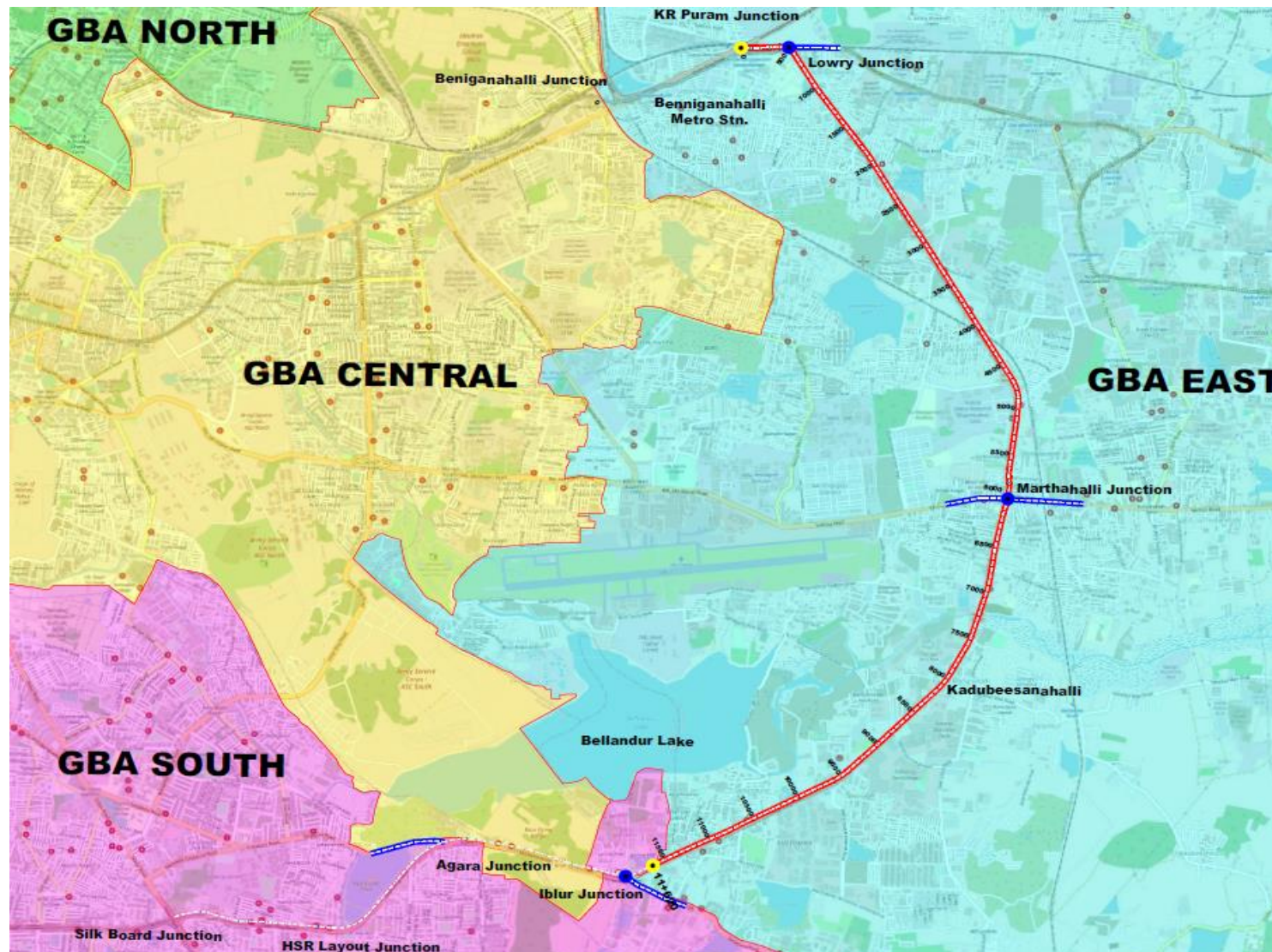


Figure 1.2 Key Plan showing the Alignment.

1.5 NEED FOR THE PROJECT

The Outer Ring Road (ORR) stretch from Silk Board to KR Puram in Bengaluru is a crucial corridor that needs sustainable improvement to facilitate movement of passenger traffic, goods traffic and pedestrians. Since all along the project corridor is surrounded by

1. Residential areas viz, Apartments, Housing Societies, Colonies and Gated Communities including multi-story apartment complexes and older, low-rise residential areas. In particular, areas like Krishna Reddy Layout, Whitefield, and Marathahalli have witnessed rapid growth in residential housing. Also, Various residential colonies and gated communities can be found, attracting professionals working in the IT sector and other industries around the Whitefield and ITPL areas This contributes to the increasing population density in the region.
2. Commercial and Office Spaces including **IT Hubs and Tech Parks**: The corridor between **KR Puram and Silk Board Junction** passes through several of Bengaluru’s prominent **IT hubs** and **technology parks**, making it a major employment and commercial zone. Key developments along this stretch include **RMZ Ecospace, RMZ Ecoworld, Embassy Tech Village, Prestige Tech Park, Cessna Business Park, Global Technology Park**, and other corporate campuses. These IT hubs and office spaces generate substantial commuter traffic during peak hours.

Retail and Shopping Centers: In addition to office spaces, the corridor is lined with commercial establishments, retail outlets, restaurants, and shopping malls, particularly near key junctions such as **KR Puram, Marathahalli, and Baiyappanahalli**, serving both daily commuters and local residents. This mix of IT and commercial activities contributes to high traffic density along the corridor, emphasizing the need for comprehensive traffic management and roadway improvements.

3. **Commercial-Residential Mix**: Areas like **KR Puram**, parts of **Old Madras Road, BTM Layout, Koramangala**, and **Jayanagar** have mixed land use, where ground floors of buildings are used for commercial purposes such as retail shops, offices, and workshops, while the upper floors are primarily residential.
4. **Transit-Oriented Development (TOD)**: The proximity to metro stations and major bus terminals has led to transit-oriented development. Since the entire length of the project corridor will be connected with metro line, where commercial, residential, and office spaces are developed around metro stations to improve

accessibility and reduce dependency on private vehicles. This has led to a rise in mixed-use developments, with increasing residential and commercial projects in the vicinity.

5. **Small-Scale Industries and Warehousing:** Parts of the stretch, especially closer to **KR Puram** and **Bommanahalli**, have industrial land use, with warehouses, workshops, and small-scale industries involved in manufacturing and trade.
6. **Logistics and Distribution Hubs:** With the growing demand for e-commerce, some portions of this stretch are used for logistics, storage, and distribution centers.
7. **Educational Institutions:** Several schools and educational institutions are located along this stretch, including both government and private institutions.
8. **Religious Places:** Temples, mosques, and churches are also scattered along the route, contributing to the cultural and social fabric of the area.
9. **Healthcare Facilities:** Hospitals, clinics, and health centers serve the growing population, including **Sri Sathya Sai General Hospital and Sakra Premium Clinic**.

In spite of the exponential development of the region in various aspects, this segment has been plagued by severe traffic congestion, leading to significant economic and social challenges warranting for sustainable Traffic and Pedestrian friendly infrastructure along the project stretch.

Key Issues Necessitating Improvement:

The Outer Ring Road (ORR) corridor from Silk Board Junction to KR Puram faces multiple challenges that severely compromise mobility, safety, and overall urban functionality.

Severe Traffic Congestion: This corridor houses a significant concentration of IT companies, leading to a massive daily influx of commuters. ORR experiences heavy traffic not only during peak hours but also late into the night. Motorists often endure prolonged delays, with travel times reaching up to 60 minutes to cover a 13 km stretch between Silk Board and Marathahalli post 11 PM. During daytime peak hours, this duration can extend to 90 minutes. Key junctions like **Silk Board and KR Puram** act as complicated bottlenecks, where multiple arterial roads converge, causing frequent gridlocks.

Infrastructure Limitations: The existing road infrastructure struggles to accommodate escalating traffic volumes, leading to severe bottlenecks. The Silk Board Junction is one

of the most congested intersections in the country, with vehicle speeds dropping to as low as **4.5 km/h during peak times**. Moreover, ongoing construction of the Metro line along ORR has further reduced carriageway capacity, aggravating traffic delays.

Traffic Volume vs. Capacity: Originally designed for a capacity of about **5,400 Passenger Car Units (PCUs)**, ORR today carries volumes far exceeding this threshold due to rapid urbanization and the concentration of IT and commercial establishments. Vehicle queues at traffic signals routinely extend up to **150 meters** during peak hours, underscoring the inadequacy of current road capacity.

Economic Implications: Persistent traffic snarls result in increased fuel consumption, longer commute times, and reduced productivity. Given that **over 40% of Karnataka's taxpayers are located along this corridor**, the inefficiency of ORR directly impacts the state's economic engine. Efficient connectivity here is critical for sustaining Bengaluru's growth and maintaining investor confidence.

Non-Motorized and Pedestrian Infrastructure Deficiency: The corridor hosts numerous **commercial, residential, and corporate hubs**, yet lacks adequate pedestrian facilities. Continuous, safe, and accessible footpaths are urgently needed. Further, the introduction of **dedicated cycle tracks** would promote sustainable mobility, reduce dependency on private vehicles, and improve first- and last-mile connectivity to public transport nodes.

Drainage and Flooding Issues: Even moderate rainfall results in waterlogging along ORR, making the corridor appear flooded and causing serious traffic disruption. This highlights the urgent need for **upgraded stormwater drainage infrastructure** integrated with road improvements.

Environmental Concerns: Prolonged congestion leads to higher vehicular emissions, worsening Bengaluru's air quality and posing health risks to commuters and residents.

Ongoing and Proposed Improvement Measures:

Metro Expansion: The construction of the Silk Board to KR Puram Metro Line, part of Namma Metro's Phase 2A expansion, is underway. This 18.236 km elevated line, featuring 13 stations, aims to provide a reliable alternative to road travel and is expected to alleviate congestion upon its anticipated completion in 2025.

Traffic Management Initiatives: Authorities are collaborating with private firms to manage traffic more effectively. For instance, the Outer Ring Road Companies'

Association (ORRCA) has initiated a clean-up drive along the ORR stretch between KR Puram and Silk Board to support traffic police in managing heavy congestion.

Improving the ORR from KR Puram to Silk Board is imperative to enhance economic productivity, reduce environmental pollution, and improve the quality of life for Bengaluru's residents. The successful implementation of these measures requires coordinated efforts from government agencies, private sectors, and the public.

1.6 STUDY METHODOLOGY

The methodology for carrying out the assignment is an important aspect. The Study methodology has been developed based on the project TOR requirements. The study has three stages, which are presented in **Figure 1.3**.

Stages of the Study

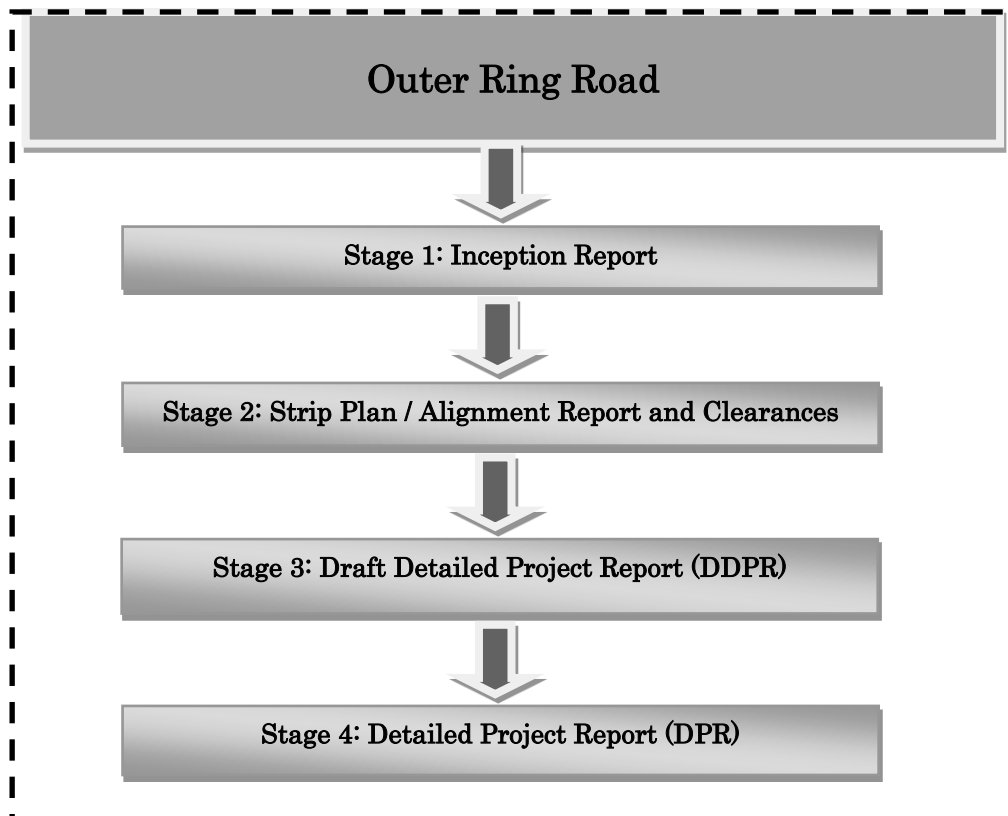


Figure 1.3 Stages of the Study

The following methodology is adopted for the completion of stages. The detailed proposed methodology was discussed and submitted in the inception report. However, an overview of the proposed methodology is as represented in flowchart and shown in Figure 1.4.

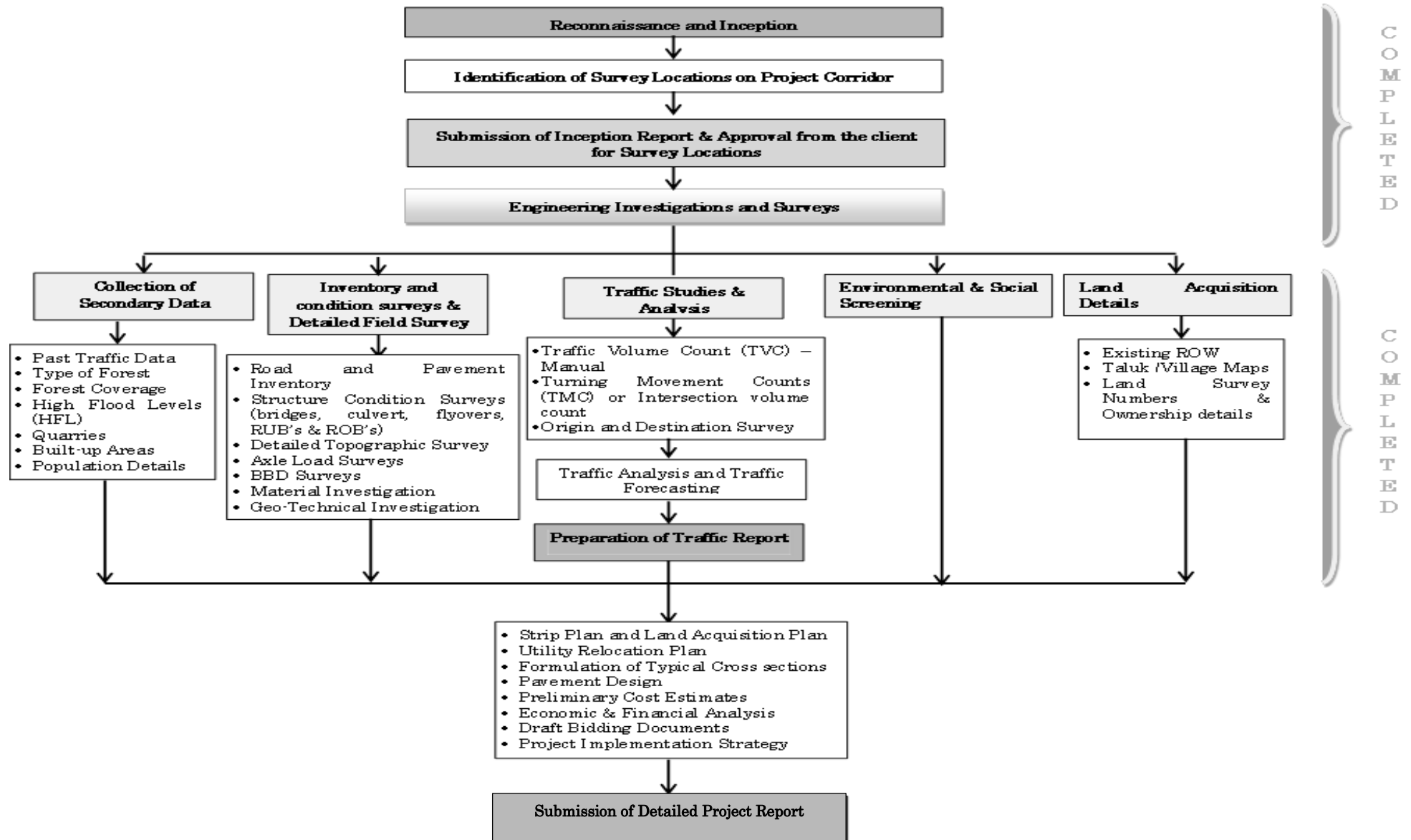


Figure 1.4 Proposed Methodology

1.7 DETAILED PROJECT REPORT

The Detailed Project Report (DPR) will consolidate the findings of all surveys and investigations, along with preliminary designs, cost estimates, and related analyses, to provide a comprehensive reference for subsequent stages of detailed engineering and tender documentation. The DPR will also outline the proposed project implementation strategy, construction timelines, and procurement methodology, including recommendations for suitable contract packaging.

As part of the DPR, preliminary engineering designs will be developed for all aspects of the project in accordance with relevant Indian design codes, and international standards will be adopted where applicable. The preliminary engineering drawings will cover horizontal and vertical geometry, alignment, and other essential geometric features of the corridor. Drainage and utility proposals will be integrated with existing infrastructure to ensure seamless functionality.

Accordingly, the Detailed Project Report (DPR) has been structured into following Three volumes:

- **Volume-I: Main Report,**
- **Volume-II: Cost Estimates,**
- **Volume-III: Drawings.**

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CHAPTER 2. SURVEYS AND INVESTIGATIONS

2.1 GENERAL

This chapter deals with various surveys and Investigations carried out as per the Terms of Reference and required for quality compliance of the Project design and report preparation.

Major surveys and Investigations carried out are as follows:

- Road Inventory
- Topographical Survey
- Pavement condition survey
- Traffic Survey
- FWD Studies

2.2 INVENTORY, CONDITION SURVEY AND ANALYSIS

As per ToR, Road Inventory and Bridges / Flyover structures / CD structures inventory surveys have been conducted. Surveys are conducted as per the standard methodology / IRC guidelines. However brief methodology is given below:

As per the ToR consultants have to propose improvement proposals for the existing roads together along the project corridors. Hence, the road and bridge inventory and condition surveys were conducted accordingly.

The road inventory survey involves making visual estimates and actual measurements of geometric and cross-sectional elements of the road and its deficiencies. This survey involves the collection of the data pertaining to the existing road such as the width of the road, type of the shoulder and its width, type of terrain, longitudinal and vertical curves, number of CD structures, retaining walls, available land widths, nearby water bodies if any, number of trees, utility services etc. Road inventory has been recorded in a standard format.

The team has travelled and walked along the alignments and adjacent roads collected first-hand information on the width and type of carriage way, length between consecutive junctions, traffic intensity, width of footpath cum drain and relevant details of Grade separators, Metro Rail crossings and skywalks comprising in the proposed corridor are noted.

2.2.1 Road Inventory

As per ToR, Road Inventory and Bridges / Flyover structures / CD structures inventory surveys have been conducted. Surveys are conducted as per the standard methodology / IRC guidelines. However brief methodology is given below:

As per the ToR consultants have to propose improvement proposals for the existing roads together with Elevated corridors along the project corridors. Hence, the road and bridge inventory and condition surveys were conducted accordingly.

The road inventory survey involves making visual estimates and actual measurements of geometric and cross-sectional elements of the road and its deficiencies. This survey involves the collection of the data pertaining to the existing road such as the width of the road, type of the shoulder and its width, type of terrain, longitudinal and vertical curves, number of CD structures, retaining walls, available land widths, nearby water bodies if any, number of trees, utility services etc. Road inventory has been recorded in a standard format.

The team has travelled and walked along the alignments and adjacent roads collected first-hand information on the width and type of carriage way, length between consecutive junctions, traffic intensity, width of footpath cum drain and relevant details of Grade separators, Metro Rail crossings and skywalks comprising in the proposed elevated corridor are noted.

The salient physical features of the project corridor are as under:

2.2.1.1 Terrain

The project corridor traverses a predominantly urban built-up area within the Bengaluru Urban district. The alignment passes through relatively flat terrain with slight undulations in elevation, typical of metropolitan topography.

The terrain is characterized by dense development, limited right of way, high traffic volumes, and the presence of critical infrastructure such as railway lines, arterial roads, commercial hubs, and institutional zones. Since the project lies within a major city, there are no natural valleys, hills, or bypasses like in rural alignments. Instead, the project navigates congested junctions and high-density corridors.

2.2.1.2 Right of way

The Right of way details for the project road is taken by measuring drain to drain or footpath outer edge at regular intervals, RoW vary from 37 m to 48 m.

Table 2.1 : Right of Way along the Project Corridor

Sl No.	Chainage		Length, m	ROW
	From	To		
1	0+000	0+200	200	42.00
2	0+200	0+340	140	38.00
3	0+340	0+460	120	35.30
4	0+460	0+800	340	47.40
5	0+800	1+300	500	46.00
6	1+300	1+430	130	44.00
7	1+430	1+480	50	42.90
8	1+480	2+020	540	48.20
9	2+020	2+350	330	47.70
10	2+350	2+490	140	48.50
11	2+490	2+900	410	47.00
12	2+900	3+600	700	48.00
13	3+600	3+760	160	45.00
14	3+760	4+160	400	38.80
15	4+160	4+500	340	42.80
16	4+500	4+640	140	39.00
17	4+640	5+200	560	45.20
18	5+200	5+650	450	46.50
19	5+650	5+740	90	37.20
20	5+740	5+950	210	45.10
21	5+950	6+000	50	38.00

Sl No.	Chainage		Length, m	ROW
	From	To		
22	6+000	6+250	250	46.80
23	6+250	6+500	250	47.70
24	6+500	7+000	500	47.70
25	7+000	7+200	200	47.10
26	7+200	7+230	30	47.10
27	7+230	7+350	120	44.30
28	7+350	7+720	370	47.70
29	7+720	8+300	580	47.50
30	8+300	8+800	500	48.50
31	8+800	9+090	290	50.10
32	9+090	9+250	160	43.70
33	9+250	9+880	630	51.90
34	9+880	10+000	120	54.70
35	10+000	10+140	140	43.90
36	10+140	10+180	40	46.20
37	10+180	10+840	660	48.50
38	10+840	11+190	350	42.50
39	11+190	11+490	300	45.60
40	11+490	11+570	80	45.60
Total length, m			11570	

2.2.1.3 Land Use

The proposed alignment passes through a dense urban corridor with mixed land use, including high-density residential areas, commercial zones, major institutional establishments and recreational spaces

2.2.1.4 Carriageway and Shoulders

Measurements were taken at locations where the cross-section changes w.r.t Types and widths of Main Carriageway, Service Roads, Footpath, Median, and Drains from beginning to end of the project roads. Along with carriageway measurements and median as a part of inventory survey. The carriageway varies from Four Lane divided carriageway to Six Lane divided carriageway. The Carriageway details for the Project Corridor is given below.

Table 2.2 : Carriageway Details for Project Corridor.

Sl No.	Chainage			LHS				Median	RHS				Remarks
	From	To	Length, m	Footpath width, m	Service road width, m	Median	Main carriage way width, m		Main carriage way width, m	Median width, m	Service road width, m	Footpath width, m	
1	0+000	0+200	200	0	0	0	15	0.5	14.5	0	0	0	Metro station
2	0+200	0+340	140	0	0	0	15	0.6	15	0	0	0	-
3	0+340	0+460	120	0	6	0	10	0	12	1.3	6	0	Flyover
4	0+460	0+800	340	3.5	8	0	10	0	12	1.3	7	2.8	Flyover
5	0+800	1+300	500	3.5	8	0.6	9	2	12	0.9	7	3	-
6	1+300	1+430	130	0	0	0	10.3	2	12	0	7	0	Metro station
7	1+430	1+480	50	1.5	7	0.8	10.3	2	12	0.8	7	1.5	-
8	1+480	2+020	540	1.5	7	0	10.3	0	12	0	7	2.5	Flyover
9	2+020	2+350	330	1.2	7.6	1.3	13.6	2	12	1	7	2	-
10	2+350	2+490	140	1.2	7.5	0	12	2	11	0	7	4.8	Metro station
11	2+490	2+900	410	4.8	7.2	1	12	2	12	1	7	0	-
12	2+900	3+600	700	0	7	0	12	0	12	0	7	0	Flyover
13	3+600	3+760	160	0	8	0	12	2	12	0	7	1	Metro station
14	3+760	4+160	400	1	8	1.8	12	2	12	2	0	0	-
15	4+160	4+580	420	1	8	1.8	12	2	12	2	4	0	-
16	4+580	4+640	60	2	6.5	0	10	2	12	0	3.5	0	Metro station
17	4+640	5+200	560	1	7	1.2	12	2	11	1	7	3	-

Sl No.	Chainage			LHS				Median	RHS				Remarks
	From	To	Length, m	Footpath width, m	Service road width, m	Median	Main carriage way width, m		Main carriage way width, m	Median width, m	Service road width, m	Footpath width, m	
18	5+200	5+650	450	1	7.5	1.2	13	2	12	0.8	7	2	-
19	5+650	5+740	90	0	0	1.2	13	2	12	0.8	7	1.2	-
20	5+740	5+950	210	2	5	0	13	2	11.8	0	8	0.3	Metro station
21	5+950	6+000	50	0	8	1	12	0	12	0	0	0	-
22	6+000	6+250	250	0	7.5	1	13	2	11.8	1	7.5	3	-
23	6+250	6+500	250	2	7.5	1	13	2	12	1	8	1.2	-
24	6+500	7+000	500	3	7.5	1	12	2	12	1	8	1.2	-
25	7+000	7+200	200	2	7	1	12	2	12.5	1	8	1.6	-
26	7+200	7+230	30	2	7	1	12	2	12.5	1	8	1.6	-
27	7+230	7+350	120	0	7.5	0	12	2	11.5	0	8	0.3	Metro station
28	7+350	7+720	370	5	8	1	11	2	11	1	7.5	1.2	-
29	7+720	8+300	580	3	7.5	1	12	2	11	1	7.5	2.5	-
30	8+300	8+800	500	4	6.5	1	12.5	2	12	1	7	2.5	-
31	8+800	9+090	290	4	7	1	12	2	14.6	1	6	2.5	-
32	9+090	9+250	160	0	7	0	12	2	12	0	6	1.7	Metro station
33	9+250	9+880	630	2.5	8	0	12	0	12	0	7	3	Flyover
34	9+880	10+000	120	4	9	1.2	13.5	2	15	1	7	2	-
35	10+000	10+140	140	0.6	10	2	11.4	2	9.6	0	6.5	0.8	Metro station
36	10+140	10+180	40	2.5	10	1.2	11.4	2	9.6	1	6.5	2	-

Sl No.	Chainage			LHS				Median	RHS				Remarks
	From	To	Length, m	Footpath width, m	Service road width, m	Median	Main carriage way width, m		Main carriage way width, m	Median width, m	Service road width, m	Footpath width, m	
37	10+180	10+840	660	4.5	6.3	0	10.7	0	10.8	0	6.5	2	Flyover
38	10+840	11+190	350	1.2	6	1	11.2	2	11.3	1	6.8	2	-
39	11+190	11+490	300	2.5	7	1	11.2	2	11.3	1	7	2.6	-
40	11+490	11+570	80	2.5	7	1	11.2	2	11.3	1	7	2.6	-
Total length, m			11.57										

2.2.1.5 Road Drainage

The project road has drain all along the corridor except at some locations where drain is missing. It was found that the existing drain is of RCC / masonry type and the drains are provided with gratings, at some location's drains are filled with silt and also condition of drain is bad at some locations.

Table 2.3 : Drain Details along Project Corridor

Chainage		Length,m	Drain details			
			LHS		RHS	
From	To		Drain at Service Road	Drain b/w Service Road & MCW	Drain b/w Service Road & MCW	Drain at Service Road
0+000	0+200	200			1.3	
0+200	0+340	140				
0+340	0+460	120			1.3	
0+460	0+800	340	1.6		1.3	1.2
0+800	1+300	500	1.6	1.4	1	
1+300	1+430	130	0			
1+430	1+480	50	0.9	1	1	1
1+480	2+020	540	0	0.9	1	
2+020	2+350	330	1.2	1	1.2	
2+350	2+490	140	1.8			1.2
2+490	2+900	410		1.2	1.1	
2+900	3+600	700	1.2			1.3
3+600	3+760	160	1.2			1.2
3+760	4+160	400		1.3	1	
4+160	4+580	420		1.3	1	1
4+580	4+640	60			1	
4+640	5+200	560		1.2	1.5	
5+200	5+650	450	0.9	1.2	1.2	1
5+650	5+740	90		1.2	1.2	1
5+740	5+950	210				1.2
5+950	6+000	50	1	1.2	1.2	
6+000	6+250	250	1	1.2	1.2	
6+250	6+500	250	1	1.2	1.2	
6+500	7+000	500		1	1	
7+000	7+200	200		1	1.5	
7+200	7+230	30		1	1.5	
7+230	7+350	120				1.2
7+350	7+720	370		1.2	1.2	
7+720	8+300	580		1.2	1.2	1.2
8+300	8+800	500		1	1.2	
8+800	9+090	290		1	1.2	

Chainage		Length,m	Drain details			
			LHS		RHS	
From	To		Drain at Service Road	Drain b/w Service Road & MCW	Drain b/w Service Road & MCW	Drain at Service Road
9+090	9+250	160				1.3
9+250	9+880	630		1.2	1.2	
9+880	10+000	120		1	1.2	
10+000	10+140	140	1.2	1.2	2	1.2
10+140	10+180	40		1	1.3	
10+180	10+840	660		1.2	1.2	
10+840	11+190	350		1	1	
11+190	11+490	300		1	1	
11+490	11+570	80	1	1	1	
Total length		11570				

2.2.1.6 Footpath

At some locations drain cum footpath is provided where land availability is limited, where sufficient land is available footpaths are provided separately.

2.2.1.7 Road Junctions

The proposed project alignment intersects several major road junctions along its route. These junctions are critical nodes in the city's traffic network, often experiencing high traffic volumes and congestion, particularly during peak hours. Significant transport benefits, across all modes, can be achieved through junction improvement and management. These improvements will aid free flow of Traffic to and from crossroads, thereby reducing travel time of through traffic. Total number of 07 Major junctions identified during inventory, which requires specific measures to develop individual improvement proposals feasible for each junction. As part of the Detailed Project Report (DPR) preparation, key junctions along the corridor have been identified to improve traffic flow, ensure safety, and minimize conflicts between local and through traffic. The following is a list of major junctions along the proposed corridor.

Table 2.4 : List of Intersections along Project Corridor

Sl.No	Chainage	Type of Junction	Side	Remarks
1	0+500	Y	Both	Lowry Junction
2	2+750	+	Both	K R Puram
3	6+100	+	Both	Marathalli Junction

From the inventory, it is found that there are 23 minor junctions and 3 Major junctions.

All these junctions are affected with extremely high traffic volume, inadequate infrastructure, existence of Traffic Bottle necks, lack of lane discipline in turning movements & weaving traffic movement, and impact of Ongoing Construction activities. Addressing these issues requires a multi-pronged approach involving infrastructure improvements, traffic management strategies, and public transportation enhancements. Sustainable solution for these problems requires a comprehensive strategy that spans short, medium, and long-term solutions. However, the project improvement proposals include only short-term improvement measures.

2.2.1.8 Bus Bays and Bus Shelters

The Details of existing Bus Bay / Shelter / Stops are shown in the below tables which are available on the site:

Table 2.5 : List of Bus Bay / Shelter / Stops

Sl. No	Chainage	Side	Remarks
1	0+980	RHS	B. Narayana Pura
2	1+055	LHS	B. Narayana Pura
3	2+065	LHS	Mahadevapura
4	2+080	RHS	Mahadevapura
5	2+700	LHS	emc2, Laxmi Sagar Layout
6	2+720	RHS	emc2, Laxmi Sagar Layout
7	4+680	LHS	Karthik Nagar
8	4+730	RHS	Karthik Nagar
9	5+250	LHS	Marathahalli Bridge, Anand Nagar
10	5+465	RHS	Marathhalli Bridge, Aswath Nagar
11	5+500	LHS	Marathhalli Bridge, Aswath Nagar
12	6+260	RHS	Chandra Layout, Marathahalli
13	6+445	LHS	Multiplex, Chandra Layout, Marathahalli
14	6+600	RHS	Innovative Multiplex, Marathahalli Village
15	7+525	RHS	Kadabisanahalli
16	7+536	LHS	Kadabisanahalli
17	8+605	LHS	New Horizon College, Kaverappa Layout
18	8+655	RHS	New Horizon College, Kaverappa Layout
19	8+980	LHS	JP Morgan ETV Tower, Embassy Tech Village Rd, Devarabisanahalli

Sl. No	Chainage	Side	Remarks
20	9+040	RHS	JP Morgan ETV Tower, Embassy Tech Village Rd, Devarabisanahalli
21	9+950	LHS	Eco Space, Kariyammanna Agrahara
22	9+970	RHS	Eco Space, Kariyammanna Agrahara
23	10+890	RHS	Bellandur Gate, Bellandur
24	10+975	LHS	Bellandur
25	11+300	RHS	Bellandur Petrol Bunk, Green Glen Layout
26	11+300	LHS	Bellandur Petrol Bunk, Green Glen Layout
27	11+490	LHS	Sarjapura Signal, Bellandur

2.2.1.9 Location of Water bodies

A list of water bodies (Lakes) noticed along the project corridor, is summarized in **Table 2.7** below.

Table 2.6 : Details of Lakes along Project Corridor

Sl No	Design Chainage		Length	Type	Remarks
	From	To			
1	1+380	1+510	130	Lake	RHS - Narayanapura Lake
2	1+625	1+675	50	Lake	LHS - Mahadevapura Lake
3	2+250	2+300	50	Lake	LHS - Mahadevapura Lake
4	11+550	11+570	20	Lake	RHS - Iblur Lake

2.2.1.10 Location of Metro Stations

The Details of Metro Stations which are being constructed along the corridor are shown in the below table:

Table 2.7 : List of Metro Stations

Sl No.	Station	From	To
1	KR Puram metro	0+000	0+200
2	Sarswathinagar	1+300	1+430
3	DRDO	2+350	2+490
4	Doddnekundi	3+600	3+760
5	ISRO	4+580	4+640
6	Marathalli	5+740	5+950

Sl No.	Station	From	To
7	Kodibisanahalli	7+230	7+350
8	Kadubeesanahalli	9+090	9+250
9	Bellandur	10+000	10+140

2.2.2 Pavement Condition Survey

The survey regarding road inventory and pavement condition was carried out along the project corridor. The width of the carriageway along the project road varies from Three Lane divided carriageway to Six Lane divided carriageway. Visual inspection of the road showed a generally Fair surface condition.

The condition of the pavement has been evaluated based on the field measurements of primary pavement surface distress of cracking (narrow and wide), patching, raveling and potholes, noted for each kilometer length. The extent of each distress has been visually estimated for every kilometer length of the road in terms of percentage area affected and then averaged for one-kilometer road length.

The distress conditions are measured under the following sub-heads:

- Cracking (%)
- Potholes (%)
- Raveling (%)
- Patching (%)
- Settlement & Upheaval (%)

2.2.2.1 Cracks

Pavement cracking is a typical failure commonly observed in flexible / bituminous pavements occurring predominantly due to the higher number of repetitions of heavier axle loads.

2.2.2.2 Patching

Patching is the process of removing and replacing small, localized areas of deteriorated pavement such as potholes, cracks, or failed spots with new material. It is a corrective maintenance activity, performed after visible damage has occurred, rather than a preventive one. The main purpose of patching is to restore the structural integrity of the pavement, eliminate safety hazards like potholes, improve ride quality, prevent water infiltration, and extend the pavement's service life before major rehabilitation becomes necessary.

2.2.2.3 Ravelling

Disintegration of the pavement surface caused due to failure of binder to hold the material together causing blowing off of fine aggregates leaving behind pock marks and when larger particles are broken free with stripping of aggregates is termed as Raveling.

2.2.2.4 Potholes

Potholes are bowl-shaped holes of varying sizes in the surface layer extending into the base course. Potholes are mainly formed due of loose base course or base course not covered properly with wearing course or due to inadequate bonding between base course and subsequent top layers.

2.2.2.5 Rutting

Rutting is a surface depression in the wheel path. Pavement uplift (shearing) may occur along the sides of the rut. Ruts are particularly evident after a rain when they are filled with water. There are two basic types of rutting: mix rutting and subgrade rutting. Mix rutting occurs when the subgrade does not rut yet the pavement surface exhibits wheel path depressions as a result of compaction/mix design problems. Subgrade rutting occurs when the subgrade exhibits wheel path depressions due to loading. In this case, the pavement settles into the subgrade ruts causing surface depressions in the wheel path.

2.2.2.6 Summary of Observations on Pavement Condition

The overall condition of the pavement is in fair to Good condition with around 82.84% and 71.60% for Main carriageway and Service Road respectively. The percentage various of distresses for project road is shown below.

Table 2.8 : Summary of Pavement Condition

Road name	Potholes	Cracks	Patching	Reavelling / Weathering	Settlement & Upheaval	Edge Break	Rut	Bleeding	Good condition
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Main carriageway (LHS)	3.91	4.97	5.21	4.24	0.00	0.00	0.00	0.00	81.68
Main carriageway (RHS)	4.03	4.39	4.52	3.06	0.00	0.00	0.00	0.00	84.00
Service Road (LHS)	6.83	7.30	7.21	7.97	0.00	0.00	0.00	0.00	70.68

Road name	Potholes	Cracks	Patching	Reavelling / Weathering	Settlement & Upheaval	Edge Break	Rut	Bleeding	Good condition
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Service Road (RHS)	5.49	7.89	6.61	5.06	2.00	0.00	0.43	0.00	72.52

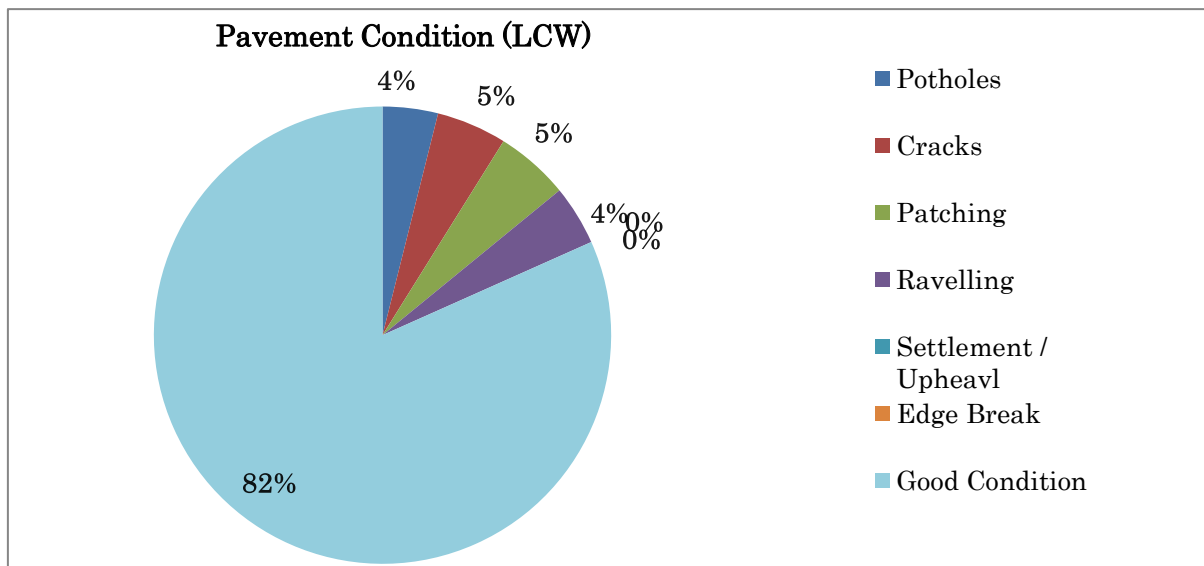


Figure 2.1 Summary of existing Pavement condition of MCW (LCW)

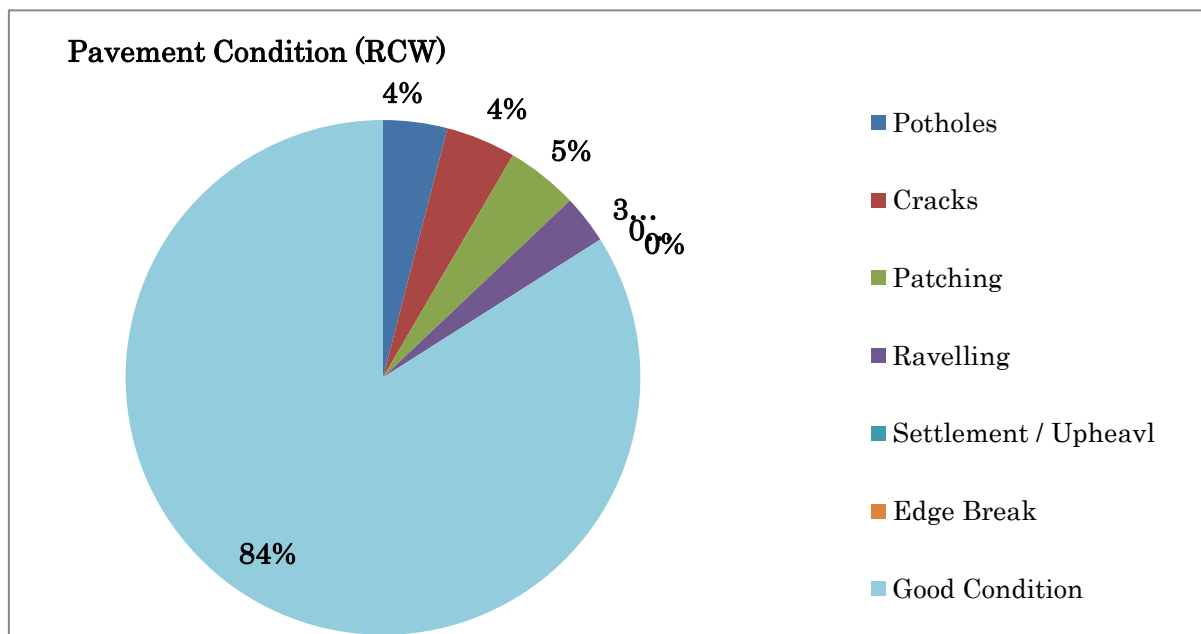


Figure 2.2 Summary of existing Pavement condition of MCW (RCW)

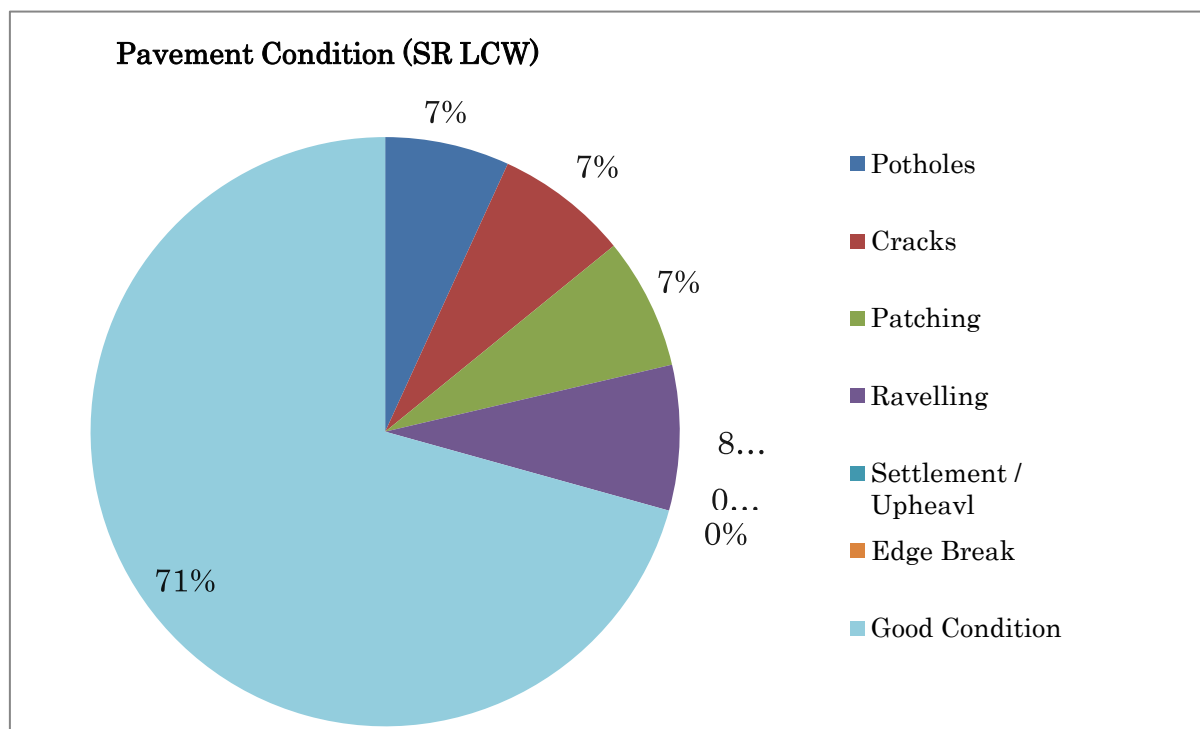


Figure 2.3 Summary of existing Pavement condition of SR (LCW)

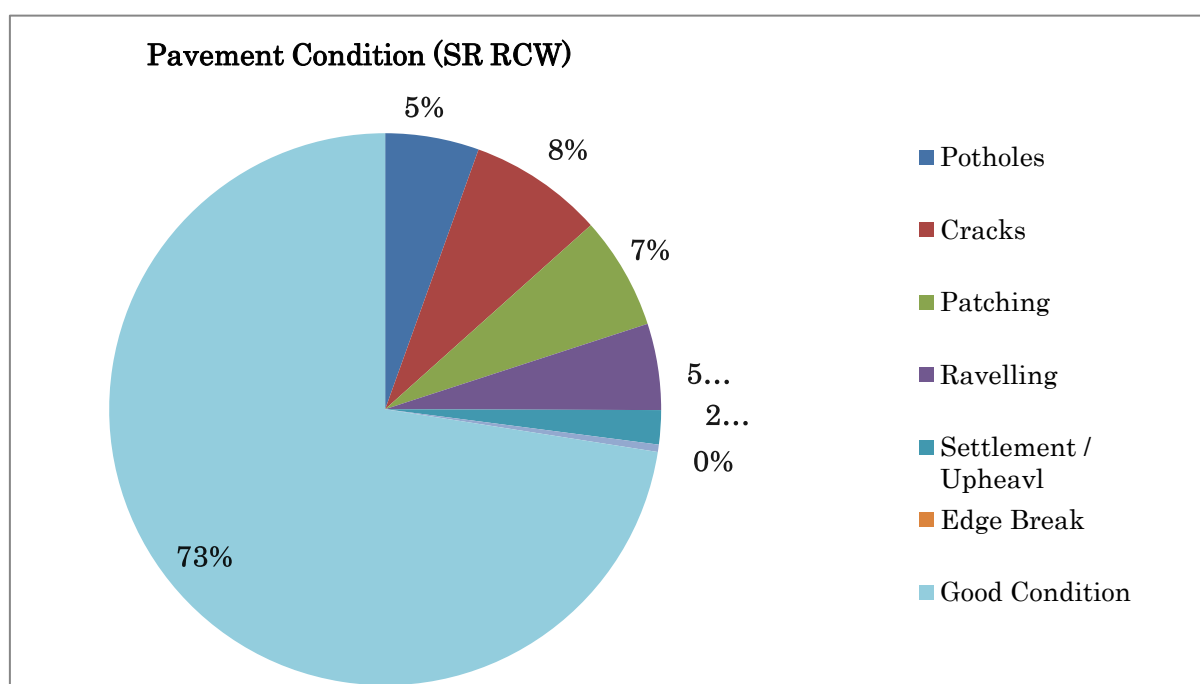


Figure 2.4 Summary of existing Pavement condition of SR (RCW)

2.2.3 Existing Pavement Structure

The bituminous layers contribute the major part of the strength of the flexible pavement structure. Hence pavement investigation is carried out to know the Existing Bituminous Thickness without disturbing the surrounding area of test pit, the existing bituminous layer thickness is measured by cutting a bituminous core cutting equipment. The core samples are taken along the corridor. The photographs taken during core cutting in project stretch are given in following paragraphs.

Table 2.9 : Bituminous Crust Thickness by Core Cutter

Sl. No	Chainage	Side	Pavement Crust Thickness in (mm)
			Bituminous Layer
Main Carriageway (Silk Board to KR Puram)			
1	0+700	RHS	235
2	3+000	RHS	185
3	4+800	LHS	165
4	8+700	LHS	300
Service Road			
5	4+800	LHS	225
6	9+000	LHS	200

2.2.4 Inventory of Existing structures details

The Inventory of all the structures (Bridges, Viaducts, ROB's/RUB and other grade separate structures, culverts, etc.) are carried out and all the details presented in a tabular form below.

Summary of Existing Structures

Sl No	Components	Unit	Total
1	Flyover Only on LHS	No	1
2	Flyover on BHS	No	4
3	Under Pass	No	2
4	RUB	No	1
5	Metro Station (under Construction)	No	9
6	FOB	No	8

Details of Existing Grade Separators

The Outer Ring Road (ORR) corridor from Silk Board Junction to Byappanahalli Metro Station currently accommodates several existing structures that facilitate traffic and pedestrian movement. These include Vehicular Underpasses (VUPs), Vehicular Overpasses (VOPs), and Foot Overbridges (FOBs) located at major intersections and strategic points along the corridor. These facilities are part of the present infrastructure and have been developed to ease traffic flow and enhance pedestrian safety. A detailed inventory of these existing structures along the alignment has been prepared and is presented in the following table.

Table 2.10 : Existing Structures along Project Road

SL. No	Chainage Design	Type of Structure
1	0+000	Hanging Bridge
2	0+500	LHS Flyover
3	1+480	Cross Culvert Drain
4	1+600	Flyover
5	2+300	Cross Culvert Drain
6	2+500	Cross Culvert Drain
7	3+000	Flyover
8	3+200	RHS Drain Divrting Doddanekundi City Road Drain.
9	3+500	Cross Culvert Drain
10	3+800	Cross Culvert Drain
11	4+050	Railway Under Bridge
12	5+925	Underpass
13	7+175	Cross Culvert Drain
14	7+350	Cross Culvert Drain
15	7+975	Underpass
16	9+900	Culvert
17	10+160	Culvert
18	10+200	Flyover

Foot Over Bridges (FOB's)

Table 2.11 : Existing FOB's along Project Road

Sl No	Design Chainage	Location
1	0+050	KR Puram
2	5+550	Marathhalli Bridge, Aswath Nagar
3	6+550	Innovative Multiplex, Marathahalli Village
4	7+600	Kadabisanahalli
5	8+700	New Horizon College, Kaverappa Layout
6	9+950	Eco Space, Kariyammana Agrahara
7	10+850	Bellandur Gate, Bellandur
8	11+250	Bellandur Petrol Bunk, Green Glen Layout

2.2.5 Utility Survey

A comprehensive utility survey is a critical component of urban infrastructure projects, ensuring effective project planning, coordinated execution, and minimizing disruption to existing utility services during construction. For Project Corridor, detailed utility information was obtained through formal correspondence with relevant utility agencies, including the Bangalore Water Supply and Sewerage Board (BWSSB), BESCOM, Karnataka Urban Water Supply & Drainage Board (KUWSDB), Minor Irrigation Department, GAIL Gas Limited, Optical Fibre Cable (OFC) service providers, and BMRCL Utility departments.

Following the receipt of utility data from these agencies, at required locations field surveys were conducted with corresponding officials to verify and supplement the collected information. During the field inventory and from the departments, all utilities including water pipelines, sewer lines, electrical infrastructure, gas pipelines, OFC routes, and other telecommunication services were recorded/collected. This process enabled a comprehensive mapping of utilities along the alignment and facilitated identification of potential conflicts with the proposed elevated corridor. In densely built urban contexts like Bengaluru, such utilities are often located within restricted right-of-way or adjacent to existing road infrastructure. Proper identification and planning are therefore essential to avoid service interruptions, ensure safety, and optimize construction sequencing.

All details of utility lines should be captured in survey. Details of utilities to be shifted or re-laid shall be identified and the same shall be marked on the Drawings to enable submission to the respective utility providers for further actions. All coordination and assistance required in this aspect shall be provided by the consultant

The details of utilities identified within Corridor are given in the annexure. Notably, Electrical lines, water & sewage networks and Optical Fibre Cable (OFC) routes are present along the corridor, necessitating careful coordination during construction to avoid service disruption, enable relocation where required, and maintain continuity of critical urban services.

All the important physical features along the alignment are collected and are shown in the below tables:

Table 2.12 : Details of Existing Utilities

Chainage		Electric Pole	Electric Pole With Light	Light Pole	Double Arm Light Pole	Electric Box (RMU)	Transformers
From	To						
0+000	1+000	34	0	73	0	14	2
1+000	2+000	38	0	26	35	16	9
2+000	3+000	29	0	50	23	15	6
3+000	4+000	16	1	76	2	15	4
4+000	5+000	37	18	49	10	6	7
5+000	6+000	96	4	62	2	8	25
6+000	7+000	78	0	61	7	42	16
7+000	8+000	56	0	14	40	27	3
8+000	9+000	46	0	5	56	21	3
9+000	10+000	4	0	15	43	12	0
10+000	11+000	26	4	19	35	3	32
11+000	11+570	44	4	4	24	5	8

Chainage		High Tension Line	Manhole	Chambers	Trees	Coconut Tree	Palm Trees
From	To						
0+000	1+000	0	19	6	119	0	0
1+000	2+000	0	32	9	138	0	0
2+000	3+000	2	19	31	205	6	15
3+000	4+000	0	22	8	79	0	6
4+000	5+000	0	12	46	236	0	1
5+000	6+000	0	46	81	142	4	0
6+000	7+000	0	19	13	132	0	10
7+000	8+000	0	31	32	119	1	7

Chainage		High Tension Line	Manhole	Chambers	Trees	Coconut Tree	Palm Trees
From	To						
8+000	9+000	0	35	39	254	18	17
9+000	10+000	0	26	4	101	9	23
10+000	11+000	0	45	47	72	2	0
11+000	11+570	0	37	3	159	11	0

2.3 TOPOGRAPHICAL SURVEYS

As per ToR, topographic survey has to be conducted along the project stretches. The main purpose of the topographical survey was to produce digital 3d base maps showing the existing terrain including all existing road features including houses, telephone line, OFC, electric line, monuments, place of worship, cremation ground, utility line, trees, hand pumps and other features covering the entire right of way of the road. The digital 3d base maps are the basis for preparation of the digital terrain models (dtm) required for the road design.

The methodology as per terms of reference (ToR) was adopted for topographical survey by the consultants for capturing all the physical features along the project corridor for facilitating proposals for the final center line of the proposed 2/4-lane road, keeping in view the possible local realignments. The corridor for survey is at least 30 m beyond either side of the center line of the proposed divided carriageway or land boundary and additional width for interchanges and intersections. This survey includes reading spot levels along L-section at every 25m interval, cross sections at every 50m interval, fixing GPS/ Benchmarks at every 5 Km interval and the Reference Benchmark Pillars at every 250m interval connected to GTS Benchmarks as specified in TOR.

The project road alignment was surveyed and Reference / Bench Mark pillars for horizontal and vertical control were fixed on the ground along the project road as per TOR. The scope of Consultancy was to carry out the topographic survey to cover following aspects:

- Control Surveys
- GPS Control
- Total Station Traverse
- Height Control

2.3.1 Control Surveys

The control traverse is the base framework for all the further survey work. This provides a coordinated horizontal grid and a level reference system to ensure accuracy. Thus, the measured coordinates of these survey grids (Northing and Easting) and the levels are tied to GTS benchmark wherever available, to verify the accuracy of survey.

The control survey is carried out in two phase survey. Horizontal control using GPS and Total Station. Vertical control using auto level Control points (cement concrete pillars) established at an interval of about 2-km along the road, using differential GPS techniques. Twin pillars were fixed at these locations so as to enable further control (200 to 300 m apart) along the road using total station traverse. The location of these GPS pillars fixed at site in such a way that GPS observation to the satellite can be carried out without any obstruction and these cement concrete pillars are available as permanent benchmarks for survey and layout at later stage.

All the GPS control pillars are uniquely numbered and described so that these can be easily located and accessed for future work.

The anticipated accuracy of the above control points will be:

- Planimetric accuracy of GPS control points: 10 mm + 5 ppm
- Adjustment accuracy of secondary traverse control points fixed by total station: better than 1:10,000

For elevations using auto-levels, the agreement with the reference benchmarks will be better than $12\sqrt{K}$ mm, K stands for distance surveyed between the benchmarks in kilometers.

2.3.2 GPS Control Survey (Primary Control)

GPS survey is the primary control survey in topographical survey. The sequence activities involved in this survey are:

- Established GPS control pillars at every 5 km along the project corridor
- Collected GPS signals at an arbitrary station for a period of about 2 (two) hours so as to compute the geographic coordinates of this point to an accuracy of few decimeters.

- Taking the above as the known point, determine the relative geographic coordinates of all geodetic and azimuth controls to an accuracy of 1: 50,000 or better from its nearest geodetic control
- Project the geographic coordinates onto a suitable grid

Three sets of receivers (make Leica GS20 with Leica AT501 external antenna) mounted on conventional aluminum tripod and centering device (tribrach + carrier) were used for data acquisition. GPS data were downloaded from the receivers, post processed, verified for loop closure and networks adjusted at select locations. The geographic coordinates of all control points were determined on WGS84 datum.

However, as the control points are being established to correct ground (ETS) survey observations, the geographic coordinates of the control points were projected on two alternative local grids.

The location of GPS pillars was marked on base map drawing and northing and easting values also shown at every control point. A List of GPS Pillar location along the project Road is appended to this report.

2.3.3 Total Station Traverse (Secondary Control):

Total station traverse in between GPS control points is basically to distribute the control points along project road to facilitate further use of them to read all topographical features. After successful completion of primary control points, secondary control points were established with total station. An open traverse was run along the existing road beginning from known GPS point and closed on the next GPS control pillar. The amount of error found after closing the traverse on successive GPS point is distributed equally on all stations, which are established during traversing in between those GPS points. If the amount of error is more than the permissible limits, the whole process was repeated until the results are satisfactory. Foresight and back sight distances of traverse station maintained equally to minimize the angular error.

2.3.4 Height control and Bench marks pillars:

The elevation of all the control points fixed by GPS and total station are established using auto levels, connecting to GTS bench marks procured from Survey of India. Precision levelling has been carried out by two levelling teams in fore and back direction and mean will be taken to establish the elevation of all cement concrete pillars, and other control

points, using auto-levels. This established control work of plan and height would enable topographical survey on systematic accurate and scientific basis.

Bench mark/ reference pillar of size 15cm x 15cm x 45cm casted in RCC of M15 grade with a nail fixed in the center of the top surface. These pillars are embedded in concrete up to a depth of 30cm with CC M10 (5 cm wide all around). The balance 15cm above ground has been painted and BM numbers are given to each pillar. These numbers along with RL value are shown in base map. The interval of these bench marks pillars are 250m along the project road as per TOR. A List of bench marks location along the project Road is appended to this report.

2.3.5 Feature Codes:

The feature code is an alphanumeric code assigned to each topographical feature to represent and communicate between surveyor and highway design engineer. Before picking of any feature the surveyor will assign the feature code to that particular feature and collect the x, y, z of that feature. Coding for feature shall comprise of four characters, first two characters describing the feature and last two characters mentioning the string number. All the surveyed points with same string name shall be joined, (eg. Road centerline, shoulder, building, etc.). All the features that are not joined (eg. Telephone poles, trees, spot levels, etc.) Shall have their codes start with P. No feature shall have its survey code starting with M, L or G. A predefined list of feature codes has been prepared and handed to surveyors. An initial training to field surveyors has been given by highway engineer to get acquaintance of these codes. A list codes used to this project are appended to this report.

2.4 LiDAR Survey

LiDAR (Light Detection and Ranging) technology was adopted for the topographic survey of the project corridor to achieve highly accurate and detailed mapping of existing ground features. The survey was carried out using a combination of mobile LiDAR mounted on survey vehicles and GNSS-based positioning systems to collect georeferenced three-dimensional point cloud data along the entire alignment.

The system uses laser pulses emitted at a very high frequency, which, upon striking the surface, return to the sensor to calculate precise distances. This results in a dense point cloud with millions of data points, capturing the exact location and elevation of the road

surface, adjacent shoulders, medians, structures, utilities, roadside features, and natural terrain. The LiDAR data was processed to remove noise and classify points into categories such as ground, vegetation, and man-made structures. From this classified data, highly accurate Digital Terrain Models (DTM) and Digital Surface Models (DSM) were generated.

The LiDAR survey methodology significantly reduces field survey time compared to traditional total station or DGPS surveys while delivering sub-decimeter accuracy. It enables detailed corridor mapping even in areas with heavy traffic, dense built-up zones, or inaccessible locations, without the need for prolonged traffic disruption.

For this project, LiDAR surveying has been employed along the entire proposed alignment. The high-resolution point cloud data generated has been utilised for preparing the base maps, alignment design, longitudinal and cross-sections, and for identifying and mapping existing utilities and structures. This ensures that the DPR is based on precise, up-to-date spatial information, thereby enhancing the accuracy of design and minimising potential construction conflicts.

2.5 TRAFFIC SURVEYS

2.5.1 Classified Traffic Volume Count Survey

The classified traffic volume count surveys will be carried out for 1 day (continuous, direction-wise) at the selected survey stations. The vehicle classification system as given in relevant IRC code will be followed. The counts were made separately for motorised and non-motorised traffic as per the vehicle classification system.

2.5.2 Speed-Delay Surveys

This survey is conducted to evaluate the journey speed, running speed, and delays experienced by different vehicle types along the corridor. Separate surveys are undertaken for general traffic and public transport (buses) during both peak and off-peak hours. The results will help identify bottlenecks, delay points, and overall corridor performance.

2.5.3 Traffic Signal Timing and Saturation Flow Survey

At all signalized intersections, the survey records signal cycle timings, phase splits, and saturation flow during morning, midday, and evening peaks, as well as off-peak periods.

This data will be used to evaluate intersection performance and identify signal optimization requirements.

2.5.4 Parking Survey (On-Street and Off-Street)

Parking accumulation and duration surveys are undertaken along the corridor to understand parking demand characteristics during peak periods. The findings will support planning of regulated and alternative parking facilities to improve corridor efficiency and safety.

2.5.5 Pedestrian Survey

Pedestrian movement surveys are being conducted at all major intersections during peak hours. Both longitudinal and cross movements are recorded to assess pedestrian intensity and to design appropriate pedestrian facilities, ensuring safety and minimizing pedestrian–vehicular conflicts.

2.5.6 Traffic Demand Estimates

The objective of this task is to estimate the future traffic demand for the proposed corridor, considering the existing traffic trends and projected socioeconomic growth in the influence area. The traffic demand estimates will form the basis for determining lane requirements, design of geometric features, and associated facilities.

The consultants will analyze historical traffic growth trends, population and economic growth rates, and vehicle registration data to establish realistic growth rates for all categories of vehicles. Factors such as urbanization patterns, land use changes, industrial and commercial development, and integration with other transport modes will also be taken into account to ensure a comprehensive assessment.

Traffic forecasts will be developed for a 30-year design period, using the base year traffic data collected through primary and secondary surveys. The projections will be made under three growth scenarios—Optimistic, Pessimistic, and Most Likely—to capture a reasonable range of future possibilities. The growth factors will be computed at five-year intervals.

Where applicable, transport demand elasticity with respect to income and economic growth will be adopted based on established national practices and relevant references. The projections will consider normal, diverted, induced, and generated traffic components.

The consultants will use sound and validated traffic forecasting methodologies, ensuring that the model assumptions are consistent with similar urban contexts and calibrated with available data. The impact of possible competing or complementary infrastructure projects and tolling strategies on traffic volumes will also be assessed.

The final traffic forecasts will serve as a key input for defining corridor capacity requirements, lane configuration, and the design of associated facilities as per relevant IRC guidelines for urban road traffic projections.

2.6 Pavement Structural Evaluation Using Falling Weight Deflectometer Studies

Falling Weight Deflectometer (FWD) applies dynamic load on the pavement, which closely simulates the duration and amplitude of the load pulses produced by moving wheel loads. The FWD test was carried out in accordance with IRC: 115-2014 “Guidelines for structural evaluation and strengthening of flexible road pavements using Falling Weight Deflectometer (FWD) Technique. FWD readings were taken along the wheel path. Readings were taken at 250m interval, with test points staggered on both sides. Adjustments to reading locations were made to avoid culverts, bridge decks and locally damaged areas. Pavement and air temperatures were recorded for the purpose of temperature correction. Subgrade moisture data was also obtained from field moisture measurements for applying seasonal corrections to deflection measurements.

Principle of Pavement evaluation using FWD

Performance of flexible pavements can be evaluated by applying loads on the pavements that simulate the traffic loading, recording the response to such loading by measuring the elastic deflection under such loads, and analyzing these data duly considering the factors influencing the performance such as subgrade strength, pavement thickness and quality of each of the pavement layers, drainage conditions, pavement surface temperature etc.

Among the equipment available for structural evaluation of pavements, the Falling Weight Deflectometer (FWD) is extensively used world-wide because it simulates, to a large extent, the actual loading conditions of the pavement. When a moving wheel load passes over the pavement it produces load pulses. The resulting load-deflection data can be interpreted through appropriate analytical techniques, such as back calculation technique, to estimate the elastic moduli of the pavement layers. The computed moduli are, in turn, used for (i) the strength evaluation of different layers of in-service pavements (ii) the estimation of the remaining life of in-service pavement (iii) determination of

strengthening requirement, if any and (iv) evaluation of different rehabilitation alternatives (overlay, recycling, partial reconstruction, etc.

Falling Weight Deflectometer (FWD) is an impulse-loading device in which a transient load is applied to the pavement and the deflected shape of the pavement surface is measured. Impulse load is applied by means of a falling mass, which is allowed to drop vertically on a system of springs placed over a circular loading plate. The deflected shape of the pavement surface is measured using displacement sensors which are placed at different radial distances starting with the center of the load plate. Trailer mounted as well as vehicle mounted FWD models are available commercially. The working principle of all these FWD models is essentially the same. A mass of weights is dropped from a pre-determined height onto a series of springs/ buffers placed on top of a loading plate. The corresponding peak load and peak vertical surface deflections at different radial locations are measured and recorded.

FWD is non-destructive test equipment for pavements. It applies a dynamic load to a pavement structure which simulates a moving load, unlike in case of BBD where static load is applied, which does not simulate moving load. FWD provides fast, non-destructive evaluation of pavements and is safe in operating with traffic. It evaluates the condition of underlying pavement layers and can trace the complete shape of bowl formed under dynamic loading.

The survey has been carried out by conducting deflection studies over the existing carriageway along the wheel paths at an effective interval of 250 m alternatively on both lanes of carriageway on each side. The deflections are measured by lowering the loading plate in proper contact with the pavement surface along with the required number of geophones placed at known distance from the loading plate. A target load of 40KN is achieved by dropping the mass from predetermined height. At each study point the load is applied once as seating load and the corresponding deflection is need not be recorded. After seating load, Raise the mass and drop minimum 3 times and record load and deflection data into the computer through data acquisition system on all 3 drops. While peak load and peak deflections at different selected radial positions must be recorded. After that the loading plate and Geophone frames are raised to original position and vehicle is moved to next test point. Temperatures are recorded at an interval of half hour and it has ensured FWD studies are not carried with pavement temperature greater than 45°C. The Summary of Normalized deflection are presented in Table below.

Table 2.13 : Summary of Normalized Deflection for Main Carriageway

SI No	Chainage, km	Side	Load(N)	Contact pressure	Corrected Deflections in mm							Peak Deflection in mm	15th Percentile	Equivalent Deflection
					D1	D2	D3	D4	D5	D6	D7			
1	0+428	LHS	40000	0.56	0.273	0.212	0.176	0.127	0.074	0.059	0.038	0.273	0.462	0.744
2	0+612	LHS	40000	0.56	0.222	0.172	0.139	0.098	0.055	0.040	0.024	0.222		
3	0+927	LHS	40000	0.56	0.617	0.468	0.382	0.272	0.156	0.124	0.075	0.617		
4	1+089	LHS	40000	0.56	0.327	0.247	0.181	0.119	0.061	0.050	0.038	0.327	0.371	0.597
5	1+032	LHS	40000	0.56	0.183	0.135	0.113	0.087	0.060	0.051	0.029	0.183		
6	1+152	LHS	40000	0.56	0.214	0.156	0.128	0.097	0.064	0.053	0.036	0.214		
7	1+291	LHS	40000	0.56	0.361	0.272	0.223	0.173	0.118	0.095	0.062	0.361		
8	1+936	LHS	40000	0.56	0.401	0.305	0.238	0.161	0.075	0.052	0.028	0.401	0.123	0.198
9	2+099	LHS	40000	0.56	0.127	0.095	0.085	0.072	0.053	0.046	0.032	0.127		
10	2+351	LHS	40000	0.56	0.112	0.071	0.056	0.040	0.027	0.024	0.019	0.112	0.420	0.676
11	4+432	LHS	40000	0.56	0.317	0.250	0.204	0.153	0.092	0.073	0.049	0.317		
12	4+607	LHS	40000	0.56	0.505	0.378	0.300	0.201	0.111	0.090	0.064	0.505		
13	4+801	LHS	40000	0.56	0.107	0.069	0.053	0.041	0.027	0.024	0.017	0.107	0.318	0.512
14	5+059	LHS	40000	0.56	0.195	0.152	0.130	0.100	0.065	0.055	0.038	0.195		
15	5+350	LHS	40000	0.56	0.171	0.124	0.105	0.081	0.056	0.048	0.036	0.171		
16	5+510	LHS	40000	0.56	0.419	0.330	0.284	0.224	0.149	0.122	0.080	0.419	0.122	0.196
17	10+826	LHS	40000	0.56	0.134	0.108	0.095	0.078	0.054	0.045	0.031	0.134		
18	11+092	LHS	40000	0.56	0.108	0.088	0.078	0.067	0.049	0.043	0.032	0.108		
19	11+287	LHS	40000	0.56	0.077	0.053	0.044	0.034	0.024	0.020	0.015	0.077	0.304	0.489
28	0+434	RHS	40000	0.56	0.398	0.260	0.199	0.131	0.080	0.068	0.052	0.398		
29	0+594	RHS	40000	0.56	0.165	0.118	0.105	0.082	0.055	0.045	0.032	0.165		
30	0+738	RHS	40000	0.56	0.190	0.151	0.131	0.103	0.070	0.061	0.055	0.190	0.293	0.472
31	1+015	RHS	40000	0.56	0.242	0.190	0.160	0.122	0.076	0.063	0.043	0.242		
32	1+244	RHS	40000	0.56	0.315	0.233	0.182	0.122	0.062	0.048	0.033	0.315		
33	1+492	RHS	40000	0.56	0.267	0.203	0.179	0.138	0.086	0.069	0.045	0.267	0.154	0.248
34	2+019	RHS	40000	0.56	0.169	0.127	0.109	0.088	0.059	0.049	0.034	0.169		
35	2+215	RHS	40000	0.56	0.072	0.049	0.041	0.031	0.021	0.018	0.013	0.072		

SI No	Chainage, km	Side	Load(N)	Contact pressure	Corrected Deflections in mm							Peak Deflection in mm	15th Percentile	Equivalent Deflection
					D1	D2	D3	D4	D5	D6	D7			
36	2+416	RHS	40000	0.56	0.144	0.116	0.108	0.089	0.065	0.054	0.037	0.144		
37	2+595	RHS	40000	0.56	0.091	0.057	0.046	0.040	0.030	0.027	0.023	0.091		
38	4+571	RHS	40000	0.56	0.111	0.090	0.081	0.066	0.048	0.042	0.030	0.111	0.332	0.535
39	4+837	RHS	40000	0.56	0.426	0.309	0.253	0.176	0.094	0.073	0.048	0.426		
40	5+206	RHS	40000	0.56	0.128	0.097	0.083	0.065	0.044	0.038	0.027	0.128	0.130	0.209
41	5+537	RHS	40000	0.56	0.131	0.106	0.091	0.075	0.053	0.044	0.032	0.131		
42	7+832	RHS	40000	0.56	0.307	0.252	0.234	0.191	0.138	0.117	0.081	0.307	0.207	0.333
43	8+325	RHS	40000	0.56	0.173	0.122	0.098	0.077	0.049	0.040	0.028	0.173		
44	8+519	RHS	40000	0.56	0.095	0.073	0.063	0.051	0.036	0.031	0.022	0.095		
45	8+695	RHS	40000	0.56	0.084	0.059	0.047	0.036	0.025	0.022	0.017	0.084		
46	8+874	RHS	40000	0.56	0.089	0.066	0.056	0.045	0.035	0.031	0.025	0.089	0.171	0.275
47	10+197	RHS	40000	0.56	0.338	0.262	0.205	0.148	0.086	0.067	0.044	0.338		
48	11+000	RHS	40000	0.56	0.105	0.075	0.064	0.051	0.038	0.033	0.025	0.105		
49	11+143	RHS	40000	0.56	0.077	0.055	0.050	0.041	0.031	0.028	0.022	0.077		
50	11+357	RHS	40000	0.56	0.066	0.044	0.037	0.028	0.021	0.018	0.015	0.066		
51	11+608	RHS	40000	0.56	0.072	0.049	0.042	0.035	0.027	0.024	0.019	0.072		
52	11+565	RHS	40000	0.56	0.152	0.109	0.096	0.076	0.051	0.043	0.031	0.152		

The Remaining Life Analysis on the Flexible pavement is carried by Evaluating the Elastic Modulus of each Layers and Performance of Flexible pavement – Fatigue and Rutting Behavioral checks.

The step-by-step analysis for flexible pavement has been explained in the flow chart attached below.

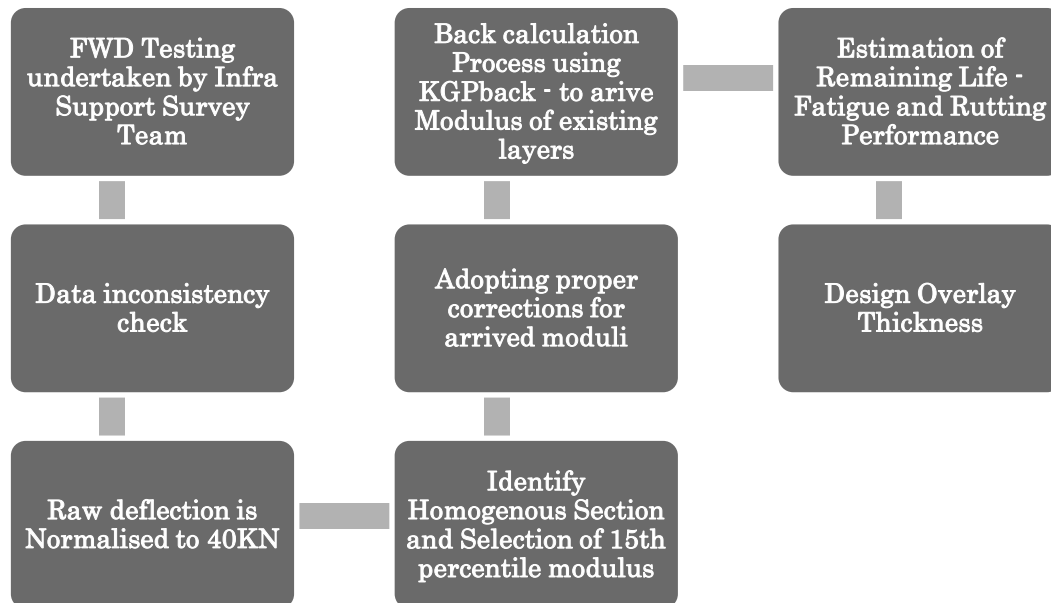


Figure 2.5 Process Flow to determine pavement modulus values

These has been explained in the procedural steps below

1. The recorded data was normalized to standard load – 40KN.
2. The Normalized deflections were then back calculated using the KGP back Application to obtain Elastic Modulus values Bituminous, Granular layer and Sub grade.
3. The corrections factors will be applied to all layers as suggested in IRC 115: 2014.

Temperature Correction

Back calculated moduli values of the bituminous layers evaluated by FWD survey are influenced by the pavement temperature. Hence the back calculated moduli obtained at temperatures other than the identified standard temperature will have to be corrected. For areas in India having a tropical climate, the standard pavement temperature is recommended as 35°C.

In accordance with section 6.4.2 of IRC 115: 2014, the calculated modulus values in the Bituminous Layers have been adjusted relative to the standard temperature of 35° C using equation 4 and 5 of IRC 115: 2014.

$$ET1 = \lambda ET2 \quad \text{Eq4, IRC115:2014}$$

Temperature Correction factor, $\lambda = 1 - 0.238 \ln T1 / 1 - 0.238 \ln T2$, Eq 5, IRC115:2014

Where,

ET 1 - Back calculated Modulus (MPa) at Temperature T1

ET 2 - Back calculated Modulus (MPa) at Temperature T2

Correction for Seasonal Variation

Moisture content affects the strength of subgrade and granular subbase/base layers. The extent to which the strength is affected will depend on the nature of subgrade soil, gradation and nature of fines in the granular layers, etc. For applying these guidelines, it is intended that the pavement layer moduli values should pertain to the period when the subgrade is at its weakest condition. In India, this period occurs during the recession of monsoon. It is, therefore, desirable to conduct deflection measurements during this period. Where the same is not feasible, a correction procedure should be adopted.

In accordance with Section 6.5.2 of IRC 11 5, the calculated modulus values for Subgrade and Granular Layer have been adjusted relative to the moisture conditions at the time of the testing.

$$E_{\text{subgrade_Monsoon}} = 3.351 * (E_{\text{subgrade_Winter}})^{0.7688 - 28.9} \dots\dots\dots \text{Eq 6, IRC115:2014}$$

$$E_{\text{subgrade_Monsoon}} = 0.8554 * (E_{\text{subgrade_Summer}})^{-8.461} \dots\dots\dots \text{Eq 7, IRC115:2014}$$

$$E_{\text{Granular_Monsoon}} = -0.0003 * E_{\text{Granular_Summer}}^2 + 0.9584 * E_{\text{Granular_Summer}} - 32.989 \quad \text{Eq 8, IRC115:2014}$$

$$E_{\text{Granular_Monsoon}} = 10.5523 * E_{\text{Granular_Winter}}^{0.624} - 113.857 \dots\dots\dots \text{Eq 9, IRC115:2014}$$

4. Using these corrected Moduli Values - Homogenous sections are prepared and 15th Percentile Moduli values are selected for Design. Here, we have performed each pointwise for the better understanding of every single location as requested.

5. Checking the in-serviceability of the Pavement layers through Performance criteria- analyzing the Remaining life (IRC 115) with reference to the Traffic MSA.

Initially, The Critical Strains Values - tensile strain (in the bituminous layer), E_t and compressive strain (at the top of the sub-grade layer), E_v are evaluated using the IRC approved program IITPAVE application (refer 4.1.2).

Using the Critical Strain values, the pavement performance in term of Fatigue and Rutting can be evaluated as provided in Section 8.3 of IRC 115.

Fatigue Model

$$N = 0.711 * 10^{-4} * (1/E_t)^{3.89} * (1/M_{bit})^{0.854} \dots\dots\dots \text{Eq 16,}$$

IRC115:2014

Rutting Model

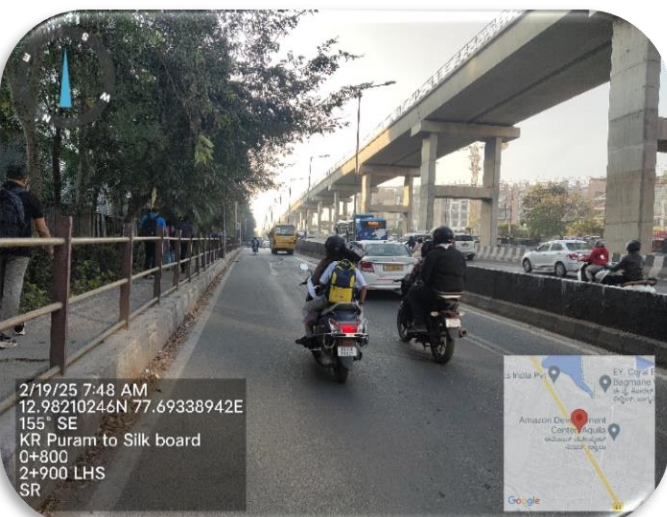
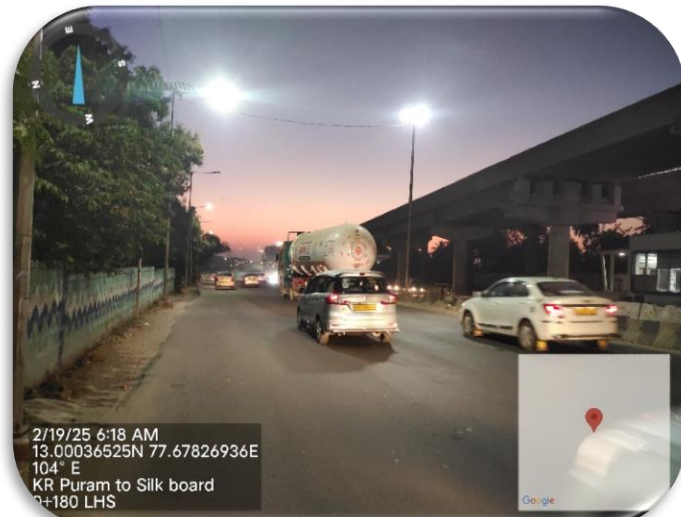
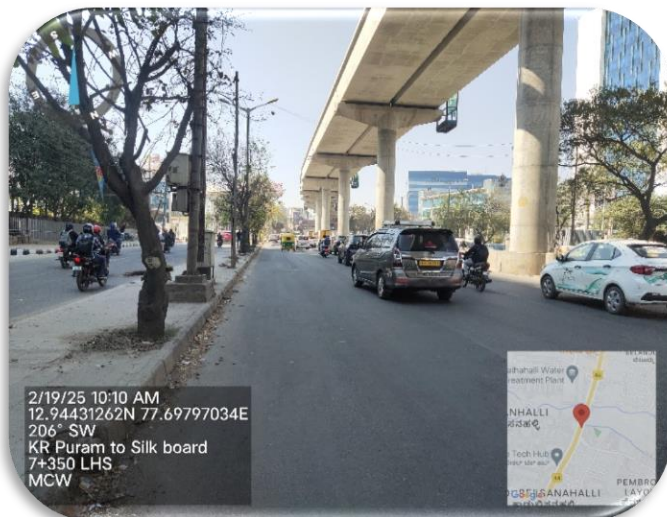
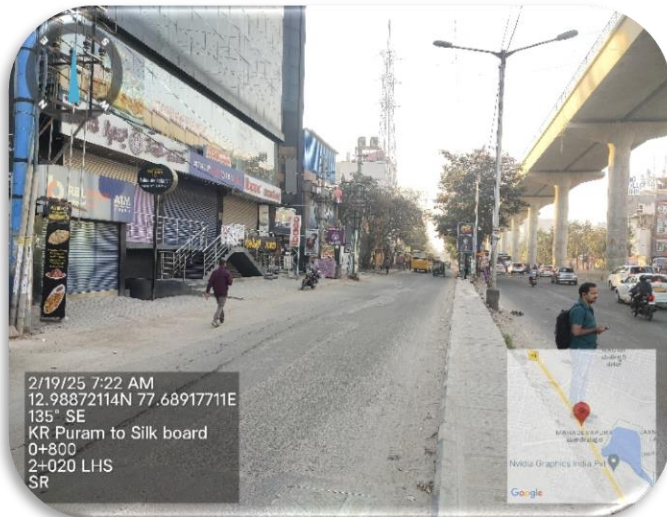
$$NR = 1.41 * 10^{-8} * (1/E_v)^{4.5337} \dots\dots\dots \text{Eq 17,}$$

IRC115:2014

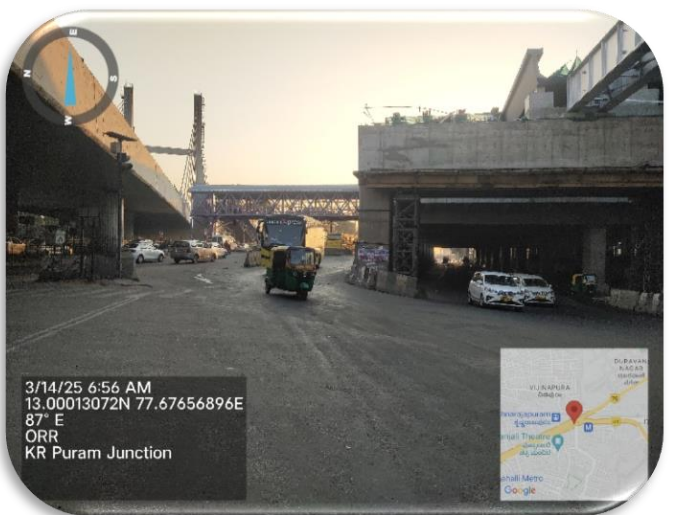
Using these equations, Actual Remaining Life of the pavement retained can be evaluated by comparing obtained strain values with the allowable strains.

6. Overlay design can be made For Strengthening the existing Pavement condition. Appropriate Overlay thickness can be selected in such a way the pavement Performance is matching the Design Traffic, MSA in terms of Both Fatigue and Rutting performances as discussed above step 5.

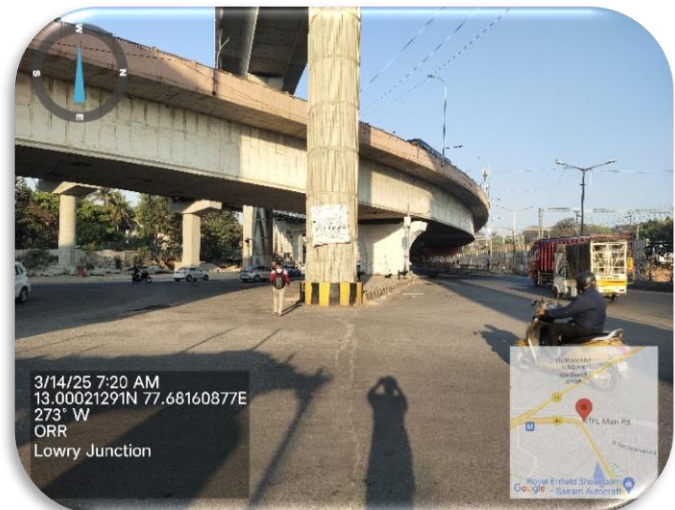
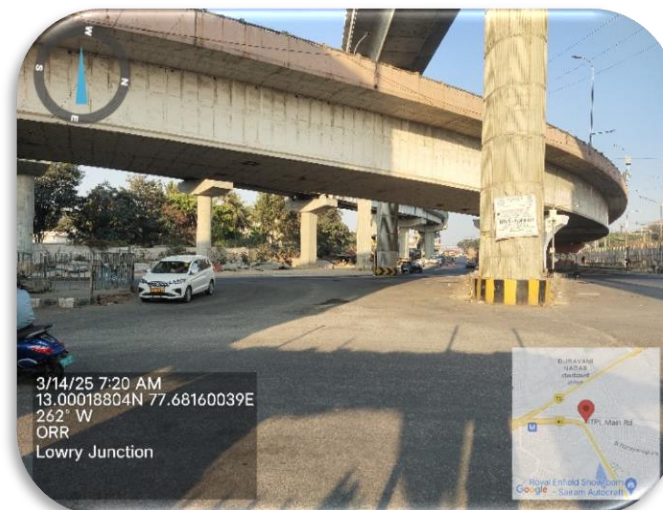
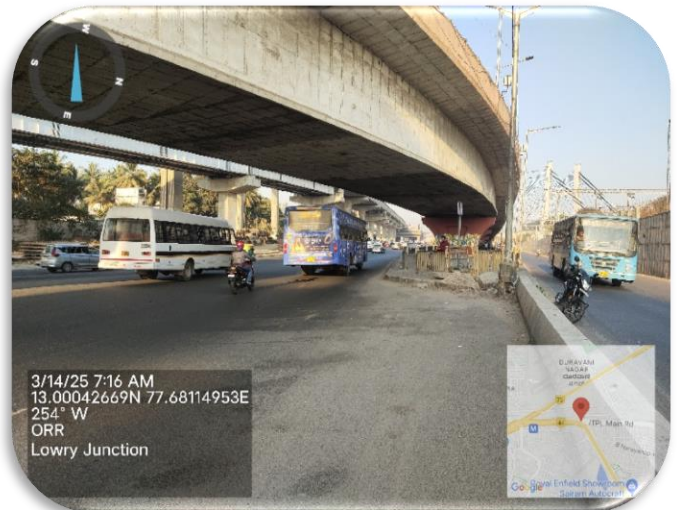
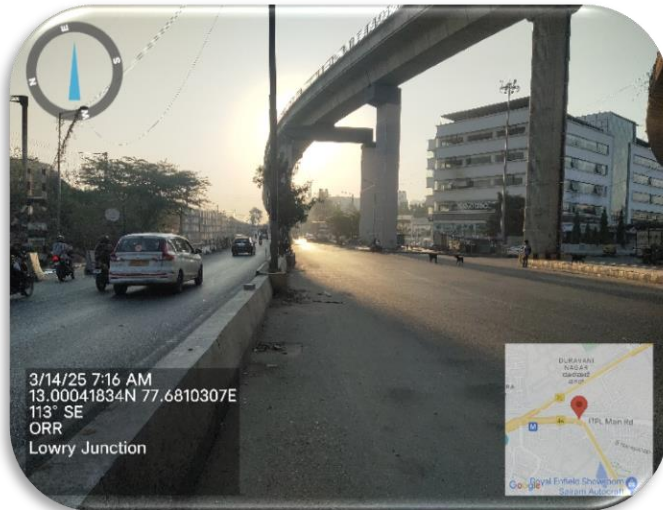
SITE PHOTOS



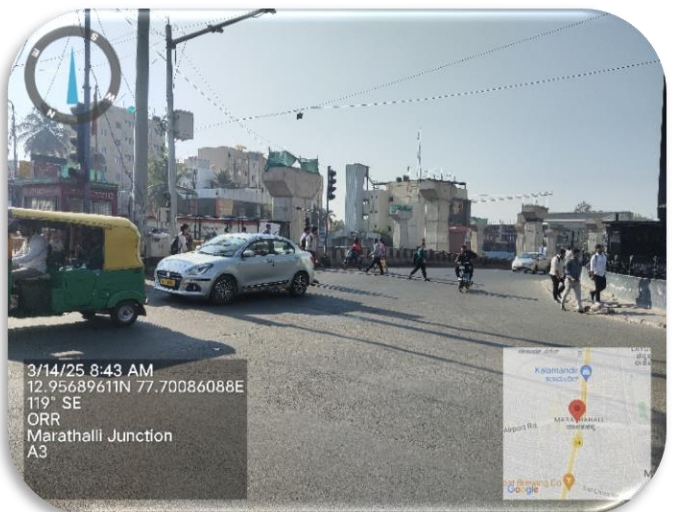
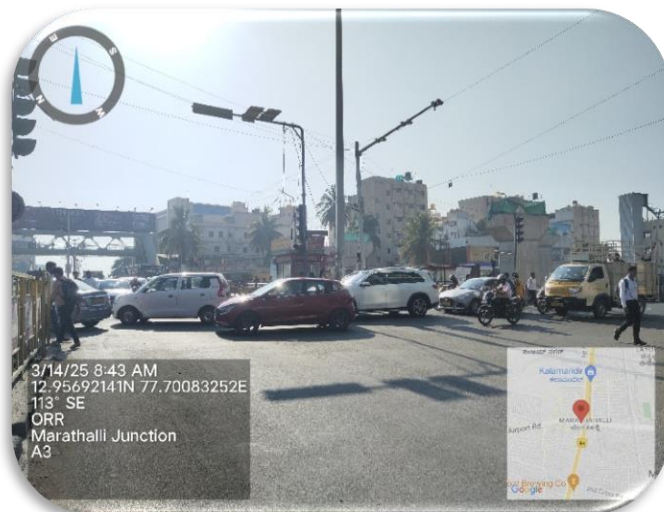
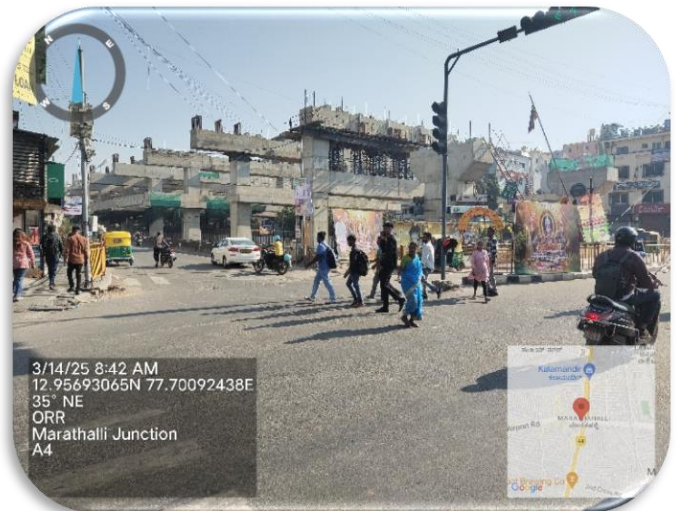
KR PURAM RAIWAY STATION JUNCTION PHOTOS



LOWRY JUNCTION PHOTOS



MARATHALLI JUNCTION PHOTOS



FWD TEST PHOTOS



CORE CUTTING PHOTOS



SITE VISIT PHOTOS



LiDAR Survey Photos

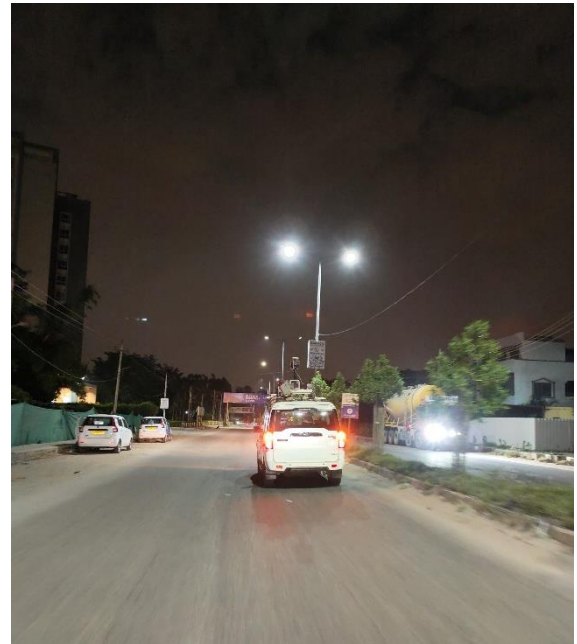


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CHAPTER 3. TRAFFIC SURVEYS AND ANALYSIS

3.1 GENERAL

In order to understand the volume and characteristics of the traffic on the project road various traffic surveys were carried out. For this purpose, a detailed reconnaissance survey was conducted to identify the appropriate locations for carrying out the surveys. The traffic surveys conducted at following locations as per TOR are presented in **Table 3.1**.

Table 3.1: Traffic Survey Schedule

Sl. No	Station No.	Location Name
Classified Traffic Volume Count		
1	TVC 01	Near Marathalli
2	TVC 02	Near Iblur Junction

Package 02 : KR Puram to Iblur Junction

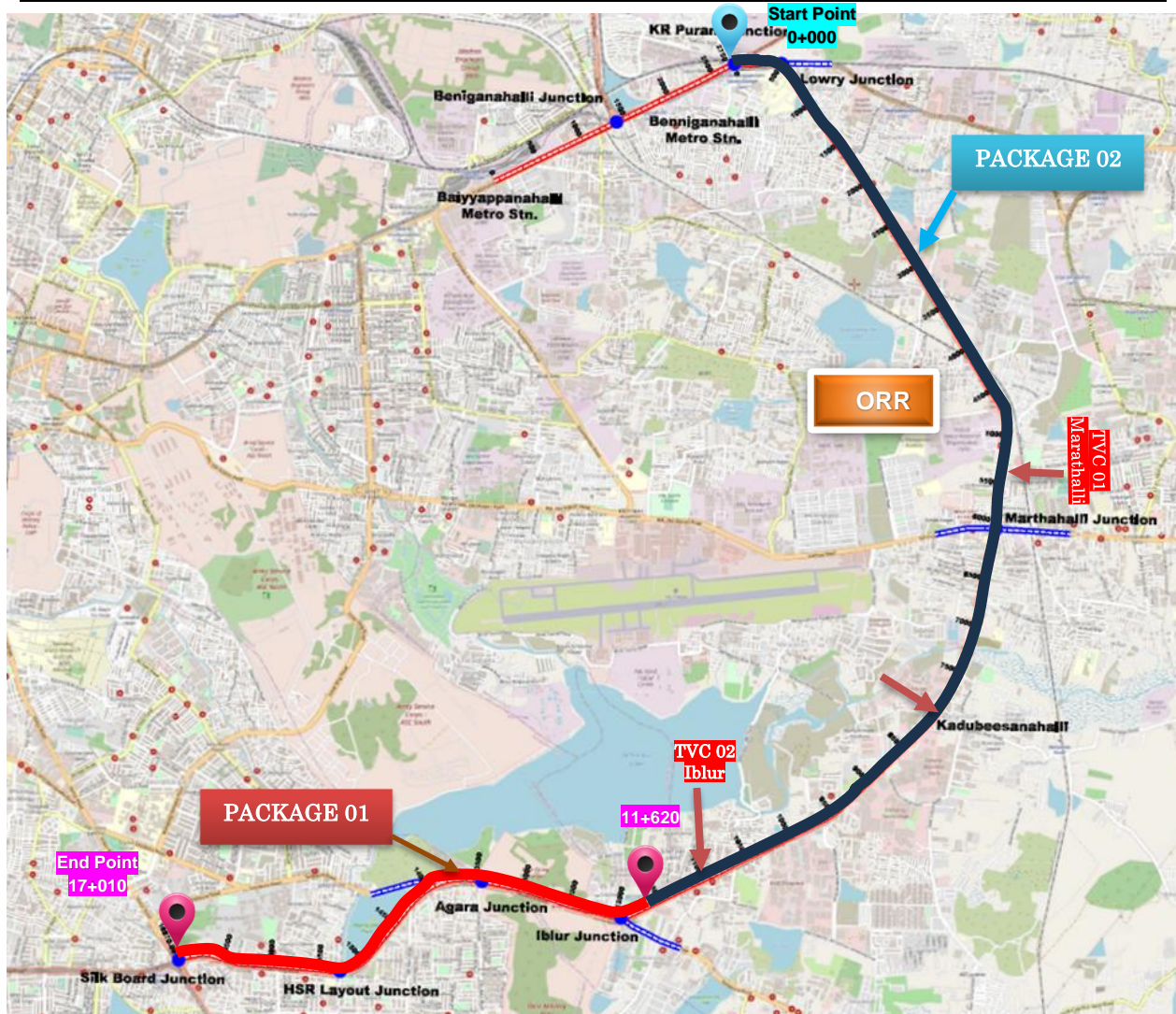


Figure 3.1 : Key Map showing Traffic Survey Locations

3.2 METHODOLOGY FOR TRAFFIC SURVEYS

Traffic Volume Count (TVC) Survey

Hourly traffic counts were conducted simultaneously in both directions at each survey location to obtain data on the magnitude of traffic flow, hourly variation and the traffic composition. The survey was carried out by manual vehicle counting and classifying the vehicles passing the survey station in both directions, in 15-minute intervals. The counts were made separately for motorised and non-motorised traffic as per the vehicle classification system shown in below table.

Table 3.2: Vehicle Classification System

Motorized Traffic	Non-Motorized Traffic
2-Wheeler	Bi-Cycle

Package 02 : KR Puram to Iblur Junction

Motorized Traffic		Non-Motorized Traffic
3-Wheeler		Cycle-Rickshaw
Passenger Car		Animal Drawn Vehicle (ADV)
Utility Vehicle (Jeep, Van etc)		Hand Cart
Bus	Mini Bus	Other Non-Motorized Vehicle
	Standard Bus	
LCV	LCV – Passenger	
	LCV – Freight	
Truck	MCV - 2 Axle Rigid Chassis	
	HCV - 3 Axle Rigid Chassis	
	MAV - Semi Articulated	
	MAV - Articulated	

The volume count data was processed and compiled using Spread Sheet software packages to get hourly and direction-wise classified traffic data. The analysis of the classified traffic volume count observed at the count locations was carried out to arrive at the following:

- Average Daily Traffic (ADT)
- Hourly variation and Peak Hour Factor (PHF)
- Directional distribution
- Traffic composition
- Annual Average Daily Traffic (AADT)

3.3 DATA ANALYSIS

The survey data and pertinent information collected from various traffic surveys discussed in preceding section of this chapter were analyzed to obtain the various traffic characteristics on the study corridor. Brief discussions on the findings are presented hereunder.

3.3.1 Traffic Volume Count Survey

Traffic volume count data collected at different locations has been analyzed to arrive at average daily traffic (ADT), hourly variation and composition. ADT in terms of total vehicles and passenger car units (PCU) are worked out. The PCU conversion factors adopted for the present study are given in **Table 3.3** and are taken from “IRC 106-1990: Guidelines for Capacity of Urban Roads in Plain Areas”.

Table 3.3: Adopted PCU Values

Type	Mode	Equivalent PCU Factors Percentage composition of Vehicle type in traffic stream	
		5%	10% and above
Passenger Vehicles	Two-Wheeler	0.5	0.75
	Three-Wheeler	1.2	2
	Car/Jeep/Van/Taxi	1	1
	Mini Bus/ Tempo	1.4	2
	Standard Bus	2.2	3.7
Freight Vehicles	Mini LCV	1.4	2
	LCV	1.4	2
	2 / 3-Axle	2.2	3.7
	Multi Axle	2.2	3.7
	Agriculture Tractor	4	5
	Agriculture Tractor Trailer	4	5
Slow Moving Vehicles	Animal Drawn	1.5	2
	Hand Carts	2	3
	Cycle	0.4	0.5
	Cycle Rickshaw	1.5	2.0

Average Daily Traffic (ADT)

Hourly traffic data collected at the count stations for each day was totaled to obtain the daily traffic volumes. The seven-day traffic volumes were then averaged out to obtain the Average Daily Traffic (ADT) at individual survey station. The observations and analysis of the same are given in following paragraphs.

Observations (Traffic Volume Count Survey)

The following observations are made from each traffic volume count survey.

3.3.1.1 Traffic Characteristics @ TVC 01 (Near Marathalli)

- A total of about 156096 vehicles (150647 PCU's) pass at this point in both directions per day.

Package 02 : KR Puram to Iblur Junction

- Goods vehicles account for 3.58 % and passenger vehicles account for 96.24 % of the total traffic. Non motorised traffic constitutes about 0.18 % of total vehicles.
- Among the passenger vehicles, two wheelers constitute about 39.88 % whereas cars, buses and auto rickshaws, constitutes about 45.35 %, 7.30 % and 3.71 % respectively.
- Goods traffic consists of LCVs (1.46%), HCVs (1.68%), MAVs (0.42%) and Agricultural Tractors (0.03%).
- Morning Peak Hour traffic is 6.52% and Evening Peak Hour traffic is 6.67%
- There is no directional imbalance in terms of traffic plying in the two directions (45:55).

There is directional balance in terms of traffic plying in the two directions (47:53). **Figure 3.2** and **Figure 3.3** shows Traffic Composition and hourly variation of traffic at location.

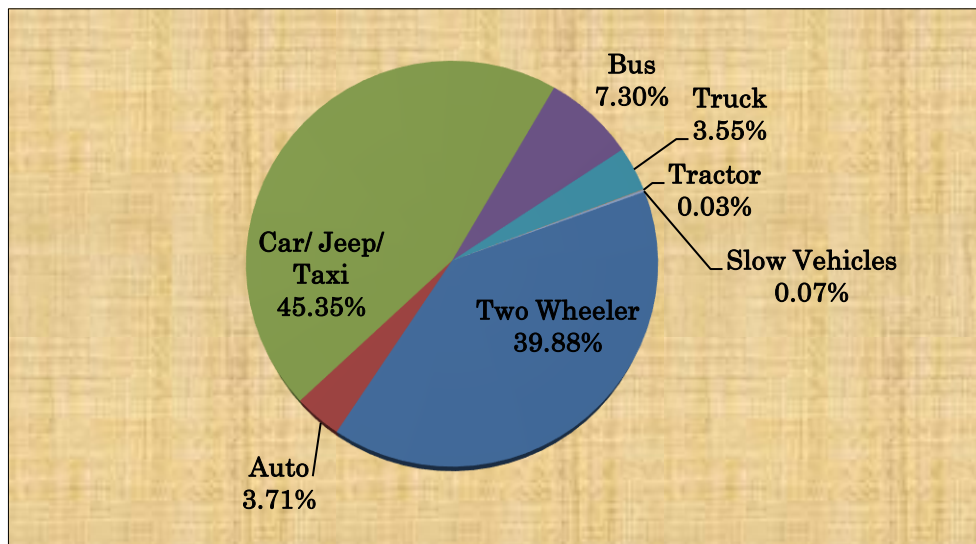


Figure 3.2 : Traffic Composition at TVC 01

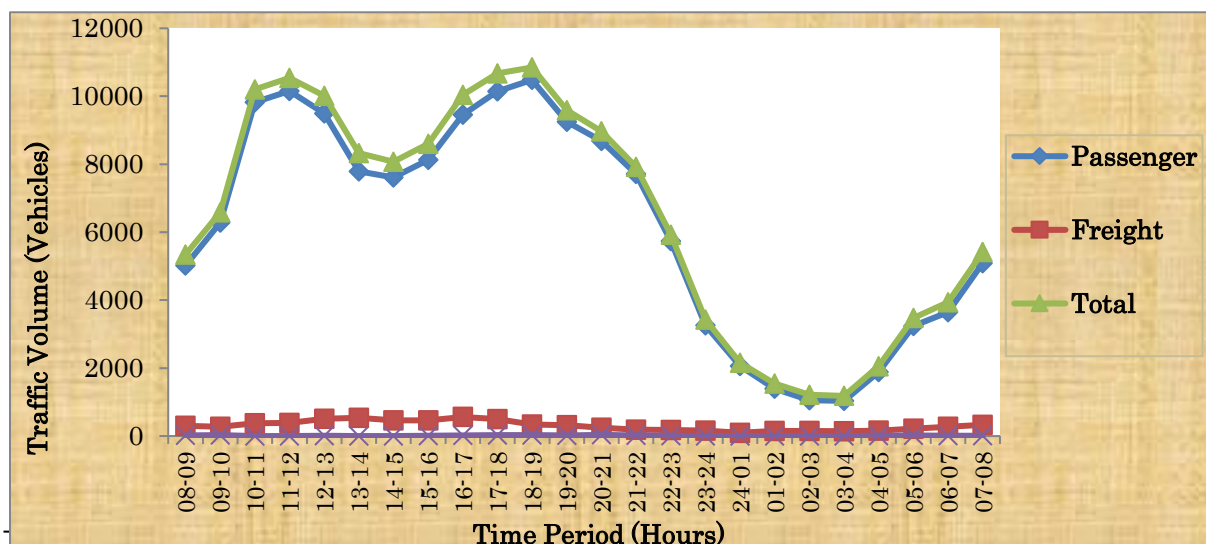


Figure 3.3 : Hourly Traffic at TVC 01

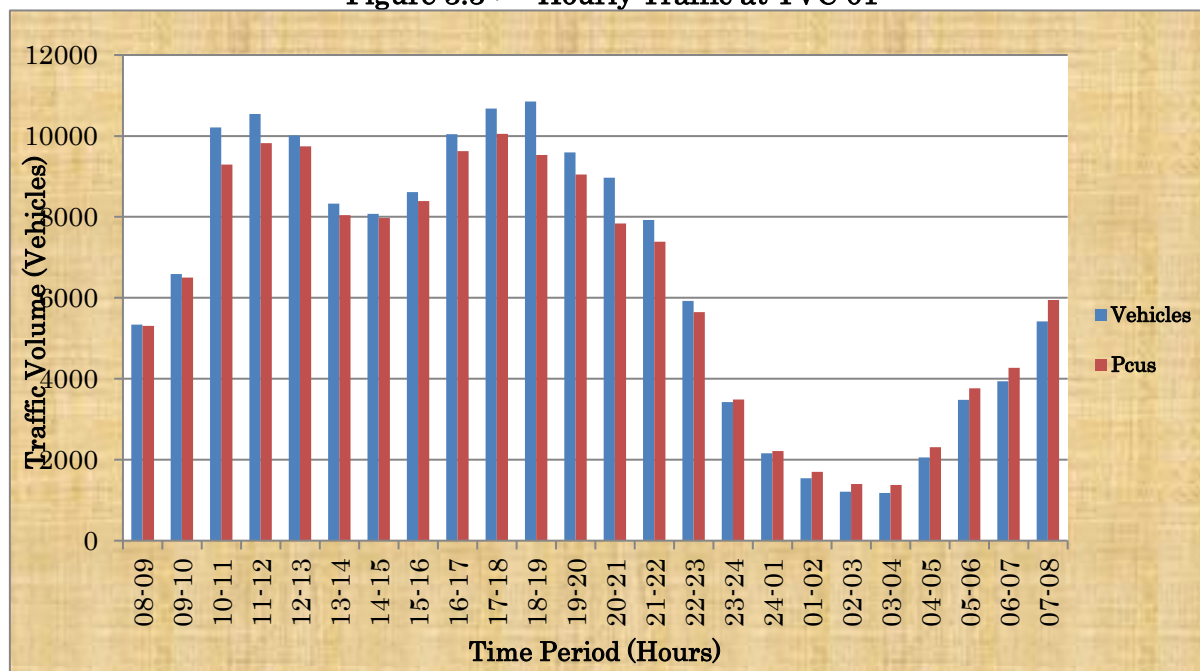


Figure 3.4 : Hourly Variation at TVC 01

A summary of direction-wise daily traffic along with the Average Daily Traffic is presented in Table 3.4 below.

Table 3.4: Average Daily Traffic (ADT) for TVC 01

Type	Mode	Silk Board to KR Puram	KR Puram to Silk Board	Both Directions
Passenger	Two-Wheeler	27160	35092	62251
	Auto Rikshaw	2278	3506	5784
	Car/ Jeep / Taxi	30827	38189	69016
	Mini Bus	1730	2136	3866
	Std Bus	3598	3929	7526
Goods	Mini LCV	854	922	1776
	LCV	1014	1261	2275
	2 Axle	642	661	1303
	3 Axle	570	743	1313
	MAV	278	372	650
Tractor	Agr. Tractor	0	0	0
	Agr. Tractor Trailer	32	17	49

Package 02 : KR Puram to Iblur Junction

Type	Mode	Silk Board to KR Puram	KR Puram to Silk Board	Both Directions
	Slow Moving Vehicle	250	36	286
	Total Vehicles	69233	86863	156096
	Total PCUs	67613	83034	150647

3.3.1.2 Location @ TVC 02 Near Iblur

A total of about 142896 vehicles (161482 PCU's) pass at this point in both directions per day.

- Goods vehicles account for 8.58% and passenger vehicles account for 91.42% of the total traffic.
- Among the passenger vehicles two wheelers and cars are the dominant ones constituting about 35.37% and 41.79%. Whereas Autos and Bus are at 11.46% and 2.79% respectively.
- Goods traffic consists of LCVs (4.07%), HCVs (3.68%), MAVs (0.83%) and Agricultural Tractors (0.0%).
- The peak hour traffic is 12583 PCUs, which is 7.79% of ADT.
- There is no directional balance in terms of traffic plying in the two directions (49:51).

Figure 3.5 and **Figure 3.6** shows Traffic Composition and hourly variation of traffic at location.

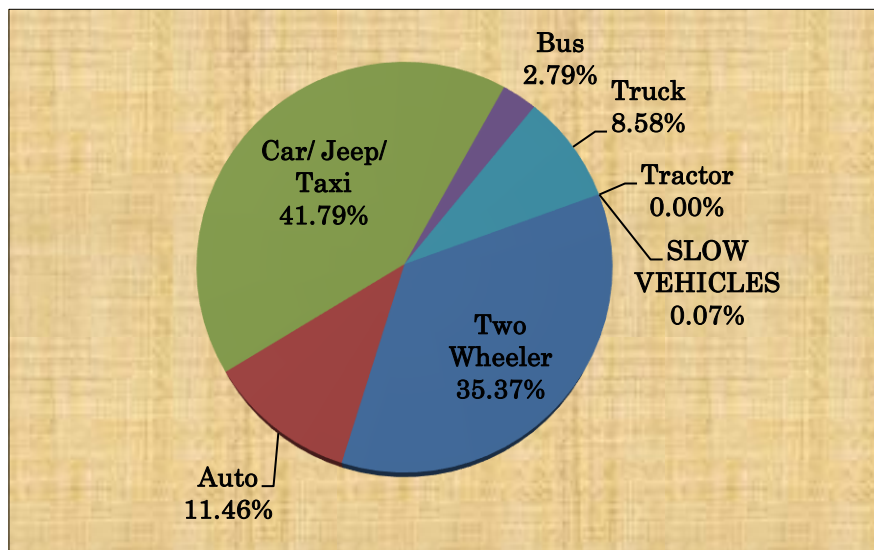


Figure 3.5 : Traffic Composition at TVC 02

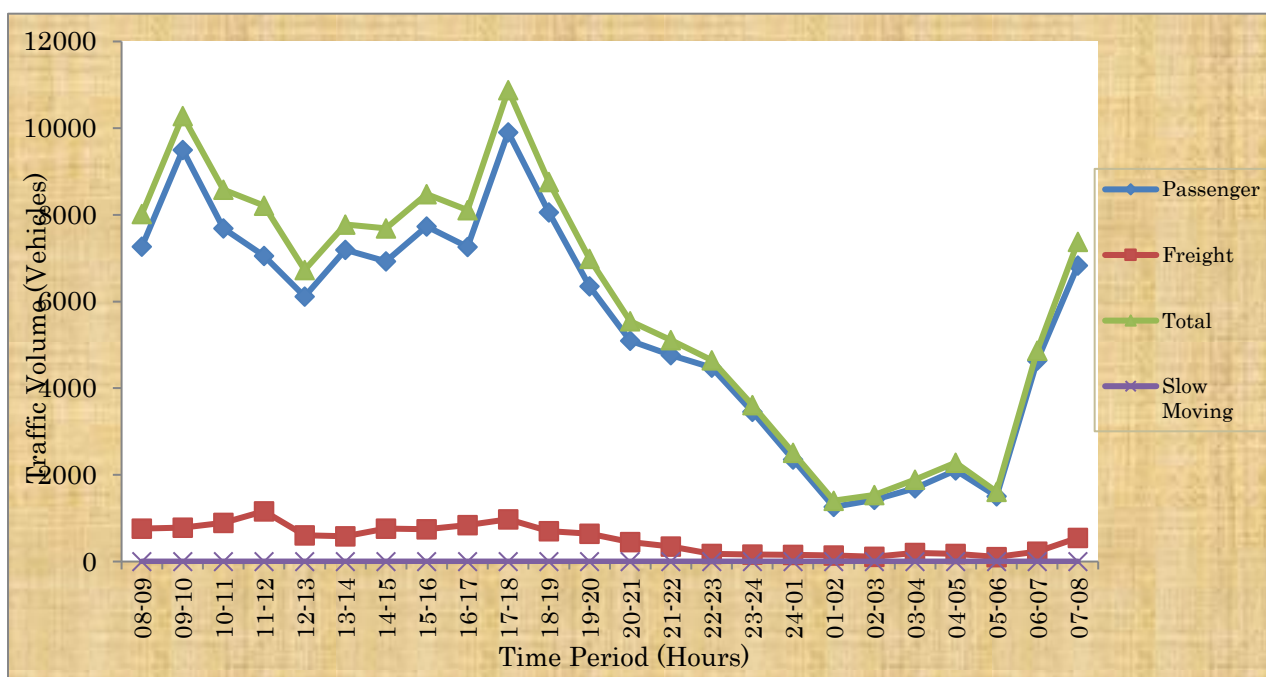


Figure 3.6 : Hourly Traffic at TVC 02

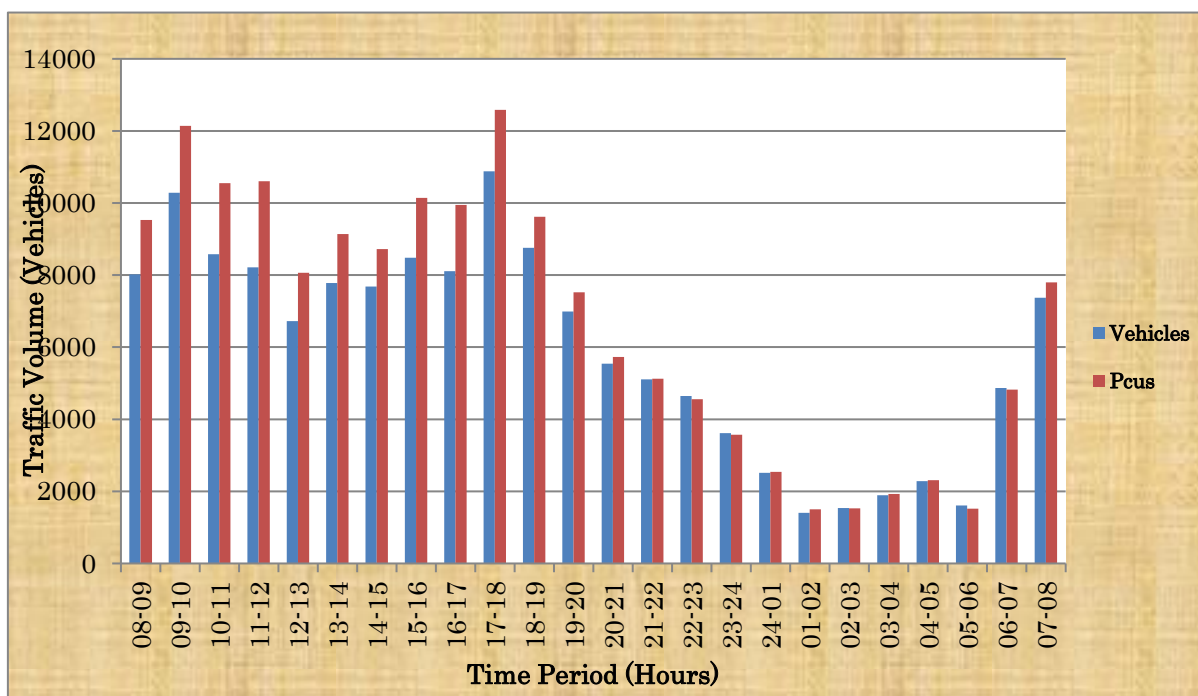


Figure 3.7 : Average Hourly Variation of Total Traffic at TVC 02

A summary of direction-wise daily traffic along with the Average Daily Traffic is presented in **Table 3.6**.

Table 3.5: Average Daily Traffic (ADT) for TVC 02

Package 02 : KR Puram to Iblur Junction

Type	Mode	Marathahalli to Silk Board	Silk Board to Marathahalli	Both Directions
Passenger	Two-Wheeler	25018	25530	50548
	Auto Rikshaw	8104	8270	16374
	Car/ Jeep / Taxi	29560	30163	59723
	Mini Bus	0	0	0
	Std Bus	1974	2014	3988
Goods	Mini LCV	0	0	0
	LCV	2878	2937	5815
	2 Axle	1642	1552	3194
	3 Axle	1037	1025	2062
	MAV	511	680	1191
Tractor	Agr. Tractor	0	0	0
	Agr. Tractor Trailer	0	0	0
Slow Moving Vehicle		0	0	0
Total Vehicles		70725	72171	142896
Total PCUs		79924	81559	161482

Annual Average Daily Traffic

The traffic plying on any road generally varies over the different periods of the year depending on the cycle of different socio-economic activities in the region through which it passes. Therefore, in order to have more realistic estimate of the traffic on the project road, it is required to assess seasonal variation in traffic over a year to estimate Annual Average Daily Traffic (AADT). The ADT observed during the survey duration is multiplied by a Seasonal Correction Factor (SCF) to derive AADT.

The seasonal correction factor is generally derived from secondary data sources such as past month-wise traffic data on the project road, monthly toll revenues from existing tolled highways in the immediate influence area, sales of fuel at different filling stations along the project road.

No seasonal correction factor for the traffic has been considered as this city traffic is not susceptible to seasonal variation. For the present study, the SCF is considered as 1.00 for both HSD and MS vehicles as there will be only minimal variation in SCF for Urban area. Hence AADT is adopted same as ADT, which is represented in earlier paragraphs.

3.3.2 Traffic Growth Rate

Minimum Traffic Growth rate of 5% is considered for commercial vehicles as suggested in IRC: 37:2018 to arrive at Design traffic in terms of Million Standard Axles for Pavement Design.

The classified traffic volume count data available was processed and compiled using Spread Sheet software packages to get Commercial Vehicles per day, which is further utilized to compute the design traffic. The CVPD adopted for each road is shown below

Table 3.6: Details of CVPD

Mode	Direction 1	Direction 2
Std Bus	3598	3929
LCV	1014	1261
2 Axle	642	661
3 Axle	570	743
Multi Axle	278	372

Table 3.7: Cardinal Years Projected Traffic for TVC 01

Years	Motorized Vehicles													Non-Motorized Vehicles			Total	
	Two- Wheeler	Auto Ricks haw	Car/ Jeep / Taxi	Mini LCV	Mini Bus	Std Bus 2 Axle	Std Bus 3 Axle	Trucks				Tractor	Tractor- trailers	Animal Drawn	Hand Carts	Cycle	Vehicles	PCUS
								LCV	2-Axle	3-Axle	MAV							
2025	62251	5784	69016	1776	3866	7526	0	2275	1303	1313	650	0	49	1	4	281	156096	150647
2026	65364	6073	72466	1865	4060	7903	0	2389	1368	1378	683	0	50	1	4	275	163879	158162
2027	68632	6377	76090	1958	4263	8298	0	2508	1437	1447	717	0	51	1	3	270	172052	166053
2028	72064	6696	79894	2056	4476	8713	0	2634	1509	1520	753	0	52	1	3	264	180634	174338
2029	75667	7030	83889	2159	4700	9148	0	2766	1584	1596	791	0	53	1	3	259	189645	183037
2030	79450	7382	88083	2267	4935	9606	0	2904	1663	1676	830	0	54	1	3	254	199108	192171
2031	83423	7751	92488	2380	5181	10086	0	3049	1746	1759	872	0	55	1	3	249	209043	201763
2032	87594	8139	97112	2499	5440	10590	0	3201	1834	1847	915	0	57	1	3	244	219476	211833
2033	91973	8546	101967	2624	5712	11120	0	3362	1925	1940	961	0	58	1	3	239	230431	222408
2034	96572	8973	107066	2755	5998	11676	0	3530	2022	2037	1009	0	59	1	3	234	241934	233511
2035	101401	9422	112419	2893	6298	12260	0	3706	2123	2138	1059	0	60	1	3	229	254012	245169
2036	106471	9893	118040	3038	6613	12873	0	3891	2229	2245	1112	0	61	1	3	225	266694	257411
2037	111794	10387	123942	3189	6943	13516	0	4086	2340	2358	1168	0	62	1	3	220	280011	270264
2038	117384	10907	130139	3349	7291	14192	0	4290	2457	2475	1226	0	64	1	3	216	293994	283760
2039	123253	11452	136646	3516	7655	14902	0	4505	2580	2599	1288	0	65	1	3	212	308677	297931
2040	129416	12025	143478	3692	8038	15647	0	4730	2709	2729	1352	0	66	1	3	207	324093	312811

Years	Motorized Vehicles													Non-Motorized Vehicles			Total	
	Two- Wheeler	Auto Ricks haw	Car/ Jeep / Taxi	Mini LCV	Mini Bus	Std Bus 2 Axle	Std Bus 3 Axle	Trucks				Tractor	Tractor- trailers	Animal Drawn	Hand Carts	Cycle	Vehicles	PCUS
								LCV	2-Axle	3-Axle	MAV							
2041	135887	12626	150652	3877	8440	16429	0	4966	2845	2866	1420	0	68	1	3	203	340281	328434
2042	142681	13257	158185	4071	8862	17251	0	5215	2987	3009	1491	0	69	1	3	199	357279	344838
2043	149815	13920	166094	4274	9305	18113	0	5476	3136	3159	1565	0	70	1	3	195	375127	362063
2044	157306	14616	174399	4488	9770	19019	0	5749	3293	3317	1644	0	72	1	2	191	393867	380149
2045	165171	15347	183119	4712	10259	19970	0	6037	3458	3483	1726	0	73	1	2	187	413545	399139
2046	173430	16114	192275	4948	10772	20968	0	6339	3631	3657	1812	0	75	1	2	184	434206	419079
2047	182101	16920	201889	5195	11310	22017	0	6656	3812	3840	1903	0	76	1	2	180	455901	440016
2048	191206	17766	211983	5455	11876	23118	0	6988	4003	4032	1998	0	78	1	2	176	478681	461999

Table 3.8: Cardinal Years Projected Traffic for TVC 02

Years	Motorized Vehicles													Non-Motorized Vehicles			Total	
	Two- Wheeler	Auto rickshaw	Car/ Jeep / Taxi	Mini LCV	Mini Bus	Std Bus 2 Axle	Std Bus 3 Axle	Trucks				Tractor	Tractor- trailers	Animal Drawn	Hand Carts	Cycle	Vehicles	PCUS
								LCV	2-Axle	3-Axle	MAV							
2025	50548	16374	59723	0	0	3988	0	5815	3194	2062	1191	0	0	0	0	0	142896	161482
2026	53075	17193	62709	0	0	4187	0	6106	3354	2165	1251	0	0	0	0	0	150041	169556
2027	55729	18052	65845	0	0	4397	0	6411	3522	2274	1313	0	0	0	0	0	157543	178034
2028	58516	18955	69137	0	0	4617	0	6732	3698	2387	1379	0	0	0	0	0	165420	186936
2029	61441	19903	72594	0	0	4847	0	7068	3883	2507	1448	0	0	0	0	0	173691	196283
2030	64513	20898	76223	0	0	5090	0	7422	4077	2632	1520	0	0	0	0	0	182376	206097
2031	67739	21943	80035	0	0	5344	0	7793	4281	2764	1596	0	0	0	0	0	191494	216402
2032	71126	23040	84036	0	0	5612	0	8182	4495	2902	1676	0	0	0	0	0	201069	227222
2033	74682	24192	88238	0	0	5892	0	8591	4720	3047	1760	0	0	0	0	0	211122	238583
2034	78417	25401	92650	0	0	6187	0	9021	4956	3199	1848	0	0	0	0	0	221679	250512
2035	82337	26672	97282	0	0	6496	0	9472	5203	3359	1940	0	0	0	0	0	232763	263037
2036	86454	28005	102147	0	0	6821	0	9946	5464	3527	2037	0	0	0	0	0	244401	276189
2037	90777	29405	107254	0	0	7162	0	10443	5737	3704	2139	0	0	0	0	0	256621	289999
2038	95316	30876	112617	0	0	7520	0	10965	6024	3889	2246	0	0	0	0	0	269452	304499
2039	100082	32419	118247	0	0	7896	0	11513	6325	4083	2359	0	0	0	0	0	282924	319724
2040	105086	34040	124160	0	0	8291	0	12089	6641	4287	2476	0	0	0	0	0	297071	335710

Years	Motorized Vehicles													Non-Motorized Vehicles			Total	
	Two-Wheeler	Auto Rickshaw	Car/ Jeep / Taxi	Mini LCV	Mini Bus	Std Bus 2 Axle	Std Bus 3 Axle	Trucks				Tractor	Tractor-trailers	Animal Drawn	Hand Carts	Cycle	Vehicles	PCUS
								LCV	2-Axle	3-Axle	MAV							
2041	110340	35742	130368	0	0	8705	0	12693	6973	4502	2600	0	0	0	0	0	311924	352495
2042	115857	37530	136886	0	0	9141	0	13328	7322	4727	2730	0	0	0	0	0	327520	370120
2043	121650	39406	143731	0	0	9598	0	13994	7688	4963	2867	0	0	0	0	0	343896	388626
2044	127732	41376	150917	0	0	10077	0	14694	8072	5211	3010	0	0	0	0	0	361091	408057
2045	134119	43445	158463	0	0	10581	0	15429	8476	5472	3161	0	0	0	0	0	379146	428460
2046	140825	45617	166386	0	0	11110	0	16200	8900	5746	3319	0	0	0	0	0	398103	449883
2047	147866	47898	174705	0	0	11666	0	17010	9345	6033	3485	0	0	0	0	0	418008	472378
2048	155259	50293	183441	0	0	12249	0	17861	9812	6335	3659	0	0	0	0	0	438908	495996

Table 3.9: Cardinal Years Projected Traffic

Cardinal Year	Cardinal Years Traffic, (PCU)	
	TVC 01	TVC 022
Growth Rate, %	5%	5%
2025	150647	161482
2028	174338	186936
2033	222408	238583
2038	283760	304499
2043	362063	388626
2048	461999	495996

Method & Inputs

- Design life: - Design Life of 10 Years is considered for the overlay design as per IRC: 115 - 2014.
- Growth rate: - Annual Growth rate of 5% is considered for designs.
- VDF: - The adopted vehicle damage factor considered for the overlay design is 1.0 for Buses & LCV, and 5.0 for other HCVs.
- Lane Distribution factor: - Lane distribution factor is adopted as indicated in IRC 37 - 2018.
- The Design Traffic adopted for Service Roads for a design period of 10 Years as per IRC 37 - 2018 is Tabulated below.

Sl. No	Road	Design traffic (msa)
1	For Service Road	20 msa

3.4 RECOMMENDATIONS ON WARRANTS & CAPACITY

Section is analysed for traffic capacity analysis to select the number of lanes required. The traffic volumes are projected for 10 years. It is proposed to improve geometrics of the road to provide better movement for the traffic. Following are the recommendations on lane requirement.

Direction	Lane Configuration	Movement	Design Capacity	Present peak hour PCU	V/C Ratio
1	6 Lane	2-way	5400	10,051	1.86

Package 02 : KR Puram to Iblur Junction

The traffic volume details for road stretch are studied and found that the capacity is exceeding the capacity and need capacity augmentation. However, this road cannot be widened as the RoW available is limited as this is an urban road with completely developed areas.

However, the design principle considered in the current project is to ensure optimal utilization of the existing RoW with provision of uniform carriageway.

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CHAPTER 4. IMPROVEMENT PROPOSALS

4.1 GENERAL

The Outer Ring Road (ORR) stretch from Krishnarajapuram (KR Puram) to Central Silk Board Junction is one of Bengaluru's most significant arterial corridors, providing a vital link between the eastern, southern, and northern parts of the city. This section of the ORR traverses rapidly developing areas such as Mahadevapura, Doddanekkundi, Marathahalli, Bellandur, HSR Layout, and BTM Layout — all of which comprise a dense mix of IT campuses, residential developments, and commercial establishments. Consequently, this corridor serves as an economic lifeline while also being one of the most heavily congested transport routes in the city.

The proposal for its upgradation, initially undertaken by the Bruhat Bengaluru Mahanagara Palike (BBMP), is now being implemented under the B-SMILE program. M/s Infra Support Engineering Consultants Pvt. Ltd. has been engaged to prepare the Detailed Project Report (DPR). For the purpose of this study, the project has been divided into two packages, of which Package 02 covers the section from KR Puram to Iblur Junction.

Over the years, this stretch has been operating far beyond its intended capacity, and traffic congestion has become a daily ordeal. Even outside conventional peak hours, the corridor remains clogged with vehicles, and travel time on sections such as Silk Board to Marathahalli often stretches to an hour or more. During daytime peaks, the same stretch can take up to 90 minutes to traverse. Junctions like Silk Board and KR Puram have become notorious choke points where multiple arterial roads converge, and traffic often remains at a standstill for extended durations. The ongoing metro construction along the ORR has further reduced available carriageway space, worsening already difficult conditions.

The existing infrastructure is proving grossly inadequate to cater to the ever-growing volume of vehicles. Originally designed for about 5,400 PCUs, the corridor today carries several times that capacity. At junctions, vehicle queues stretch well beyond 100 to 150 meters, reflecting the mismatch between design standards and present-day demand. Average travel speeds during peak periods drop to less than 5 km/h, particularly at Silk Board, which is widely regarded as one of the most congested intersections in the country.

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The economic implications of this persistent congestion are severe. Longer commute times, fuel wastage, and productivity losses directly impact both individuals and businesses. More importantly, nearly 40% of Karnataka’s taxpayers live or work along this corridor, underscoring the significance of its smooth functioning to the state’s economy. Without substantial improvements, the inefficiencies on ORR risk undermining Bengaluru’s competitive advantage as a global technology hub.

In addition to traffic delays, the corridor suffers from acute deficiencies in pedestrian and non-motorized infrastructure. Despite being lined with offices, residences, and retail complexes, continuous and safe footpaths are missing, forcing pedestrians onto the carriageway and creating safety hazards. The absence of a dedicated cycle track further discourages sustainable transport choices, even though such facilities would ease last-mile connectivity to metro stations and reduce dependence on private vehicles.

Another pressing concern is drainage. Even moderate rainfall results in severe waterlogging, and stretches of the road often appear flooded, leading to further disruption and damage to road infrastructure. This recurring problem highlights the urgent need for an upgraded and integrated stormwater drainage system to complement road improvements.

The environmental impact of the present situation is also significant. Prolonged traffic jams contribute to high levels of vehicular emissions, worsening local air quality and exposing residents and commuters to health risks. With the ORR already identified as a high-density transport and residential zone, the absence of effective mitigation measures will only compound the challenges.

Recognizing these issues, multiple interventions are already in motion. The ongoing metro line from Silk Board to KR Puram, part of Namma Metro Phase 2A, promises a high-capacity alternative once completed. Initiatives by organizations such as the Outer Ring Road Companies’ Association (ORRCA) in supporting traffic management and maintenance are valuable, but insufficient on their own. Comprehensive improvements to the ORR are essential ranging from white topping of the main carriageway, provision of SMA for service roads, construction of safe pedestrian footpaths and cycle tracks, improved junction management, and modernized drainage infrastructure. Together, these measures will not only restore efficiency and safety but also ensure that this critical corridor continues to support Bengaluru’s growth in a sustainable and resilient manner.

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4.2 PROJECT SCOPE

Improvement works are proposed for the following stretches and the summary of the improvement lengths is represented below.

Sl. No	Name of the Road / Junction	Project length considered in Km
1	“Development of Outer Ring Road to International Standards including Main Carriageway and Service Roads in Bangalore City” Package 02 : KR Puram to Iblur Junction	11.57
Total length, Km		11.57 Km

The project corridor is studied with respect to the existing features on the project roads viz No of lanes, carriageway details, Drains and CDs, Footpaths, Medians, Junctions, sign Boards and other traffic safety appurtenances along the project corridor. Accordingly, Improvement Proposals for the corridor are listed and briefed below.

Main Carriageway Improvements: The existing main carriageway currently exhibits multiple deficiencies, including uneven surfaces, potholes, poor riding quality, faded lane markings, and inadequate traffic management features. These issues not only reduce traffic efficiency but also increase travel time, vehicle operating costs, and accident risks. Given that over 40% of Karnataka’s taxpayers, along with numerous commercial, residential, and IT establishments, are located along this corridor, it is essential to carry out comprehensive improvements.

The proposed improvement involves rehabilitation of the carriageway using flexible/bituminous pavement, including complete reconstruction of Carriageway width, disturbed and restored by METRO. by dismantling of the existing BT and granular layers, milling, prime coat, tack coat, granular sub-base (GSB), wet mix macadam (WMM), dense bituminous macadam (DBM), bituminous concrete (BC), glass grid reinforcement, and remaining width is constructed with strengthening and Overlay of Bituminous layers. An additional 12 mm mastic asphalt, is provided at structures locations. Provisions are also made for pavement repair works during-construction in terms of DBM and BC. In addition, proper lane markings, road studs, edge and centre line markings, and additional provisions for strips, bays, rumble strips, and traffic management features are planned to enhance safety and operational efficiency.

These interventions will create a stronger, smoother, and more durable carriageway capable of accommodating high traffic volumes, reducing recurrent maintenance requirements, and improving overall traffic flow. Considering ongoing metro construction

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and its impact on commuter delays, this upgrade will help mitigate congestion while providing safer, more reliable, and efficient travel for daily commuters, commercial transport, and residents along one of Bengaluru’s busiest corridors.

Service Road Improvements: The existing service roads are characterized by distressed pavement surfaces, frequent patchwork repairs, uneven riding quality, and inadequate markings, making them inconvenient and unsafe for local traffic. These conditions disrupt smooth access to adjacent residential, commercial, and institutional establishments and create conflicts between slower local traffic and high-speed through traffic on the main carriageway. Given that a large proportion of Karnataka’s taxpayers, businesses, and residents rely on these service roads for daily access, their improvement is essential.

The proposed improvements involve flexible pavement rehabilitation, including dismantling of the existing bituminous layer, excavation, laying of wet mix macadam (WMM), Application of prime coat, tack coat, dense bituminous macadam (DBM), and bituminous concrete (BC). Additionally, edge line marking, road studs, PCC kerbs, kerb construction and painting, and additional provisions for strips, bays, and rumble strips will be provided to enhance safety and traffic discipline.

These interventions will provide a durable and smooth riding surface with improved skid resistance, ensure safe and seamless access to properties, support proper segregation of local and through traffic, reduce recurring maintenance needs, and enhance the overall efficiency, safety, and functionality of the corridor.

Central Median Improvement: The central median along the main carriageway is proposed to be upgraded to enhance safety, channelize traffic, and improve urban aesthetics. In stretches where metro piers are present, the median works will be executed between the piers, avoiding structural conflicts. The improvement scope includes median construction, barrier painting, crash barrier painting, and painting for grade separators. Landscaping works will include digging pits, plantation, topsoil spreading with quality red earth, and turfing with Bermuda grass, with labour charges for spreading accounted for. These enhancements will provide a robust, clearly delineated median that helps prevent mid-line crossings, reduces accident potential, and offers visual consistency along the corridor.

Service Road Median Improvement: The existing service road median is currently combined with footpath and RCC drain elements. To improve functionality and aesthetics, the proposal entails reconstruction and enhancement as per the defined work items. The

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scope includes scarification of existing bituminous and metal layers, dismantling and resetting of paver blocks, removal of existing kerb, excavation, laying of WMM, construction of channel kerbs, laying of new 60 mm paver blocks, and landscaping (planting, topsoil, Bermuda grass turf). These interventions will reconfigure the median as a dedicated landscape and safety strip, better delineating service road carriageways, facilitating drainage, and improving the streetscape while maintaining safe pedestrian access.

Footpath and Kerbs: Well-designed footpaths and kerbs are essential for ensuring pedestrian safety, accessibility, and overall urban aesthetics. The proposed improvements focus on upgrading pedestrian facilities to provide smooth, durable, and walk-friendly infrastructure. The scope of work includes dismantling of existing paver blocks and kerb stones, excavation, provision of WMM and PCC M10 base layers, PCC for kerbs, fixing of new kerbs, kerb painting, and construction of M30-grade brushed concrete for ramps and Footpath surfaces, making the surface commutable for both Cyclists and Pedestrians.

Additional features such as bollards, tree guards, and green hedging are proposed to improve safety, delineation, and visual appeal. Underground HDPE utility ducts with inspection chambers will be provided at suitable intervals to enable future maintenance of service lines without disrupting the pavement. These improvements will ensure safe and comfortable pedestrian movement while enhancing the functional and aesthetic quality of the corridor.

Utility Ducts: Provision of underground utility ducts is an integral component of the corridor improvement works, aimed at facilitating the organized and safe placement of various utility services such as power, optical fibre cables (OFC), water, and communication lines. The objective is to eliminate frequent road cutting and ensure long-term maintainability without disturbing the newly improved pavement and pedestrian facilities.

The scope of work includes excavation, laying of HDPE pipes (200 mm and 110 mm dia) for utility and OFC ducts, followed by sand filling and compaction. Chambers for both utility and OFC ducts will be constructed using PCC M10 for base, RCC M25 for bottom slab, side walls, and cover slab, reinforced with TMT steel and finished with MS steel collars for the cover slabs to ensure durability and ease of access.

In addition, cross ducts will be provided at regular intervals and key junctions across the carriageway for interconnection of services. These works involve scarification of existing

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bituminous and granular layers, excavation, laying of NP3 pipes, sand filling, and reinstatement with GSB and WMM layers.

This systematic ducting approach will ensure efficient accommodation of present and future utility requirements while preserving the structural integrity and aesthetic value of the corridor.

Drainage Improvement and Structural Works: Robust drainage design is critical to corridor longevity and safety, especially in high-traffic and heavy rainfall conditions. Under this component, RCC side drains will be constructed in stretches where existing drainage is absent or disconnected, and desilting of existing drains will be undertaken where required. The structural works include excavation, PCC M10 bedding, RCC M25 raft and wall construction, cover slabs reinforced with TMT steel, kerb installations, kerb painting, and chequered tiles. Further, integrated ducting may pass through or alongside drain structures (HDPE pipes, sand filling, grating) to support utility crossings. Together, these works will ensure uninterrupted conveyance of stormwater, prevent waterlogging and pavement deterioration, and improve safety by reducing hydroplaning and skidding risks.

Green Hedging and Landscape Development: To enhance the visual appeal and environmental quality of the corridor, green hedging and landscape works are proposed along the medians, service roads, and pedestrian zones. The scope of work includes excavation, PCC foundation for kerb placement, kerb installation and painting, followed by digging of planting pits, filling with quality red earth, and plantation of hedges and turfing with Bermuda grass. Labor charges for spreading and finishing have been included to ensure uniform greenery and well-maintained turf surfaces. These interventions not only improve the aesthetics of the corridor but also contribute to dust suppression, microclimate regulation, and better delineation of pedestrian and vehicular zones. The inclusion of hedging along key sections also provides a soft barrier to discourage jaywalking and improves the overall urban landscape experience.

Street Lighting: Efficient street lighting is essential for road safety, security and urban aesthetics. This proposal focuses on upgrading street lighting infrastructure to enhance visibility, reduce energy consumption, and to aid overall mobility on the project road. The street lighting proposal includes installation new street lighting illuminating both Main Carriageway and service road, however shifting of existing utility is not considered in the project proposal.

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Cross Road Improvement: To enhance connectivity, safety, and traffic flow at intersections along the corridor, cross road improvements are proposed, including resurfacing, kerb provision, and pavement strengthening. These improvements will ensure better segregation of vehicular and pedestrian traffic, improved drainage along intersections, and enhanced durability of pavement at high-stress crossing areas, thereby contributing to overall corridor safety and operational efficiency.

Bus Bay and Bus Shelter Improvements: To enhance public transport facilities along the corridor, improvements to existing bus bays and provision of modern bus shelters are proposed. The upgrades will include bus shelters and provisions for kiosks and other passenger amenities. The improvements for bus bays will involve milling of existing bituminous layers, application of tack coat, replacement of granular base if required, DBM and BC resurfacing, application of glass grid for reinforcement, and edge/centre line markings. Additional provisions for strips, bays, rumble strips, and road studs are also included to improve traffic safety and passenger convenience. These measures are expected to enhance passenger comfort, reduce boarding/alighting delays, and improve traffic flow at bus stops, thereby contributing to the overall operational efficiency of the corridor.

Traffic Sign, Markings and Other Safety Appurtenances: Traffic signs, road markings and safety appurtenances play a vital role in guiding road users, improving traffic discipline and reducing accidents. This proposal focuses on upgrading and installing necessary safety infrastructure to enhance road safety and efficiency. Proper traffic signs were selected at required locations along the project corridor. Centre line and edge markings along with Raised Pavement Markers required from safety point of view were considered in the project improvement proposal.

Major Junction Improvements: Major junctions are critical points in an urban road network, where multiple roads intersect, often leading to congestion and accidents. This proposal aims to improve junction capacity, enhance traffic flow, and ensure pedestrian safety through geometric and traffic management upgrades. The main objective of improvement is to Reduce congestion and travel delays at key intersections, improve safety for vehicles, pedestrians and cyclists, optimize traffic signal coordination for better flow, accommodate future traffic growth with sustainable solutions. Junction improvement proposal includes overlay for carriageway, Road markings, installation of sign Boards, construction of channelization islands and Beautification as per the requirement.

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The junctions along the stretch are also affected with extremely high traffic volume, inadequate infra structure, existence of Traffic Bottle necks, lack of lane discipline in turning movements & weaving traffic movement, and impact of Ongoing Construction activities. Addressing these issues requires a multi-pronged approach involving infrastructure improvements, traffic management strategies, and public transportation enhancements. Sustainable solution for these problems requires a comprehensive strategy that spans short, medium, and long-term solutions. However, the project improvement proposals include only short-term improvement measures.

Short-Term Improvements (0 -12 months):

- Improve signage and lane markings to guide traffic flow more effectively.
- Optimize existing diversions due to construction, ensuring clear signage and minimal disruption through construction of channelization islands.
- Deploy traffic marshals during peak hours to manually direct traffic and manage congestion.
- Implement intelligent traffic signal systems with adaptive timing based on real-time traffic flow.
- Lane Discipline Management
- Improving street lighting, proper footpaths and pedestrian crossings with clear markings and signage.
- Improve pedestrian and cyclist infrastructure, including wider footpaths and dedicated cycle lanes.
- Repair and improve the damaged shoulder drains and stormwater drains.

Medium-Term Improvements (1-3 years):

- Completion of ongoing metro ensuring seamless integration with existing transportation networks.
- Development of dedicated bus lanes or priority corridors to improve public transport efficiency.
- Enhance public transportation options, including increased bus frequency and improved connectivity.

Long-Term Improvements (3-5+ years):

- Complete the peripheral ring road to divert through traffic.
- Develop a comprehensive urban transportation plan that prioritizes sustainable mobility and reduces reliance on private vehicles.

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- Integrate land use planning with transportation planning to minimize travel demand.
- Promote the use of public transportation, cycling, and walking.
- Implement smart traffic management systems that utilize data analytics and artificial intelligence to optimize traffic flow.

Promote the use of electric vehicles and other sustainable transportation options

4.3.1 Proposed Cross Sections

The total length of the project road improvement is 11.57 Km excluding the improvement lengths of cross roads at Major junctions. Five typical cross section has been proposed. The detailed Cross Section with their details is as shown in the **Table 4.1**

Table 4.1 Summary of Improvement proposals of Cross Sections

TCS Type	Proposed Cross Section	Length in Kms
TCS-01	Typical Cross Sections at Metro section reaches	1470
TCS-02	Typical Cross Sections at Regular reaches with Service Roads	5600
TCS-03	Typical Cross Sections at Underpass reaches	1360
TCS-04	Typical Cross Sections at Dual Flyover reaches	2660
TCS-05	Typical Cross Sections at Single Flyover reaches	480
Total Length of Proposed Project Road, m		11570

TYPICAL CROSS SECTIONS:

TCS-01: Typical Cross Sections at Metro section reaches;

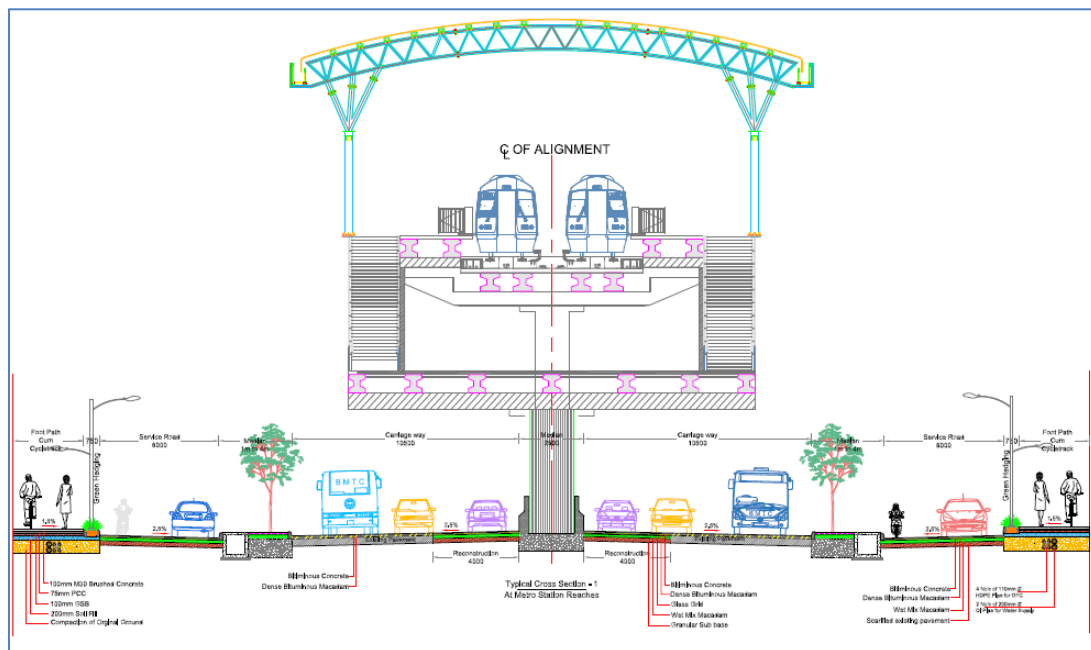


Figure 4.1 TCS-01

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TCS-02: Typical Cross Sections at Regular reaches with Service Roads;

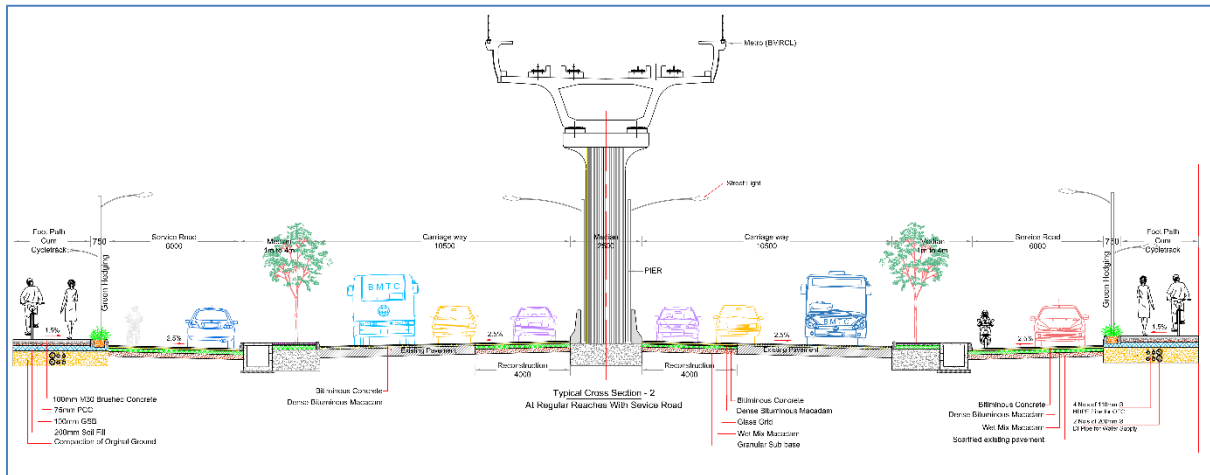


Figure 4.2 TCS-02

TCS-03: Typical Cross Sections at Underpass reaches;

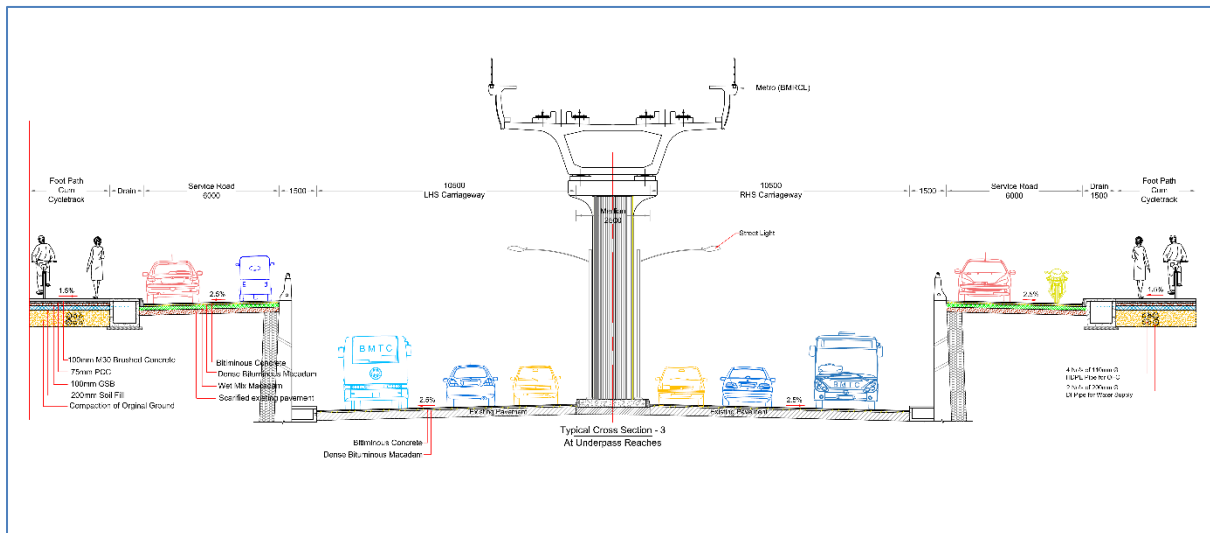


Figure 4.3 TCS-03

Package 02 : KR Puram to Iblur Junction

TCS-04: Typical Cross Sections at Dual Flyover reaches:

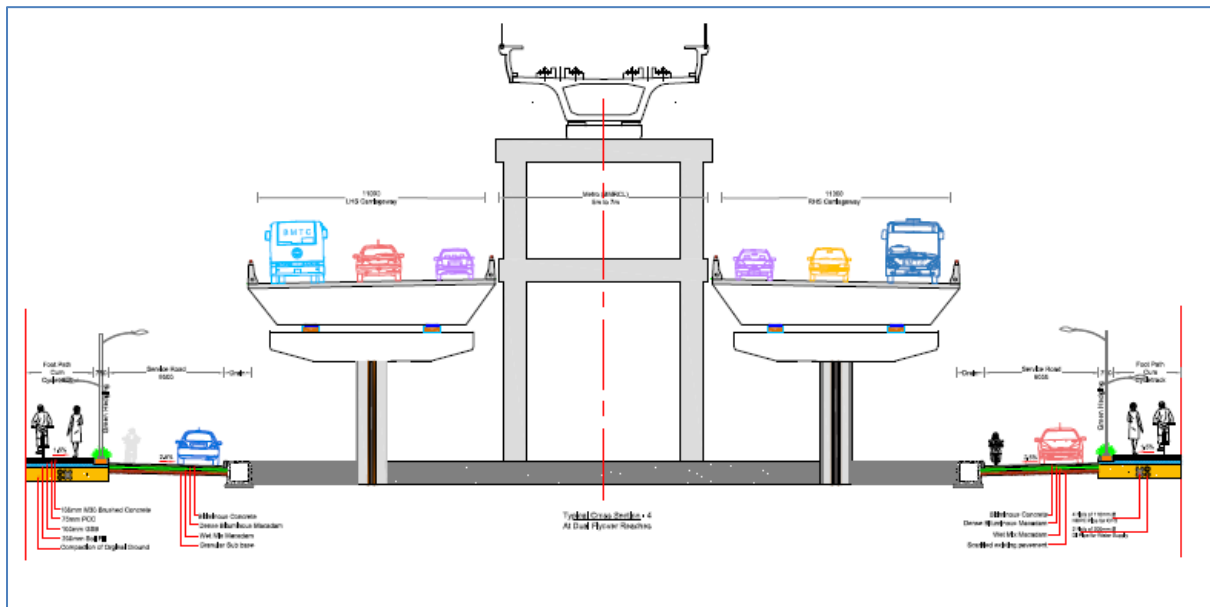


Figure 4.4 TCS-04

TCS-05: Typical Cross Sections at Single Flyover reaches:

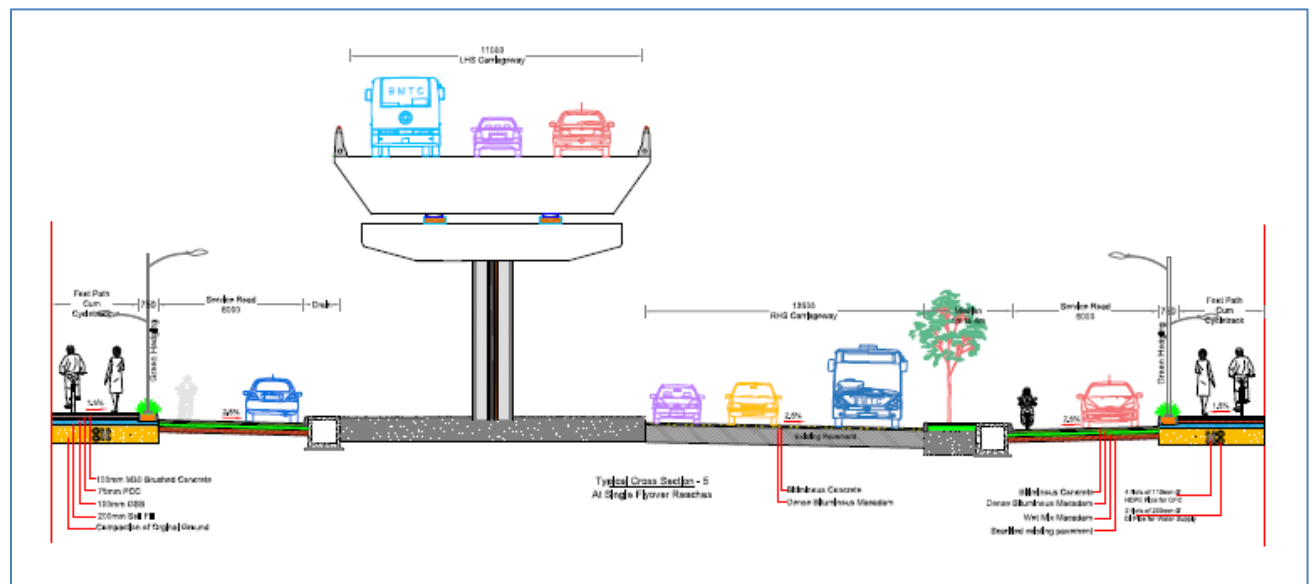


Figure 4.5 TCS-05

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CHAPTER 5. PROJECT COSTING

5.1 GENERAL

The project cost estimates have been prepared based on the various items of work proposed for the comprehensive improvement of the Outer Ring Road (ORR) corridor, covering a total length of approximately 17.01 km. The improvement works extend from KR Puram (Ch. 0+000) to Central Silk Board Junction (Ch. 17+010), passing through key locations such as Tin Factory, Marathahalli, Kadubeesanahalli, Bellandur, Iblur, Agra, and HSR Layout.

The overall project is divided into two packages based on the jurisdictional limits of the Greater Bengaluru Authority (South and East). This report pertains to **Package 02**, which covers a total length of **11.57 km**, extending from **KR Puram to Iblur Junction**, and falls within the **GBA East Zone**. The proposed scope of works includes the provision of flexible pavement for the main carriageway and service roads, junction improvements and corridor beautification at critical locations, construction and upgradation of pedestrian facilities, and strengthening of the stormwater drainage system.

These improvements are designed to enhance traffic flow, improve road safety, provide adequate non-motorized transport (NMT) infrastructure, and ensure sustainable and efficient mobility along this high-density urban corridor. The details of the proposed improvements are given in the below tables.

Table 5.1 :Summary of Proposed Improvements along the Project Corridor

Sl. No	Name of the Road / Junction	Project length considered in Km
1	“Development of Outer Ring Road to International Standards including Main Carriageway and Service Roads in Bangalore City” Package 02 : KR Puram to Iblur Junction	11.57
Total length, Km		11.57 Km

Table 5.2 :Proposed Improvements Length along the Project Corridors

TCS Type	Proposed Cross Section	Length in Kms
TCS-01	Typical Cross Sections at Metro section reaches	1470
TCS-02	Typical Cross Sections at Regular reaches with Service Roads	5600
TCS-03	Typical Cross Sections at Underpass reaches	1360
TCS-04	Typical Cross Sections at Dual Flyover reaches	2660
TCS-05	Typical Cross Sections at Single Flyover reaches	480
Total Length of Proposed Project Road, m		11570

5.2 SPECIFICATIONS

The specifications adopted for arriving at the item rates for estimating the project cost conform to the provisions made in the Ministry of Road Transport & Highways (MoRT&H) “Specifications for Road and Bridge Works,” Fifth Revision. In addition, provisions from the Indian Roads Congress (IRC) Codes, Bureau of Indian Standards (BIS), and specific guidelines issued by the Government of Karnataka have been followed wherever applicable.

5.3 COMPUTATION OF QUANTITIES

The quantities have been worked out separately for different items of work. The construction cost has been sub - divided into Main Carriageway & Service Road improvement, Junction Improvement, Footpath Improvement, Utility Ducts, Median Improvement, Road Furnitures, Green Hedging and RCC Drains, Drainage Improvement and other structural Works, Traffic signs, Marking and other traffic safety Appurtenances.

The following are the Bill wise of works, which have been estimated:

Main Carriageway Improvements: Rehabilitation of the main carriageway with flexible pavement including milling, GSB, WMM, DBM, BC, mastic asphalt, lane markings, road studs, rumble strips, and traffic management features to improve riding quality and safety.

Service Road Improvements: Service roads will be upgraded with flexible pavement, edge line markings, PCC kerbs, road studs, rumble strips, and provisions for safe local traffic access.

Footpath and Kerb Improvements: Replacement of damaged paver blocks and kerbs with WMM and PCC layers, ramps, bollards, tree guards, and green hedging for safe pedestrian movement.

Utility Ducts with Chambers: Underground HDPE ducts and cross ducts with inspection chambers provided for organized placement of utilities without disturbing pavements.

Median Improvements: Central and service road medians improved with kerbs, WMM, paver blocks, New Jersey barriers, guard rails, and landscaping including turfing.

RCC Drainage and Structural Works: Construction of new drains, desilting of existing drains, PCC bedding, RCC walls and cover slabs, and integrated duct crossings for utilities.

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Green Hedging and Road Furnitures: Provision of hedges, bollards, road markings, RPMs, and signboards for traffic safety and visual appeal.

Street Lighting: Adequate lighting along main carriageway, service roads, and pedestrian zones for safety and visibility.

Cross Road, Junction, Bus Bay and Shelter Improvements: Pavement strengthening, overlay, kerbs, channelization islands, signage, bus bays, and shelters for improved traffic flow, public transport, and commuter safety.

Traffic Signs, Markings and Safety Appurtenances: Selection and installation of traffic signs, center/edge markings, and raised pavement markers for improved road safety.

Major Junction Improvement: Short-term improvements include lane markings, signage, traffic marshals, footpath/cycle lane upgrades, and drain repairs. Medium-term includes metro integration and bus lanes. Long-term focuses on ring road completion, sustainable mobility planning, smart traffic systems, and promotion of public transport and EVs.

5.4 UNIT RATES

Rate analysis has been carried out considering the Schedule of Rates (SoR) 2023–24, Public Works Department, Karnataka (Bengaluru Circle), duly incorporating the latest issue rates of cement, steel, bitumen, and fuel as notified by the Government of Karnataka.

5.5 PROJECT COST

The total project cost includes Main Carriageway Improvement, Service Road Improvement, Footpath Improvement, Utility Ducts, Chamber for OFC ducts, Utility Cross Ducts, Median Improvement, Green Hedging, RCC Drain, Sign Boards, Cross Road Improvement, Street Lighting, Dismantling and Haulage. A detailed breakup of costs is presented in below table.

Table 5.3 :Summary of Cost Estimate

SL No	Description	Amount, Rs	Amount, Cr Rs
1	Main Carriageway Improvement	63,70,68,600.43	63.71
2	Service Road Improvement	28,21,46,235.10	28.21
3	Service Road Median	8,34,32,960.24	8.34
4	Footpath Improvement	13,39,14,383.15	13.39
5	Utility Ducts	19,29,42,521.62	19.29

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SL No	Description	Amount, Rs	Amount, Cr Rs
6	Utility Cross Ducts	5,41,17,334.40	5.41
7	Median Improvement	6,39,41,821.83	6.39
8	Land Scaping	1,95,81,780.40	1.96
9	RCC Drain	14,67,54,631.36	14.68
10	Sign Boards and Safety Appurtenances	2,54,63,496.40	2.55
11	Cross Road Improvement	7,11,23,118.00	7.11
12	Dismantling and Haulage	15,48,15,536.17	15.48
13	Bus Bay and Bus Shelter	7,36,75,657.87	7.37
14	Street Lighting	13,95,34,624.86	13.95
15	Major Jn. Improvement	7,08,79,310.71	7.09
16	Restoration of Manholes	70,21,578.83	0.70
17	Preliminary Works like Diversion of Traffic, Barricading, Asphaltting Bad Reaches and Appointment of Home Guards	7,97,36,038.06	7.97
18	Civil Cost (Amount put to Tender)	2,23,61,49,629.44	223.61
19	GST @ 18%	40,25,06,933.30	40.25
20	Civil Construction Total	2,63,86,56,562.74	263.87
21	PMC @ 1.5% of Civil Cost	3,35,42,244.44	3.35
22	Departmental Establishment Charges and other Contingencies @ 2% of Civil Cost	4,47,22,992.59	4.47
23	Escalation @ 5.0 % of Civil Cost for the 1st Year	11,18,07,481.47	11.18
24	Maintenance Charges @ 2.5% of Civil Cost for 5 years	5,59,03,740.74	5.59
25	Tender Premium @ 5% of Civil Cost	11,18,07,481.47	11.18
26	Provision for ITMS, ATCS and Utility Shifting	7,35,00,000.00	7.35
27	Subtotal of Centages	43,12,83,940.71	43.13
28	Rounding Off	59,496.55	0.01
29	Total Project Cost, Rs.	3,07,00,00,000.00	307.00

Cost Summary

Summary of Cost

Name of work: "Improvements of Outer Ring Road from KR Puram to Silk board Junction (Total Length 17.01 Km) in Bangalore City."
Package 02 : KR Puram to Iblur Junction - Length (11.57 Km)

SL No	Description	Amount, Rs	Amount, Cr Rs
1	Main Carriageway Improvement	63,70,68,600.43	63.71
2	Service Road Improvement	28,21,46,235.10	28.21
3	Service Road Median	8,34,32,960.24	8.34
4	Footpath Improvement	13,39,14,383.15	13.39
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27	Subtotal of Centages	43,12,83,940.71	43.13
28	Rounding Off	59,496.55	0.01
29	Total Project Cost , Rs.	3,07,00,00,000.00	307.00

Bill of Quantity

Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
Main Carriageway Improvement									
1	Dismantling of Flexible Pavements Dismantling of Flexible pavements and disposal of dismantled materials and stacking serviceable and unserviceable materials separately II) By Mechanical Means. A. Bituminous course	Cum					20903.01	354.20	7403847.88
	PWD SR 23-24 V-3 Item no 2.18 II A Page no 11 & 12								
	TCS-01 at Metro Station Reaches LHS	Cum	0.4	1470.00	10.51	0.20	1235.40		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	0.4	5600.00	11.25	0.20	5040.00		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	0.4	1360.00	10.75	0.20	1169.60		
	TCS-04 at Both side Flyover Reaches LHS	Cum	0.4	2660.00	11.79	0.20	2509.20		
	TCS-05 at One side Flyover Reaches LHS	Cum	0.4	480.00	11.25	0.20	432.00		
	TCS-01 at Metro Station Reaches RHS	Cum	0.4	1470.00	11.25	0.20	1323.00		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	0.4	5600.00	11.25	0.20	5040.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	0.4	1360.00	11.75	0.20	1278.40		
	TCS-04 at Both side Flyover Reaches RHS	Cum	0.4	2660.00	11.66	0.20	2481.81		
	TCS-05 at One side Flyover Reaches RHS	Cum	0.4	480.00	10.25	0.20	393.60		
2	Dismantling of Flexible Pavements Dismantling of Flexible pavements and disposal of dismantled materials and stacking serviceable and unserviceable materials separately II) By Mechanical Means. A. Granular courses	Cum					36580.28	58.30	2132630.10
	PWD SR 23-24 V-3 Item no 2.18 II B Page no 11 & 12								
	TCS-01 at Metro Station Reaches LHS	Cum	0.4	1470.00	10.51	0.35	2161.95		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	0.4	5600.00	11.25	0.35	8820.00		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	0.4	1360.00	10.75	0.35	2046.80		
	TCS-04 at Both side Flyover Reaches LHS	Cum	0.4	2660.00	11.79	0.35	4391.10		
	TCS-05 at One side Flyover Reaches LHS	Cum	0.4	480.00	11.25	0.35	756.00		
	TCS-01 at Metro Station Reaches RHS	Cum	0.4	1470.00	11.25	0.35	2315.25		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	0.4	5600.00	11.25	0.35	8820.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	0.4	1360.00	11.75	0.35	2237.20		
	TCS-04 at Both side Flyover Reaches RHS	Cum	0.4	2660.00	11.66	0.35	4343.18		
	TCS-05 at One side Flyover Reaches RHS	Cum	0.4	480.00	10.25	0.35	688.80		
3	Milling of existing Bituminous surface to a specified depth up to 40mm using Milling machine including disposal of removed material.	Sqm					156772.61	49.50	7760244.28
	PWD SR 23-24 V-3 Item no 2.18 II B Page no 11 & 12								
	TCS-01 at Metro Station Reaches LHS	Sqm	0.6	1470.00	10.51	-	9265.50		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	0.6	5600.00	11.25	-	37800.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	0.6	1360.00	10.75	-	8772.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	0.6	2660.00	11.79	-	18819.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	0.6	480.00	11.25	-	3240.00		

Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-01 at Metro Station Reaches RHS	Sqm	0.6	1470.00	11.25	-	9922.50		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	0.6	5600.00	11.25	-	37800.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	0.6	1360.00	11.75	-	9588.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	0.6	2660.00	11.66	-	18613.61		
	TCS-05 at One side Flyover Reaches RHS	Sqm	0.6	480.00	10.25	-	2952.00		
4	Providing and applying primer coat with SS1 grade Bitumen Emulsion on prepared surface of granular base including cleaning of road surface and spraying primer at the rate of 0.70 kg/m ² using mechanical means.	Sqm					104515.07	45.10	4713629.86
	PWD SR 23-24 V-3 Item no 5.2 Page no 31								
	TCS-01 at Metro Station Reaches LHS	Sqm	0.4	1470.00	10.51	-	6177.00		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	0.4	5600.00	11.25	-	25200.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	0.4	1360.00	10.75	-	5848.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	0.4	2660.00	11.79	-	12546.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	0.4	480.00	11.25	-	2160.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	0.4	1470.00	11.25	-	6615.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	0.4	5600.00	11.25	-	25200.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	0.4	1360.00	11.75	-	6392.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	0.4	2660.00	11.66	-	12409.07		
	TCS-05 at One side Flyover Reaches RHS	Sqm	0.4	480.00	10.25	-	1968.00		
5	Providing and applying tack coat with VG-10 Bitumen using pressure distributor at the rate of 0.20 kg/m ² on the prepared bituminous surface cleaned with mechanical broom	Sqm					261287.69	13.20	3448997.46
	PWD SR 23-24 V-3 Item no 5.32 Page no 43								
	TCS-01 at Metro Station Reaches LHS	Sqm	1.0	1470.00	10.51	-	15442.50		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	1.0	5600.00	11.25	-	63000.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	1.0	1360.00	10.75	-	14620.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	1.0	2660.00	11.79	-	31365.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	1.0	480.00	11.25	-	5400.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	1.0	1470.00	11.25	-	16537.50		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	1.0	5600.00	11.25	-	63000.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	1.0	1360.00	11.75	-	15980.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	1.0	2660.00	11.66	-	31022.69		
	TCS-05 at One side Flyover Reaches RHS	Sqm	1.0	480.00	10.25	-	4920.00		

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
10	Providing and laying Bituminous Concrete with 120 TPH capacity hot mix plant batch type using crushed aggregates of specified grading, premixed with bituminous binder VG-40, @ 5.4 per cent of mix and filler, transporting the hot mix to work site, laying with mechanical paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 507 complete in all respects	Cum					10451.51	12566.40	131337823.21
	PWD CSR 23-24 V-3 Item no 5.15 A Page no 37								
	TCS-01 at Metro Station Reaches LHS	Cum	1.0	1470.00	10.51	0.04	617.70		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	1.0	5600.00	11.25	0.04	2520.00		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	1.0	1360.00	10.75	0.04	584.80		
	TCS-04 at Both side Flyover Reaches LHS	Cum	1.0	2660.00	11.79	0.04	1254.60		
	TCS-05 at One side Flyover Reaches LHS	Cum	1.0	480.00	11.25	0.04	216.00		
	TCS-01 at Metro Station Reaches RHS	Cum	1.0	1470.00	11.25	0.04	661.50		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	1.0	5600.00	11.25	0.04	2520.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	1.0	1360.00	11.75	0.04	639.20		
	TCS-04 at Both side Flyover Reaches RHS	Cum	1.0	2660.00	11.66	0.04	1240.91		
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	480.00	10.25	0.04	196.80		
11	Providing and laying 12 mm thick mastic asphalt wearing course on top of deck slab excluding prime coat with paving grade bitumen meeting the requirements given in table 500- 29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005 m3 per 10 m2 and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 100 deg. C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 515.	Sqm					19140.00	550.00	10527000.00
	PWD CSR 23-24 V-3 Item no 13.3 Page no 121								
		Sqm	1.0	1740.00	11.00	-	19140.00		
12	Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 g/m2 area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35:2015.The finished surface to be level, uniform and free from streaks and holes.	Sqm					41393.30	583.00	24132293.90
	PWD SR 23-24 V-3 Item no 8.15 Page no 67								

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-01 at Metro Station Reaches LHS	Sqm	4.0	1470.00	0.15	-	882.00		Edge Line Marking
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	4.0	5600.00	0.15	-	3360.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	4.0	1360.00	0.15	-	816.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	4.0	2660.00	0.15	-	1596.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	4.0	480.00	0.15	-	288.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	4.0	1470.00	0.15	-	882.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	4.0	5600.00	0.15	-	3360.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	4.0	1360.00	0.15	-	816.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	4.0	2660.00	0.15	-	1596.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	4.0	480.00	0.15	-	288.00		
	TCS-01 at Metro Station Reaches LHS	Sqm	1.0	1470.00	0.15	-	73.50		Centre Line Marking
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	1.0	5600.00	0.15	-	280.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	1.0	1360.00	0.15	-	68.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	1.0	2660.00	0.15	-	133.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	1.0	480.00	0.15	-	24.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	1.0	1470.00	0.15	-	73.50		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	1.0	5600.00	0.15	-	280.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	1.0	1360.00	0.15	-	68.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	1.0	2660.00	0.15	-	133.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	1.0	480.00	0.15	-	24.00		
	TCS-01 at Metro Station Reaches LHS	Sqm	-	-	-	-	286.65		additional 30% for Strips, Bays, rumble strips etc.,
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	-	-	-	-	1092.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	-	-	-	-	265.20		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	-	-	-	-	518.70		
	TCS-05 at One side Flyover Reaches LHS	Sqm	-	-	-	-	93.60		
	TCS-01 at Metro Station Reaches RHS	Sqm	-	-	-	-	286.65		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	-	-	-	-	1092.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	-	-	-	-	265.20		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	-	-	-	-	518.70		
	TCS-05 at One side Flyover Reaches RHS	Sqm	-	-	-	-	93.60		
	TCS-01 at Metro Station Reaches LHS	Sqm	9.0	50.00	3.50	-	1575.00		Stamping for Bus Lane
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	24.0	50.00	3.50	-	4200.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	8.0	50.00	3.50	-	1400.00		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-04 at Both side Flyover Reaches LHS	Sqm	14.0	50.00	3.50	-	2450.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	5.0	50.00	3.50	-	875.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	9.0	50.00	3.50	-	1575.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	24.0	50.00	3.50	-	4200.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	8.0	50.00	3.50	-	1400.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	14.0	50.00	3.50	-	2450.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	5.0	50.00	3.50	-	875.00		
	TCS-01 at Metro Station Reaches LHS	Sqm	9.0	3.50	2.00	-	63.00		-
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	24.0	3.50	2.00	-	168.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	8.0	3.50	2.00	-	56.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	14.0	3.50	2.00	-	98.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	5.0	3.50	2.00	-	35.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	9.0	3.50	2.00	-	63.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	24.0	3.50	2.00	-	168.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	8.0	3.50	2.00	-	56.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	14.0	3.50	2.00	-	98.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	5.0	3.50	2.00	-	35.00		
13	Supplying and Fixing of Molded Shank Raised Pavement Markers / Cat's Eye made of polycarbonate and ABS moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 16000 kg tested in accordance to ASTM D 4280 Type H and complying to Specifications of Category A of MORTH Circular No RW/NH/33023/10-97 DO III Dt 11.06. 1997. The height, width and length shall not exceed 50 mm, 100 mm and 102 +/- 2 mm and with minimum reflective area of 13 cm2 on each side and the slope to the base shall be 35 +/- 5 degree. The strength of detachment No. 500.00 of the integrated cylindrical shanks, (of diameter not less than 19 +/- 2 mm and height not less than 30 +/- 2 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturer's recommendation and complete as directed by the engineer. The contractor shall submit a two year warranty for satisfactory field performance including stipulated retro-reflectance of the reflecting panel, to the Engineer	Each					16722.00	401.50	6713883.00
	PWD SR 23-24 V-3 Item no 8.43 Page no 74								
	TCS-01 at Metro Station Reaches LHS	Nos	5.0	1470.00	9.00	m c/c	817.00		Road Studs
	TCS-02 At Grade Sections with Service Roads LHS	Nos	5.0	5600.00	9.00	m c/c	3111.00		

Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-03 At Underpass / RUB Reaches LHS	Nos	5.0	1360.00	9.00	m c/c	756.00		
	TCS-04 at Both side Flyover Reaches LHS	Nos	5.0	2660.00	9.00	m c/c	1478.00		
	TCS-05 at One side Flyover Reaches LHS	Nos	5.0	480.00	9.00	m c/c	267.00		
	TCS-01 at Metro Station Reaches RHS	Nos	5.0	1470.00	9.00	m c/c	817.00		
	TCS-02 At Grade Sections with Service Roads RHS	Nos	5.0	5600.00	9.00	m c/c	3111.00		
	TCS-03 At Underpass / RUB Reaches RHS	Nos	5.0	1360.00	9.00	m c/c	756.00		
	TCS-04 at Both side Flyover Reaches RHS	Nos	5.0	2660.00	9.00	m c/c	1478.00		
	TCS-05 at One side Flyover Reaches RHS	Nos	5.0	480.00	9.00	m c/c	267.00		
	TCS-01 at Metro Station Reaches LHS	Nos	-	-	-	-	246.00		additional 30% for Strips, Bays, rumble strips etc.,
	TCS-02 At Grade Sections with Service Roads LHS	Nos	-	-	-	-	934.00		
	TCS-03 At Underpass / RUB Reaches LHS	Nos	-	-	-	-	227.00		
	TCS-04 at Both side Flyover Reaches LHS	Nos	-	-	-	-	444.00		
	TCS-05 at One side Flyover Reaches LHS	Nos	-	-	-	-	81.00		
	TCS-01 at Metro Station Reaches RHS	Nos	-	-	-	-	246.00		
	TCS-02 At Grade Sections with Service Roads RHS	Nos	-	-	-	-	934.00		
	TCS-03 At Underpass / RUB Reaches RHS	Nos	-	-	-	-	227.00		
	TCS-04 at Both side Flyover Reaches RHS	Nos	-	-	-	-	444.00		
	TCS-05 at One side Flyover Reaches RHS	Nos	-	-	-	-	81.00		
14	Supplying and fixing M15 grade precast cement concrete Kerb stones for Roadway, Sidewalls and gutters fixed with CM 1:3 fixed and finished in line as per direction of Engineer in charge. (The cost of PCC shall be paid extra) 300 x 250 x 100 mm size	m					-	333.30	-
	PWD SR 23-24 V-3 Item no 8.42.1 Page no 74								
	TCS-01 at Metro Station Reaches LHS	m	-	1470.00	-	-	-		
	TCS-02 At Grade Sections with Service Roads LHS	m	-	5600.00	-	-	-		
	TCS-03 At Underpass / RUB Reaches LHS	m	-	1360.00	-	-	-		
	TCS-04 at Both side Flyover Reaches LHS	m	-	2660.00	-	-	-		
	TCS-05 at One side Flyover Reaches LHS	m	-	480.00	-	-	-		
	TCS-01 at Metro Station Reaches RHS	m	-	1470.00	-	-	-		
	TCS-02 At Grade Sections with Service Roads RHS	m	-	5600.00	-	-	-		
	TCS-03 At Underpass / RUB Reaches RHS	m	-	1360.00	-	-	-		
	TCS-04 at Both side Flyover Reaches RHS	m	-	2660.00	-	-	-		
	TCS-05 at One side Flyover Reaches RHS	m	-	480.00	-	-	-		
15	Painting Two Coats on New Concrete Surfaces Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces	Sqm					-	105.60	-

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-01 at Metro Station Reaches LHS	Sqm	-	-	-	-	132.30		additional 30% for Strips, Bays, rumble strips etc.,
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	-	-	-	-	504.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	-	-	-	-	122.40		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	-	-	-	-	239.40		
	TCS-05 at One side Flyover Reaches LHS	Sqm	-	-	-	-	43.20		
	TCS-01 at Metro Station Reaches RHS	Sqm	-	-	-	-	132.30		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	-	-	-	-	504.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	-	-	-	-	122.40		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	-	-	-	-	239.40		
	TCS-05 at One side Flyover Reaches RHS	Sqm	-	-	-	-	43.20		
25	Supplying and Fixing of Molded Shank Raised Pavement Markers / Cat's Eye made of polycarbonate and ABS moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 16000 kg tested in accordance to ASTM D 4280 Type H and complying to Specifications of Category A of MORTH Circular No RW/NH/33023/10-97 DO III Dt 11.06. 1997. The height, width and length shall not exceed 50 mm, 100 mm and 102 +/- 2 mm and with minimum reflective area of 13 cm2 on each side and the slope to the base shall be 35 +/- 5 degree. The strength of detachment No. 500.00 of the integrated cylindrical shanks, (of diameter not less than 19 +/- 2 mm and height not less than 30 +/- 2 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturer's recommendation and complete as directed by the engineer. The contractor shall submit a two year warranty for satisfactory field performance including stipulated retro-reflectance of the reflecting panel, to the Engineer	Each					6692.00	401.50	2686838.00
	PWD SR 23-24 V-3 Item no 8.43 Page no 74								
	TCS-01 at Metro Station Reaches LHS	Nos	2.0	1470.00	9.00	m c/c	327.00		Road Studs
	TCS-02 At Grade Sections with Service Roads LHS	Nos	2.0	5600.00	9.00	m c/c	1244.00		
	TCS-03 At Underpass / RUB Reaches LHS	Nos	2.0	1360.00	9.00	m c/c	302.00		
	TCS-04 at Both side Flyover Reaches LHS	Nos	2.0	2660.00	9.00	m c/c	591.00		
	TCS-05 at One side Flyover Reaches LHS	Nos	2.0	480.00	9.00	m c/c	107.00		
	TCS-01 at Metro Station Reaches RHS	Nos	2.0	1470.00	9.00	m c/c	327.00		
	TCS-02 At Grade Sections with Service Roads RHS	Nos	2.0	5600.00	9.00	m c/c	1244.00		
	TCS-03 At Underpass / RUB Reaches RHS	Nos	2.0	1360.00	9.00	m c/c	302.00		

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
34	Providing and laying 60mm thick factory made precast M -30 grade Cement Concrete Paver Block as per IRC SP 63:2018 & IS 15658 for Cycle Tracks & Pedestrian Footpaths of approved shape and colour, laid in required pattern and including over 30mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.	Sqm					28177.42	1174.80	33102838.85
	PWD CSR V-3 Item no 6.8.1 Page no 51								
	TCS-01 at Metro Station Reaches LHS	Sqm	1.0	882.00	2.00	-	1764.00		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	1.0	3360.00	2.49	-	8359.42		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	1.0	816.00	2.00	-	1632.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	1.0	1596.00	1.50	-	2394.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	1.0	288.00	0.50	-	144.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	1.0	882.00	2.00	-	1764.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	1.0	3360.00	2.00	-	6720.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	1.0	816.00	2.00	-	1632.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	1.0	1596.00	2.00	-	3192.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	1.0	288.00	2.00	-	576.00		
35	Digging pits and Plantation	Nos					29624.00	164.80	4882035.20
	TCS-01 at Metro Station Reaches LHS	Nos	3.0	588.00	-	-	1764.00		
	TCS-02 At Grade Sections with Service Roads LHS	Nos	4.0	2240.00	-	-	8960.00		
	TCS-03 At Underpass / RUB Reaches LHS	Nos	3.0	544.00	-	-	1632.00		
	TCS-04 at Both side Flyover Reaches LHS	Nos	3.0	1064.00	-	-	3192.00		
	TCS-05 at One side Flyover Reaches LHS	Nos	1.0	192.00	-	-	192.00		
	TCS-01 at Metro Station Reaches RHS	Nos	3.0	588.00	-	-	1764.00		
	TCS-02 At Grade Sections with Service Roads RHS	Nos	3.0	2240.00	-	-	6720.00		
	TCS-03 At Underpass / RUB Reaches RHS	Nos	3.0	544.00	-	-	1632.00		
	TCS-04 at Both side Flyover Reaches RHS	Nos	3.0	1064.00	-	-	3192.00		
	TCS-05 at One side Flyover Reaches RHS	Nos	3.0	192.00	-	-	576.00		
36	Quality red earth	Cum					2817.74	530.86	1495826.78
	TCS-01 at Metro Station Reaches LHS	Cum	1.0	588.00	2.00	0.15	176.40		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	1.0	2240.00	2.49	0.15	835.94		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	1.0	544.00	2.00	0.15	163.20		
	TCS-04 at Both side Flyover Reaches LHS	Cum	1.0	1064.00	1.50	0.15	239.40		
	TCS-05 at One side Flyover Reaches LHS	Cum	1.0	192.00	0.50	0.15	14.40		
	TCS-01 at Metro Station Reaches RHS	Cum	1.0	588.00	2.00	0.15	176.40		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	1.0	2240.00	2.00	0.15	672.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	1.0	544.00	2.00	0.15	163.20		
	TCS-04 at Both side Flyover Reaches RHS	Cum	1.0	1064.00	2.00	0.15	319.20		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	192.00	2.00	0.15	57.60		
37	Bermuda Grass turf	Sqm					18784.95	110.00	2066344.50
	TCS-01 at Metro Station Reaches LHS	Sqm	1.0	588.00	2.00	-	1176.00		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	1.0	2240.00	2.49	-	5572.95		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	1.0	544.00	2.00	-	1088.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	1.0	1064.00	1.50	-	1596.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	1.0	192.00	0.50	-	96.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	1.0	588.00	2.00	-	1176.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	1.0	2240.00	2.00	-	4480.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	1.0	544.00	2.00	-	1088.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	1.0	1064.00	2.00	-	2128.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	1.0	192.00	2.00	-	384.00		
38	Labour Charge for Spreading	Sqm					18784.95	61.91	1162938.68
	TCS-01 at Metro Station Reaches LHS	Sqm	1.0	588.00	2.00	-	1176.00		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	1.0	2240.00	2.49	-	5572.95		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	1.0	544.00	2.00	-	1088.00		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	1.0	1064.00	1.50	-	1596.00		
	TCS-05 at One side Flyover Reaches LHS	Sqm	1.0	192.00	0.50	-	96.00		
	TCS-01 at Metro Station Reaches RHS	Sqm	1.0	588.00	2.00	-	1176.00		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	1.0	2240.00	2.00	-	4480.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	1.0	544.00	2.00	-	1088.00		
	TCS-04 at Both side Flyover Reaches RHS	Sqm	1.0	1064.00	2.00	-	2128.00		
	TCS-05 at One side Flyover Reaches RHS	Sqm	1.0	192.00	2.00	-	384.00		
								Total (C)	83432960.24

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
43	By Mix in Place Method Construction of Granular Sub-Base of required grading as per design spreading in uniform layers with motor grader on prepared surface mixing by mix in place method with front end loader at OMC and compacting with vibratory roller to achieve the desired density, complete as per clause 401 -Grade V Material PWD SR 23-24 V-3 Item no 4.2 B (v) Page no 23	Cum					6129.00	2594.90	15904141.10
	TCS-01 at Metro Station Reaches LHS	Cum	1.0	1470.00	2.00	0.10	294.00		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	1.0	5600.00	3.22	0.10	1806.00		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	1.0	1360.00	1.00	0.10	136.00		
	TCS-04 at Both side Flyover Reaches LHS	Cum	1.0	2660.00	2.00	0.10	532.00		
	TCS-05 at One side Flyover Reaches LHS	Cum	1.0	480.00	4.50	0.10	216.00		
	TCS-01 at Metro Station Reaches RHS	Cum	1.0	1470.00	2.00	0.10	294.00		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	1.0	5600.00	3.50	0.10	1960.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	1.0	1360.00	1.50	0.10	204.00		
	TCS-04 at Both side Flyover Reaches RHS	Cum	1.0	2660.00	1.50	0.10	399.00		
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	480.00	6.00	0.10	288.00		
44	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					5059.55	6452.60	32647250.46
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
	TCS-01 at Metro Station Reaches LHS	Cum	1.0	1470.00	2.00	0.075	220.50		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	1.0	5600.00	3.22	0.075	1354.50		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	1.0	1360.00	1.00	0.075	102.00		
	TCS-04 at Both side Flyover Reaches LHS	Cum	1.0	2660.00	2.00	0.075	399.00		
	TCS-05 at One side Flyover Reaches LHS	Cum	1.0	480.00	4.50	0.075	162.00		
	TCS-01 at Metro Station Reaches RHS	Cum	1.0	1470.00	2.00	0.075	220.50		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	1.0	5600.00	3.50	0.075	1470.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	1.0	1360.00	1.50	0.075	153.00		
	TCS-04 at Both side Flyover Reaches RHS	Cum	1.0	2660.00	1.50	0.075	299.25		
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	480.00	6.00	0.075	216.00		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-01 at Metro Station Reaches LHS	Cum	1.0	1470.00	0.20	0.100	29.40		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	1.0	5600.00	0.20	0.10	112.00		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	1.0	1360.00	0.20	0.10	27.20		
	TCS-04 at Both side Flyover Reaches LHS	Cum	1.0	2660.00	0.20	0.10	53.20		
	TCS-05 at One side Flyover Reaches LHS	Cum	1.0	480.00	0.20	0.10	9.60		
	TCS-01 at Metro Station Reaches RHS	Cum	1.0	1470.00	0.20	0.10	29.40		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	1.0	5600.00	0.20	0.10	112.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	1.0	1360.00	0.20	0.10	27.20		
	TCS-04 at Both side Flyover Reaches RHS	Cum	1.0	2660.00	0.20	0.10	53.20		
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	480.00	0.20	0.10	9.60		
45	Supplying and fixing M15 grade precast cement concrete Kerb stones for Roadway, Sidewalls and gutters fixed with CM 1:3 fixed and finished in line as per direction of Engineer in charge. (The cost of PCC shall be paid extra) 300 x 300 x 150 mm Kerb Stone	m					23140.00	413.60	9570704.00
	PWD SR 23-24 V-3 Item no 8.42.7 Page no 74								
	TCS-01 at Metro Station Reaches LHS	M	1.0	1470.00	-	-	1470.00		
	TCS-02 At Grade Sections with Service Roads LHS	M	1.0	5600.00	-	-	5600.00		
	TCS-03 At Underpass / RUB Reaches LHS	M	1.0	1360.00	-	-	1360.00		
	TCS-04 at Both side Flyover Reaches LHS	M	1.0	2660.00	-	-	2660.00		
	TCS-05 at One side Flyover Reaches LHS	M	1.0	480.00	-	-	480.00		
	TCS-01 at Metro Station Reaches RHS	M	1.0	1470.00	-	-	1470.00		
	TCS-02 At Grade Sections with Service Roads RHS	M	1.0	5600.00	-	-	5600.00		
	TCS-03 At Underpass / RUB Reaches RHS	M	1.0	1360.00	-	-	1360.00		
	TCS-04 at Both side Flyover Reaches RHS	M	1.0	2660.00	-	-	2660.00		
	TCS-05 at One side Flyover Reaches RHS	M	1.0	480.00	-	-	480.00		
46	Painting Two Coats on New Concrete Surfaces Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces	Sqm					6247.80	105.60	659767.68
	PWD SR 23-24 V-3 Item no 8.10 Page no 66								
	TCS-01 at Metro Station Reaches LHS	Sqm	1.0	1470.00	0.27	-	396.90		
	TCS-02 At Grade Sections with Service Roads LHS	Sqm	1.0	5600.00	0.27	-	1512.00		
	TCS-03 At Underpass / RUB Reaches LHS	Sqm	1.0	1360.00	0.27	-	367.20		
	TCS-04 at Both side Flyover Reaches LHS	Sqm	1.0	2660.00	0.27	-	718.20		
	TCS-05 at One side Flyover Reaches LHS	Sqm	1.0	480.00	0.27	-	129.60		
	TCS-01 at Metro Station Reaches RHS	Sqm	1.0	1470.00	0.27	-	396.90		
	TCS-02 At Grade Sections with Service Roads RHS	Sqm	1.0	5600.00	0.27	-	1512.00		
	TCS-03 At Underpass / RUB Reaches RHS	Sqm	1.0	1360.00	0.27	-	367.20		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-04 at Both side Flyover Reaches RHS	Sqm	1.0	2660.00	0.27	-	718.20		
	TCS-05 at One side Flyover Reaches RHS	Sqm	1.0	480.00	0.27	-	129.60		
47	Providing and fixing M.S. bollard of 100 mm dia, 3 mm thick GI/MS pipe, total length 1.5 m (1.2 m above ground, 0.3 m embedded), filled with M20 concrete. Base embedded in M20 PCC block of size 300×300×450 mm. Top dome-shaped with welded MS cap. Two coats of synthetic enamel paint (Black & Yellow alternate bands, 150 mm wide) over red oxide primer. Including excavation, fixing, concreting, curing, painting, and all labour, lead & lift – Complete as directed by Engineer-in-charge	Nos					2400.00	2294.00	5505600.00
	Data rate								
	TCS-01 at Metro Station Reaches LHS	Nos	192.0	-	-	-	192.00		
	TCS-02 At Grade Sections with Service Roads LHS	Nos	592.0	-	-	-	592.00		
	TCS-03 At Underpass / RUB Reaches LHS	Nos	96.0	-	-	-	96.00		
	TCS-04 at Both side Flyover Reaches LHS	Nos	232.0	-	-	-	232.00		
	TCS-05 at One side Flyover Reaches LHS	Nos	24.0	-	-	-	24.00		
	TCS-01 at Metro Station Reaches RHS	Nos	176.0	-	-	-	176.00		
	TCS-02 At Grade Sections with Service Roads RHS	Nos	712.0	-	-	-	712.00		
	TCS-03 At Underpass / RUB Reaches RHS	Nos	120.0	-	-	-	120.00		
	TCS-04 at Both side Flyover Reaches RHS	Nos	240.0	-	-	-	240.00		
	TCS-05 at One side Flyover Reaches RHS	Nos	16.0	-	-	-	16.00		
48	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M30 Grade	Cum					943.99	7295.20	6886577.61
	PWD SR 23-24 V-1 Item no 2.3.3 Page no 16								
	TCS-01 at Metro Station Reaches LHS	Cum	16.0	7.50	3.50	0.150	63.00		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	59.0	7.50	3.50	0.15	232.31		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	7.0	7.50	3.50	0.15	27.56		
	TCS-04 at Both side Flyover Reaches LHS	Cum	19.0	7.50	3.50	0.15	74.81		
	TCS-05 at One side Flyover Reaches LHS	Cum	2.0	7.50	3.50	0.15	7.88		

Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	TCS-01 at Metro Station Reaches RHS	Cum	14.0	7.50	3.50	0.15	55.13		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	62.0	7.50	3.50	0.15	244.13		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	7.0	7.50	3.50	0.15	27.56		
	TCS-04 at Both side Flyover Reaches RHS	Cum	18.0	7.50	3.50	0.15	70.88		
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	7.50	3.50	0.15	3.94		
	Tree Guard	Cum	1900.0	3.60	0.10	0.20	136.80		
49	Construction of un-reinforced plain cement concrete pavement using RMC M-30 grade with OPC @ 270 kg/m ³ and GGBS@ 90 kg/m ³ (75:25 proportion) as per approved mix design procedure and thickness as per design, over a prepared sub base. The superplastisiser confirming to IS 9103-1999 Reaffirmed-2008 ,Coarse aggregates and Fine aggregate confirming to IS:383-2016, transported to site, laid in approved fixed side form work (steel channel, laying and fixing of 125 micron thick polythene film, wedges, steel plates including levelling the form work). Spreading the concrete with shovels, rakers and compacted using needle, suitable plate vibrator and finished in a continuous operation including provision of separation membrane and Hessian cloth finishing to lines and grades complete including cost of all materials, labour, all lead & lift, loading charges as per specification & direction of Engineer - incharge of the work. (Groove cutting shall be paid seperately)	Cum					6129.00	7451.40	45669627.72
	PWD SR 23-24 V-1 Item no 2.3.3 Page no 16								
	TCS-01 at Metro Station Reaches LHS	Cum	1.0	1470.00	2.00	0.100	294.00		
	TCS-02 At Grade Sections with Service Roads LHS	Cum	1.0	5600.00	3.22	0.10	1806.00		
	TCS-03 At Underpass / RUB Reaches LHS	Cum	1.0	1360.00	1.00	0.10	136.00		
	TCS-04 at Both side Flyover Reaches LHS	Cum	1.0	2660.00	2.00	0.10	532.00		
	TCS-05 at One side Flyover Reaches LHS	Cum	1.0	480.00	4.50	0.10	216.00		
	TCS-01 at Metro Station Reaches RHS	Cum	1.0	1470.00	2.00	0.10	294.00		
	TCS-02 At Grade Sections with Service Roads RHS	Cum	1.0	5600.00	3.50	0.10	1960.00		
	TCS-03 At Underpass / RUB Reaches RHS	Cum	1.0	1360.00	1.50	0.10	204.00		
	TCS-04 at Both side Flyover Reaches RHS	Cum	1.0	2660.00	1.50	0.10	399.00		
	TCS-05 at One side Flyover Reaches RHS	Cum	1.0	480.00	6.00	0.10	288.00		

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Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
Utility Ducts									
51	Earth work excavation by manual means for drains,canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such simillar works in all kinds of soils , as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenaces required to complete the work. `In all kinds of soils Depth upto 1.5 m	Cum					45123.00	266.20	12011742.60
	PWD CSR 23-24 V-1 Item no 1.4.1 Page no 5								
	LHS	Cum	1.0	11570.00	1.50	1.300	22561.50		
	RHS	Cum	1.0	11570.00	1.50	1.300	22561.50		
52	Red Soil	m					17355.00	130.90	2271769.50
	LHS	Cum	1.0	11570.00	1.50	0.700	12148.50		
	RHS	Cum	1.0	11570.00	1.50	0.300	5206.50		
53	Supplying, laying and jointing HDPE pipes of specified grade and conforming to IS 4984-2016 with latest ammendments and conveying to work site including loading and unloading at both destinations and rolling and lowering into trenches, laying true to line and jointing of pipes and specials with electrofusion welding, giving hydraulic test as per relevant ISS with all lead and lifts including encasing the pipe alround to a depth of not less than 15 cms. with soft gravel or selected earth available from the excation, testing and commissioning. The rate is exclusive of required specials and fittings wherever necessary like saddle Tee, stub ends, flanged sets, bedns, reducers etc. complete (Contractor will make his own arrangements for procuring water for testing) etc. Note: Upto 110mm dia Coil shall be used. For Grade PE80 PN6.0 :HDPE Grade PE100-PN6.0,200mm dia	m					46280.00	1355.20	62718656.00
	PWD CSR V-5 Item no 9.10.9 K060I Page no 102								
	LHS	m	2.0	11570.00	-	-	23140.00		
	RHS	m	2.0	11570.00	-	-	23140.00		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
54	Supplying, laying and jointing HDPE pipes of specified grade and conforming to IS 4984-2016 with latest ammendments and conveying to work site including loading and unloading at both destinations and rolling and lowering into trenches, laying true to line and jointing of pipes and specials with electrofusion welding, giving hydraulic test as per relevant ISS with all lead and lifts including encasing the pipe alround to a depth of not less than 15 cms. with soft gravel or selected earth available from the excation, testing and commissioning. The rate is exclusive of required specials and fittings wherever necessary like saddle Tee, stub ends, flanged sets, bedns, reducers etc. complete (Contractor will make his own arrangements for procuring water for testing) etc. Note: Upto 110mm dia Coil shall be used. For Grade PE80 PN6.0 :HDPE Grade PE100-PN6.0,110mm dia	m					92560.00	453.20	41948192.00
	PWD CSR V-5 Item no 9.10.4 Page no 102								
	LHS	m	4.0	11570.00	-	-	46280.00		
	RHS	m	4.0	11570.00	-	-	46280.00		
55	Providing Bedding or Backfilling using approved stone dust/quarry dust of size not exceeding 5.6 mm for the pipe line trenches including watering and consolidation etc., complete with all lead and lifts as per specification and as directed by the engineer incharge, after obtaining the approval of the Chief Engineer.	Cum					10413.00	2839.10	29563548.30
	PWD CSR V-3 Item no 11.36 Page no 112								
	LHS	Cum	1	11570.00	1.50	0.30	5206.50		
	RHS	Cum	1	11570.00	1.50	0.30	5206.50		
56	Earth work excavation by manual means for drains,canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such simillar works in all kinds of soils , as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenaces required to complete the work. `In all kinds of soils Depth upto 1.5 m	Cum					2702.34	266.20	719361.84
	PWD CSR 23-24 V-1 Item no 1.4.1 Page no 5								
	LHS	Cum	232	2.60	1.60	1.40	1351.17		

Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	RHS	Cum	232	2.60	1.60	1.40	1351.17		
57	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					193.02	6452.60	1245506.66
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
	LHS	Cum	232	2.60	1.60	0.10	96.51		
	RHS	Cum	232	2.60	1.60	0.10	96.51		
58	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. C. RMC M25 Grade	Cum					1380.86	9235.22	12752575.93
	PWD SR 23-24 V-1, Item no-2.10 C page no 18								
	LHS	Cum	232	2.40	1.40	0.20	155.90		
	LHS	Cum	232	6.80	0.20	1.20	378.62		
	LHS	Cum	232	2.40	1.40	0.20	155.90		
	RHS	Cum	232	2.40	1.40	0.20	155.90		
	RHS	Cum	232	6.80	0.20	1.20	378.62		
	RHS	Cum	232	2.40	1.40	0.20	155.90		

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Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
Chamber for OFC ducts									
62	Earth work excavation by manual means for drains,cannels, waste weir, draft, approach channels, key trenches, foundation of bridges and such simillar works in all kinds of soils , as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenaces required to complete the work. `In all kinds of soils Depth upto 1.5 m	Cum					1351.17	266.20	359680.92
	PWD CSR 23-24 V-1 Item no 1.4.1 Page no 5								
	LHS	Cum	232	1.30	1.60	1.40	675.58		
	RHS	Cum	232	1.30	1.60	1.40	675.58		
63	Ready Mix Concrete (RMC) with Cement & CEMENTITIOUS Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					96.51	6452.60	622753.33
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
	LHS	Cum	232	1.30	1.60	0.10	48.26		
	RHS	Cum	232	1.30	1.60	0.10	48.26		

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
73	Wet Mix Macadam (Plant mix method) Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver/grader in sub-base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density	Cum					2066.26	2814.90	5816315.27
	PWD SR 23-24 V-3 Item no 4.17 Page no 26								
	LHS	Cum	58	47.50	1.50	0.25	1033.13		
	RHS	Cum	58	47.50	1.50	0.25	1033.13		
	Total (G)								54117334.40
Median Improvement									
74	Construction of median and Island above road level with approved material brought from borrow pits, spread, sloped and compacted as per clause 408	Cum					21693.75	597.30	12957676.88
	PWD SR 23-24 V-3 Item no 4.20 Page no 27								
	LHS	Cum	1	11570.00	2.50	0.75	21693.75		
75	Painting Two Coats on New Concrete Surfaces Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces	Sqm					264098.88	105.60	27888841.73
	PWD SR 23-24 V-3 Item no 8.10 Page no 66								
		sqm	2	11570.00	1.80	-	41652.00		
		Sqm	2	18906.00	3.00	-	113436.00		
		Sqm	2	20646.00	2.64	-	109010.88		
76	Reinforced Cement Concrete Crash Barrier (New Jersey) Provision of an Reinforced cement concrete new jersey crash barrier at the medians constructed with reinforcement cement concrete with TMT reinforcement conforming MoRT&H Specification and as per details given IRC:119 (Fig-6) including dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, as per approved drawing and at locations directed by the Engineer, all as specified M 30 grade concrete	m					680.00	2830.30	1924604.00
	PWD SR 23-24 V-3 Item no 8.24B(ii) Page no 69								
		m	1	680.00	-	-	680.00		
77	Providing, fixing and erecting 50 mm dia steel pipe railing in 3 rows duly painted on medium weight steel channels (ISMC series) 100 mm x 50 mm, 1.2 metres high above ground, 2 m centre to centre, complete as per approved drawings	m					2892.50	2167.00	6268047.50

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Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
83	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					524.80	6452.60	3386324.48
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
	LHS	Cum	2.00	6560.00	0.20	0.10	262.40		
	RHS	Cum	2.00	6560.00	0.20	0.10	262.40		
84	Supplying and fixing M15 grade precast cement concrete Kerb stones for Roadway, Sidewalls and gutters fixed with CM 1:3 fixed and finished in line as per direction of Engineer in charge. (The cost of PCC shall be paid extra) 300 x 300 x 150 mm Kerb Stone	m					26240.00	413.60	10852864.00
	PWD SR 23-24 V-3 Item no 8.42.7 Page no 74								
	LHS	M	2.00	6560.00	-	-	13120.00		
	RHS	M	2.00	6560.00	-	-	13120.00		
85	Painting Two Coats on New Concrete Surfaces Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces	Sqm					3542.40	105.60	374077.44
	PWD SR 23-24 V-3 Item no 8.10 Page no 66								
	LHS	Sqm	1.00	6560.00	0.27	-	1771.20		
	RHS	Sqm	1.00	6560.00	0.27	-	1771.20		
86	Digging pits and Plantation	Nos					13120.00	164.80	2162176.00
	LHS	Nos	1.00	6560.00	-	-	6560.00		
	RHS	Nos	1.00	6560.00	-	-	6560.00		
87	Quality red earth	Cum					1476.00	530.86	783549.36
	LHS	Cum	1.00	6560.00	0.75	0.15	738.00		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
	RHS	Cum	1.00	6560.00	0.75	0.15	738.00		
88	Bermuda Grass turf	Sqm					9840.00	110.00	1082400.00
	LHS	Sqm	1.00	6560.00	0.75	-	4920.00		
	RHS	Sqm	1.00	6560.00	0.75	-	4920.00		
89	Labour Charge for Spreading	Sqm					9840.00	61.91	609174.72
	LHS	Sqm	1.00	6560.00	0.75	-	4920.00		
	RHS	Sqm	1.00	6560.00	0.75	-	4920.00		
Total (I)									19581780.40
RCC Drain									
90	Earth work excavation by manual means for drains, canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such similar works in all kinds of soils, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenances required to complete the work. `In all kinds of soils Depth upto 1.5 m	Cum					3428.44	266.20	912650.73
	PWD CSR 23-24 V-1 Item no 1.4.1 Page no 5								
		Cum	1.00	2000.00	1.40	1.15	3220.00		
		Cum	1158.00	2.00	0.30	0.30	208.44		
91	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					1185.00	6452.60	7646331.00
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
		Cum	1.00	2000.00	1.40	0.10	280.00		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
		Cum	2.00	11570.00	0.20	0.10	462.80		PCC for Kerb
		Cum	1158.00	2.00	0.30	0.10	69.48		
		Cum	1158.00	2.00	0.30	0.15	104.22		
		Cum	50.00	15.00	1.30	0.10	97.50		
		Cum	1.00	1140.00	1.50	0.10	171.00		
92	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. C. RMC M25 Grade	Cum					6474.68	9235.22	59795061.86
	PWD SR 23-24 V-1, Item no-2.10 C page no 18								
		Cum	1.00	2000.00	3.20	0.15	960.00		
		Cum	2.00	11570.00	1.20	0.13	3471.00		
		Cum	4628.00	0.60	0.15	0.15	62.48		
		Cum	50.00	15.00	5.00	0.20	750.00		
		Cum	1.00	1140.00	5.40	0.20	1231.20		
93	Supplying, fitting and placing TMT FE 550 / 550D Steel Reinforcement including cost of all materials, machinery, labour, cleaning, straightening, cutting, bending, hooking, laping/welding joints, tying with binding wire / soft annealed steel wire and other ancillary operations complete as per drawing and technical specification.	T					347.43	88858.00	30871934.94
	PWD CSR V-1 Item no 2.11 f Page no 18								
		MT	1.00	2000.00	30.00	Kg/m	60.00		
		MT	2.00	11570.00	6.00	Kg/m	138.84		
		MT	-	750.00	75.00	Kg/Cum	56.25		
		MT	-	1231.20	75.00	Kg/Cum	92.34		
94	Supplying and fixing M15 grade precast cement concrete Kerb stones for Roadway, Sidewalls and gutters fixed with CM 1:3 fixed and finished in line as per direction of Engineer in charge. (The cost of PCC shall be paid extra) 300 x 300 x 150 mm Kerb Stone	m					23140.00	413.60	9570704.00
	PWD SR 23-24 V-3 Item no 8.42.7 Page no 74								
		M	2.00	11570.00	-	-	23140.00		

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
100	Retro-Reflectorised Traffic Signs Providing and fixing of retro-reflectorised cautionary, mandatory and informatory sign as per IRC:67:2022 made of Class C Type XI retro reflective sheeting fixed over 2 mm thick aluminium sheeting vide clause 801.3, 3mm/4mm thick Aluminium composite material sheet depending on the size of the sign fixed over the back support frame of min 25 x 25 x 3mm angle mounted on a mild steel circular pipe 65 NB, 3.2 mm thickness firmly fixed to the ground by means of properly designed foundation with M25 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing.The sign shall be maintained as per section 12 of IRC:67:2022. 60 cm equilateral triangle	Each					232.00	3950.10	916423.20
	PWD SR 23-24 V-3 Item no 8.6 (iv) Page no 64								
	LHS	Nos	116.00	-	-	-	116.00		
	RHS	Nos	116.00	-	-	-	116.00		
101	Direction and Place Identification Signs with size more than 0.9 m ² size Board. Providing and erecting direction and place identification retroreflectorised sign as per IRC:67:2022 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick or Aluminium composite material sheet with overall thickness of 4mm with area exceeding 0.9 m ² fixed over back support frame of min 40 x 40 x 5mm angle mounted on a mild steel circular pipe 65 NB, firmly fixed to the ground by means of properly designed foundation with M25 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing	Sqm					479.52	10652.40	5108038.85
	PWD SR 23-24 V-3 Item no 8.8 Page no 65								
	LHS	Sqm	158.00	1.20	1.20	-	227.52		
	RHS	Sqm	175.00	1.20	1.20	-	252.00		
102	Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide strips, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming to IRC-79-2019 and the drawings.	Nos					190.00	2223.10	422389.00
	PWD SR 23-24 V-3 Item no 8.17 Page no 67								
	LHS	Nos	78.00	-	-	-	78.00		
	RHS	Nos	112.00	-	-	-	112.00		

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
106	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					5.59	6452.60	36063.58
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
	LHS	Cum	23.00	0.90	0.90	0.15	2.79		
	RHS	Cum	23.00	0.90	0.90	0.15	2.79		
107	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. C. RMC M25 Grade	Cum					31.05	9235.22	286753.43
	PWD SR 23-24 V-1, Item no-2.10 C page no 18								
	LHS	Cum	23.00	0.75	0.75	1.20	15.53		
	RHS	Cum	23.00	0.75	0.75	1.20	15.53		
108	Supplying, fitting and placing TMT FE 550 / 550D Steel Reinforcement including cost of all materials, machinery, labour, cleaning, straightening, cutting, bending, hooking, laping/welding joints, tying with binding wire / soft annealed steel wire and other ancillary operations complete as per drawing and technical specification.	T					2.07	88858.00	183936.06
	PWD CSR V-1 Item no 2.11 f Page no 18								
	LHS	MT	23.00	45.00	-	-	1.04		

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Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
113	Providing and laying Dense Graded Bituminous Macadam with 120 TPH capacity hot mix plant batch type using crushed aggregates of specified grading, premixed with bituminous binder VG-40, @ 4.0 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with mechanical paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 505 complete in all respects.	Cum					2375.00	10054.00	23878250.00
	PWD SR 23-24 V-3 Item no 5.11 A Page no 34								
	LHS	Cum	39.00	50.00	10.00	0.05	975.00		
	RHS	Cum	56.00	50.00	10.00	0.05	1400.00		
114	Providing and laying Bituminous Concrete with 120 TPH capacity hot mix plant batch type using crushed aggregates of specified grading, premixed with bituminous binder VG-40, @ 5.4 per cent of mix and filler, transporting the hot mix to work site, laying with mechanical paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 507 complete in all respects	Cum					1900.00	12566.40	23876160.00
	PWD CSR 23-24 V-3 Item no 5.15 A Page no 37								
	LHS	Cum	39.00	50.00	10.00	0.04	780.00		
	RHS	Cum	56.00	50.00	10.00	0.04	1120.00		
115	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					190.00	6452.60	1225994.00
	PWD CSR 23-24 V-1 Item no 2.10 a. Page no 17								
	LHS	Cum	78.00	50.00	0.20	0.10	78.00		

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SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
Dismantling and Haulage									
119	Earth work excavation for Foundation by mechanical means for all works & depth upto 3 m, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, including dressing of excavated surfaces, disposing off or levelling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m and lift upto 1.5m including cost of labour, tools, usage of machinery & other appurtenances required to complete the work. In all kinds of soils Depth upto 3 m	Cum					9371.70	112.20	1051504.74
	PWD SR 23-24 V-3 Item no 1.14.1 Page no 8								
	LHS	Cum	1.00	11570.00	0.90	0.45	4685.85		
	RHS	Cum	1.00	11570.00	0.90	0.45	4685.85		
120	Dismantling of Guard Rails Dismantling guard rails by manual means and disposal of dismantled material with all lifts and lead, stacking serviceable materials and unserviceable materials separately.	m					6942.00	127.60	885799.20
	PWD SR 23-24 V-3 Item no 2.20 Page no 12								
	LHS	M	1.00	3471.00	-	-	3471.00		
	RHS	M	1.00	3471.00	-	-	3471.00		
121	Dismantling of Kerb Stone Dismantling kerb stone by manual means and disposal of dismantled material with all lifts and lead	m					46280.00	33.00	1527240.00
	PWD SR 23-24 V-3 Item no 2.21 Page no 12								
	LHS	M	2.00	11570.00	-	-	23140.00		
	RHS	M	2.00	11570.00	-	-	23140.00		
122	Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead (iv) Dismantling Stone Masonry II) By Mechanical means A Dismantling Brick / Tile	Cum					2776.80	474.10	1316480.88
	PWD SR 23-24 V-3 Item no 2.10Page no 10								
	LHS	Cum	1.00	11570.00	2.00	0.06	1388.40		
	RHS	Cum	1.00	11570.00	2.00	0.06	1388.40		

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Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
128	Direction and Place Identification Signs with size more than 0.9 m ² size Board. Providing and erecting direction and place identification retroreflectorised sign as per IRC:67:2022 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 2 mm thick or Aluminium composite material sheet with overall thickness of 4mm with area exceeding 0.9 m ² fixed over back support frame of min 40 x 40 x 5mm angle mounted on a mild steel circular pipe 65 NB, firmly fixed to the ground by means of properly designed foundation with M25 grade cement concrete 45 x 45 x 60 cm, 60 cm below ground level as per approved drawing	Sqm					99.36	10652.40	1058422.46
	PWD SR 23-24 V-3 Item no 8.8 Page no 65								
		Sqm	92.00	1.20	0.90	-	99.36		
129	Positioning of a smart flagman with a yellow vest and a yellow cap and a red flag 600 x 600 mm securely fastened to a staff 1 m in length for guiding the traffic	Each					17870.40	854.70	15273830.88
	PWD CSR V-3 Item no 8.39 Page no 202								
		Each	17870.40	-	-	-	17870.40		
130	Construction of a permanent type barricade made of steel components, 1.5 m high from road level, fitted with 3 horizontal rails 200 mm wide and 4 m long on 50 x 50 x 5 mm angle iron vertical support, painted with yellow and white strips, 150 mm in width at an angle of 45 degree, complete as per IRC:SP:55:2014	Each					700.00	6243.60	4370520.00
	PWD CSR V-3 Item no 8.34 (i) A Page no 72								
		Nos	700.00	-	-	-	700.00		
131	Wet Mix Macadam (Plant mix method) Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver/grader in sub-base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density	Cum					6363.50	2814.90	17912616.15
	PWD SR 23-24 V-3 Item no 4.17 Page no 26								
		Cum	0.20	11570.00	11.00	0.25	6363.50		
132	Providing and applying primer coat with SS1 grade Bitumen Emulsion on prepared surface of granular base including cleaning of road surface and spraying primer at the rate of 0.70 kg/m ² using mechanical means.	Sqm					25454.00	45.10	1147975.40
	PWD SR 23-24 V-3 Item no 5.2 Page no 31								
		Sqm	0.20	11570.00	11.00	-	25454.00		

SI No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
133	Providing and applying tack coat with VG-10 Bitumen using pressure distributor at the rate of 0.20 kg/m ² on the prepared bituminous surface cleaned with mechanical broom	Sqm					66000.00	13.20	871200.00
	PWD SR 23-24 V-3 Item no 5.32 Page no 43								
		Sqm	2.00	3000.00	11.00	-	66000.00		
134	Providing and laying Bituminous Concrete with 120 TPH capacity hot mix plant batch type using crushed aggregates of specified grading, premixed with bituminous binder VG-40, @ 5.4 per cent of mix and filler, transporting the hot mix to work site, laying with mechanical paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 507 complete in all respects	Cum					1980.00	12566.40	24881472.00
	PWD CSR 23-24 V-3 Item no 5.15 A Page no 37								
		Cum	2.00	3000.00	11.00	0.03	1980.00		
135	Providing and laying Dense Graded Bituminous Macadam with 120 TPH capacity hot mix plant batch type using crushed aggregates of specified grading, premixed with bituminous binder VG-40, @ 4.0 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with mechanical paver finisher to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 505 complete in all respects.	Cum					594.00	10054.00	5972076.00
	PWD SR 23-24 V-3 Item no 5.11 A Page no 34								
		Cum	-	30%	as PCC	-	594.00		
136	Ready Mix Concrete (RMC) with Cement & Cementitious Materials. Providing and laying in position Ready Mixed or Batch Mixed concrete as per IS 10262 mix design procedure for Cement Concrete works in all types of Structures other than Road works, using coarse aggregate and fine aggregate derived from natural sources, Ordinary Portland Cement (OPC) @ 75% & GGBS @ 25% proportion, admixtures to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the Engineer-in-charge. RMC M10 Grade	Cum					57.80	6452.60	372960.28

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Bus Bay and Bus Shelters

	LHS	RHS	Total		
No of Bus Stops	14	14	28		
				Rate	Amount
No of Bus Shelters	28	28	56	12,00,000.00	6,72,00,000.00
Additional Cost for KIOSK and Other Provision	0	0	0	6,00,000.00	-
Bus Bay					64,75,657.87
					7,36,75,657.87

Existing Bus Bay Improvements		Area	2970.00	Width					
Sl No	Item Description	Unit	No	Length, m	Breadth, m	Depth, m	Total Quantity	Rate	Total Amount
1	Dismantling of Existing BT Layer	Cum	0	2970		0.2	0	354.2	-
2	Dismantling of Existing Granular Layer	Cum	0	2970		0.35	0	58.3	-
3	Milling	Sqm	0.8	2970			2376	49.5	1,17,612.00
4	Prime Coat	Sqm	0.2	2970			594	45.1	26,789.40
5	Tackcoat	Sqm	1	2970			2970	13.2	39,204.00
6	Scarification BT	Sqm	0.2	2970			594	6.6	3,920.40
7	Scarification Metal	Sqm	0.2	2970			594	5.5	3,267.00
8	Excavation	Cum	0.2	2970		0.3	178.2	112.2	19,994.04
9	GSB	Cum	0.2	2970		0.2	118.8	2594.9	3,08,274.12
10	WMM	Cum	0.2	2970		0.25	148.5	2814.9	4,18,012.65
11	DBM	Cum	1	2970		0.1	297	10054	29,86,038.00
12	Glass Grid	Sqm	1	2970			2970	300	8,91,000.00
13	BC	Cum	1	2970		0.04	118.8	13042.7	15,49,472.76
14	Edge Line Marking	Sqm	1	850	0.15		127.5	583	74,332.50
15	Centre Line Marking	Sqm	0	850	0.15		0	583	-
16	additional 30% for Strips, Bays, rumble strips etc.,	Sqm					0	583	-
17	Road Studs	Nos	1	850	9	m c/c	94	401.5	37,741.00
18	additional 30% for Strips, Bays, rumble strips etc.,	Nos					0	401.5	-

64,75,657.87

Name of work: "Improvements of Outer Ring Road from KR Puram to Silk board Junction (Total Length 17.01 Km) in Bangalore City." Package 02 : KR Puram to Iblur Junction - Length (11.57 Km)														
Street Lighting Estimate														
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth ,m	Quantity	Rate	Amount					
Street Lighting														
1	Supply of LED Streetlight luminaire with pressure die cast aluminium housing body for optimal thermal dissipation. Lamp compartment comprising of anti glare clear diffuser with Injection moulded polycarbonate material, delivering superior light output Rated life Burning Hrs 50000 hr @ Lumen Maintenance of 70%, aximum light intensity should be between 60 degrees to 70 degrees. CCT > 5500K, IP66 optical and electrical compartment & impact resistance of complete luminaire > IK08. Power Factor >0.9 with mains, Surge Protection- Min 5KV along with Over voltage/ Overload, short circuit/ miss-wiring protection. Compatible for pole mounting with outer dia of 40mm to 50mm. Universal Voltage driver to operate wide voltage range from 100V to 270V 50/60Hz application. Compliance to IS 10322/IEC 60598, LM 79 & LM 80 Adherence with RoHS. UL approved MCPCB.Top access street light with single screw to ensure ease of maintenance at the sight site location with minimized minimal tools. LED Light fixture with 120 W System Power consumption. LED Efficiency>130lm/w, nominal CRI >75. Luminaire manufacturer should have in-house facility accredited by NABL/CPRI & any Government certified agency & Design & Development facility certified by ISO 9001:2008. Housing with supplier word mark /name shall be Engraved / Embossing on the die cast housing/ Body part. Warranty of 2 Years against any manufacturing defect working under standard electrical conditions as mentioned LED Streetlight 120 W													
	PWD Vol-6, Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 36, Item No. 11.8.5													
	LHS and RHS in Footpath													
	From Ch. 0.00m to Ch. 11620.00m	Each	2	12220.00	Spacing	25.0m	980.00							
	At 25m interval						980.00	12,498.00	1,22,48,040.00					
2	Earth work excavation by manual means for drains,canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such simillar works in all kinds of soils , as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenaces required to complete the work. In all kinds of soils Depth upto 1.5m													
	PWD SR 2021-22, Vol-I,Pg No 5, Item No.1.4.1													
	LHS and RHS in Footpath													
	From Ch. 0.00m to Ch. 11620.00m	m ³	980	0.80	0.80	1.40	878.08							
	Excavation for Foundation (Poles at 25m interval)						878.08	204.60	1,79,655.17					
3	Providing and laying in position plain cement concrete for levelling course for all works in foundation. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed, laid in layers not exceeding 150 mm thickness, well compacted using plate vibrators, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machineries, curing, and all the other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork shall be paid separately) Mix 1:3:6 (M10) Using 20 mm nominal size graded crushed coarse aggregates													
	PW,P& IWTD SR 2021-22 P-15, I-2.1.4, Vol-I. issue rate WEF 07.07.2022													
	LHS and RHS in Footpath													
	From Ch. 0.00m to Ch. 11620.00m	m ³	980	0.80	0.80	0.10	62.72							
	Poles at 25m interval						62.72	6,300.80	3,95,186.18					
4	Providing and laying in position Reinforced cement concrete for all Sub structures of building, Irrigation works, Sub structure works of bridges, Drain works & other parallel works from 0.50m to 3.50 m height. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticisers, laid in layers, well compacted using needle vibrators, providing weep holes wherever necessary, including all lead & lifts, cost of all materials of quality, confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork to be paid separately) M20 Design Mix Using 20 mm nominal size graded crushed coarse aggregates													
	PW,P& IWTD SR 2021-22 P-17, I-2.4.2. Issue rate WEF 07.07.2022													
	LHS and RHS in Footpath													
	From Ch. 0.00m to Ch. 11620.00m	m ³	980	0.70	0.70	1.60	768.32							
	Poles at 25m interval						768.32	6,893.04	52,96,060.49					
5	"Add Extra for Formwork, Centering shuttering complete for item no "&A5801&" with all lead and lift as per the directions of engineer in charge & Scaffolding													
	PW,P& IWTD SR 2021-22, Appendix I, Page no-115, I-2 Corrigendum - 3 WEF. 01.09.2022 Vol-I"													
	Vide Item no 4						0.00	328.24	-					
6	Supplying, Fitting and Placing un-coated TMT Fe550 bar Reinforcement in sub-structure complete as per Drawing and Technical Specifications.													
	PWD SR 2021-22, Pg No 99 Item No.13.1, Vol-III. Issue rate WEF 09.11.2022													
	LHS and RHS in Footpath													
	From Ch. 0.00m to Ch. 11620.00m	Tonne	980			25.00	24500.00							
	25 Ka per Pole						24.50	96,864.90	23,73,190.05					

Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth ,m	Quantity	Rate	Amount
7	Fabricating, supplying and erection of 8 mts long hot dip Galvanized Conical hot dip Pole with BSEN 10025 grade S355JO steel plate for shaft, IS 2062 for base plate with door opening arrangements, including suitable boards, Bakelite sheet and MCBs as per IS specifications suitable to withstand the wind speed of 47 m/s for 8 m Pole in single section and single joint welded as per IS 9595/IS10178AWS having dimensions bottom 155 mm , top 75 mm with 3 mm thick , suitable base plate and 4Nos of 550mm long J bolts along with template and the Pole shall be hot dip galvanized in single dipping with not less than 65micron as per ASTM-A123 and 153 etc..(excluding foundation) as per drawing appended. 8 m - Top 75 mm and Bottom 155 mm dia								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 8, Item No. 4.4.6								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Each	2	12220.00	Spacing	25.0m	980.00		
	At 25m interval						980.00	25,924.00	2,54,05,520.00
8	Fixing halogen/metal halide /SVL/IL/LED floodlight fitting over existing pole / wall ceiling including cIA, bolts, nuts and								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 45, Item No. 13.5								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Each	2	12220.00	Spacing	25.0m	980.00		
							980.00	189.00	1,85,220.00
8	Supplying and fixing telescopic M.S. bracket fabricated by using 0.5m length 4" dia telescopic M. S. pipe, with 2" dia 1.5m long M.S.Bracket and are welded with suitable angle, using 6mm thick M. S. sheet, grip bolts & nuts, as required, suitable for 9 to 12 ms. M. S. tubular pole, with necessary two coats of painting, with all other accessories.. Double bracket 2x1.5 m. Length								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 45, Item No. 13.4.3								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Each	2	12220.00	Spacing	25.0m	980.00		
	At 25m interval						980.00	2,119.00	20,76,620.00
9	1.1 kV, XLPE or Heat resistant PVC insulated, PVC extruded Inner Seath Armoured LTUG Cable as per IS-1554 (Part- 1) or IS-7098 Part-1, Armouring strip thickness and resistivity as per IS-3975 25 Sqmm, 3.5 Core, (12 GI Strips - 4 x 0.8 mm)								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 9, Item No. 32.07								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		KM	2	12220.00			24440.00		
	Extra 1m cable per pole for connection						980.00		
	providing Connection from source			20.00			20.00		
							25.440	1,53,772.88	39,11,982.07
10	Laying of cable in Existing Trench/GI pipe/Stone Ware/RCC Hume pipe using Wooden/Aluminum Rollers as directed by the departmental staff - LT Cable - 2.5 to 25 Sqmm								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-4, Page No.- 9, Item No. 31.05								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		KM	2	12220.00			24440.00		
	Extra 1m cable per pole for connection						980.00		
	providing Connection from source			20.00			20.00		
							25.440	16,159.00	4,11,084.96
11	Earth work excavation for cable trench of 0.5 to 0.75 Mtr. Width and Depth upto 1 Mtr including trial pits, depositing on bank upto a lead of 50 Mtr, Supplying and Displaying necessary Danger Boards and Lighting, Using sight Rails and Sign Boards at every 100 Mtr wherever necessary as directed. In Ordinary Soil								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-4, Page No.- 8, Item No. 29.02								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		m³	2	12220.00	0.6	0.60	8798.40		
							8798.40	338.00	29,73,859.20
12	Supplying, laying and jointing HDPE pipes of specified grade and conforming to IS 4984-2016 with latest ammendments and conveying to work site including loading and unloading at both destinations and rolling and lowering into trenches, laying true to line and jointing of pipes and specials with electrofusion welding, giving hydraulic test as per relevant ISS with all lead and lifts including encasing the pipe alround to a depth of not less than 15 cms. with soft gravel or selected earth available from the excation, testing and commissioning. The rate is exclusive of required specials and fittings wherever necessary like saddle Tee, stub ends, flanged sets, bedns, reducers etc. complete (Contractor will make his own arrangements for procuring water for testing) etc. - HDPE Grade PE80-PN6.0, 63mm dia								

Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth,m	Quantity	Rate	Amount
	Water supply & UGD Works SR 2021-22, Pg No 121 Item No.1.1, K010A, Vol-V. Issue Rate WEF 05.04.2022								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	m	2	12220.00			24440.00		
							24440.00	185.90	45,43,396.00
13	Straight Through Jointing Kit Suitable for 1.1 kV Class LTUG Cable as per IS-13573 - Epoxy Type - 25 Sqmm, 4 Core								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 10, Item No. 34.06								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Set	2	12220.00	Spacing	100.0m	246.00		
							246.00	620.34	1,52,603.64
14	Supplying and drawing Flexible Multicore Cable manufactured with electrolytic grade flexible copper with low conductor confirming to IS:8130-1984 and (Virgin) PVC insulation sheathed suitable for working voltage upto 1100Volts as per IS-694:1990 3C X 4Sq.mm								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 4, Item No. 2.5.15								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Mtr	2	12220.00	Cable Per Pole	12.0m	11760.00		
							11760.00	119.00	13,99,440.00
15	Digging of Pit for providing GI Pipe type Earthing - Ordinary Soil								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-4, Page No.- 1, Item No. 1.6.1								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	Per pit	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	578.00	47,396.00
16	Grounding Material - Pipe Grounding GI Grounding pipe, B - Class, 42 mm dia, 2.5 Mtr long, 3.2 mm thick with bolt, nut, GI Strips and washer complete. Minimum Weight of GI Pipe: 7.3 Kg								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 17, Item No. 54.01								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	No	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	652.54	53,508.47
17	Good Quality well burnt Charcoal for grounding purposes packed in non returnable gunny bag of 30 Kg each								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 17, Item No. 54.02								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	No	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	559.32	45,864.24
18	Good Quality Salt for grounding purposes packed in 50 Kg gunny bag								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 17, Item No. 54.03								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	Bag	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	256.78	21,055.96
19	Supplying and fixing Microprocessor based Electronic timer (without contactor, Din Mounting using necessary bolts, nuts and washers etc..) 3-120sec setting.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 16, Item No. 5.47								
		Each	25				25.00		
							25.00	2,079.00	51,975.00
20	Supplying of on load change over switches 4 poles, AC 23Amps duty 415V, 50HZ, AC Supply. (Open Execution) Upto 63Amps								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 11, Item No. 5.11.1								
		Each	25				25.00		
							25.00	5,185.00	1,29,625.00
21	Supply and fixing of 4Pole Power Contactor With No/NC Contacts on existing wood/panel board using necessary bolts, nuts, washers and wiring etc., complete with AC-3 Rating and as per IS-13947. 40AMPS								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 11, Item No. 5.13.2								
		Each	25				25.00		
							25.00	2,126.00	53,150.00
22	Supplying and fixing Moulded Case Circuit Breaker (MCCB) over the existing wood/panel board using necessary screws, bolts, nuts, necessary phase separators, handle and wiring complete. Protection of Overload and Short circuit with thermal Magnetic/Micro processor release and Earth Fault as per IS-13947. (Icu = Ics) THREE POLE 100Amps 25KA.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 12, Item No. 5.14.1								

Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth ,m	Quantity	Rate	Amount
		Each	25				25.00		
							25.00	5,641.00	1,41,025.00
23	Supplying and Fixing of shunt trip suitable for MCCB/CBCT.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 12, Item No. 5.15								
		Each	25				25.00		
							25.00	1,512.00	37,800.00
24	Supplying and fixing miniature circuit breakers on existing MCB distribution boards using necessary fixing materials and 'C' cure, indicator ON/OFF, energy cross-3 with Short circuit breaking capacity of 10K and complete wiring as required. Confirming to IEC 60898. 6-32 AMPS TPN.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 13, Item No. 5.17.7								
		Each	50				50.00		
							50.00	1,777.00	88,850.00
25	Supplying, fixing and wiring rotary selector switch suitable for Ammeter.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.27								
		Each	25				25.00		
							25.00	178.00	4,450.00
26	Supplying, fixing and wiring rotary selector switch suitable for Voltmeter.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.28								
		Each	25				25.00		
							25.00	146.00	3,650.00
27	Supplying, fixing and wiring 3 phase Digital Ammeter/ Voltmeter								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.29								
		Each	50				50.00		
							50.00	1,280.00	64,000.00
28	Supplying, fixing and wiring Electronic Trivector Meter (ETV) 5 to 32/63 Amps three phase 4 wire whole current class-1 Accuracy Energy Meter.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.35								
		Each	25				25.00		
							25.00	5,125.00	1,28,125.00
29	Supplying and fixing of LED type panel board indicating lamp with required colour suitable for 230/440v A.C. 50 Hz 12/24v D.C.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.38								
		Each	50				50.00		
							50.00	464.00	23,200.00
30	Supplying 100Amps rated 3phase with neutral bus bar using required capacity electrolytic alluminium strips covered with heat shrinkable coloured PVC sleeve, mounted on phenolic/FRP/DMC insulator which are mounted on powder coated 40x6mm M.S.flat frame work in existing panel board. The bus bar shall have suitable holes for termination of incoming and outgoing cables as per IS specification with necessary bolts,nuts and washers 100Amps 4x30x6mm Alluminium Strips								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 15, Item No. 5.40.1								
		Mtr	25				25.00		
							25.00	2,214.00	55,350.00
31	Supplying and fixing angle iron frame work fabricated out of M.S. angle iron.. and M.S. flat 50X50X6MM with bolts, washers etc., and painted with 2 coats of red oxide and then two coats of approved paint. - 50X50X6MM								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 15, Item No. 5.41.2								
		Mtr	50				50.00		
							50.00	356.00	17,800.00
32	Fabricating supplying and mounting MS box made out 14 SWG suitable for floor / wall mounting, fully weather proof with provision for better heat dissipation, provided with hinged front cover, equipped with tamper proof locking arrangements, with suitable size clamps with necessary cable entry pipe with gland and box should be finished with 7tanks treatment with powder coated paint and finally finished with approved colour etc., complete. 14SWG.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 15, Item No. 5.42.1								
		Sqcm	25	800.00	120.00		2400000.00		
							2400000.00	0.43	10,32,000.00
								Total	6.35,50,682.43

Name of work: "Improvements of Outer Ring Road from KR Puram to Silk board Junction (Total Length 17.01 Km) in Bangalore City." Package 02 : KR Puram to Iblur Junction - Length (11.57 Km)									
Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth ,m	Quantity	Rate	Amount
Street Lighting									
1	Supply of LED Streetlight luminaire with pressure die cast aluminium housing body for optimal thermal dissipation. Lamp compartment comprising of anti glare clear diffuser with Injection moulded polycarbonate material, delivering superior light output Rated life Burning Hrs 50000 hr @ Lumen Maintenance of 70%, aximum light intensity should be between 60 degrees to 70 degrees. CCT > 5500K, IP66 optical and electrical compartment & impact resistance of complete luminaire > IK08. Power Factor >0.9 with mains, Surge Protection- Min 5KV along with Over voltage/ Overload, short circuit/ miss-wiring protection. Compatible for pole mounting with outer dia of 40mm to 50mm. Universal Voltage driver to operate wide voltage range from 100V to 270V 50/60Hz application. Compliance to IS 10322/IEC 60598, LM 79 & LM 80 Adherence with RoHS. UL approved MCPCB.Top access street light with single screw to ensure ease of maintenance at the sight site location with minimized minimal tools. LED Light fixture with 120 W System Power consumption. LED Efficiency>130lm/w, nominal CRI >75. Luminaire manufacturer should have in-house facility accredited by NABL/CPRI & any Government certified agency & Design & Development facility certified by ISO 9001:2008. Housing with supplier word mark /name shall be Engraved / Embossing on the die cast housing/ Body part. Warranty of 2 Years against any manufacturing defect working under standard electrical conditions as mentioned LED Streetlight 120 W								
	PWD Vol-6, Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 36, Item No. 11.8.5								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	Each	2	12220.00	Spacing	25.0m	1960.00		
	At 25m interval						1960.00	12,498.00	2,44,96,080.00
2	Earth work excavation by manual means for drains,canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such simillar works in all kinds of soils , as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools & other appurtenaces required to complete the work. In all kinds of soils Depth upto 1.5m								
	PWD SR 2021-22, Vol-I,Pg No 5, Item No.1.4.1								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		m³	980	0.80	0.80	1.40	878.08		
	Excavation for Foundation (Poles at 25m interval)						878.08	204.60	1,79,655.17
3	Providing and laying in position plain cement concrete for levelling course for all works in foundation. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed, laid in layers not exceeding 150 mm thickness, well compacted using plate vibrators, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machineries, curing, and all the other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork shall be paid separately) Mix 1:3:6 (M10) Using 20 mm nominal size graded crushed coarse aggregates								
	PW,P& IWTD SR 2021-22 P-15, I-2.1.4, Vol-I. issue rate WEF 07.07.2022								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		m³	980	0.80	0.80	0.10	62.72		
	Poles at 25m interval						62.72	6,300.80	3,95,186.18
4	Providing and laying in position Reinforced cement concrete for all Sub structures of building, Irrigation works, Sub structure works of bridges, Drain works & other parallel works from 0.50m to 3.50 m height. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticisers, laid in layers, well compacted using needle vibrators, providing weep holes wherever necesary, including all lead & lifts, cost of all materials of quality, confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork to be paid separately) M20 Design Mix Using 20 mm nominal size graded crushed coarse aggregates								
	PW,P& IWTD SR 2021-22 P-17, I-2.4.2. Issue rate WEF 07.07.2022								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		m³	980	0.70	0.70	1.60	768.32		
	Poles at 25m interval						768.32	6,893.04	52,96,060.49
5	"Add Extra for Formwork, Centering shuttering complete for item no "&A5801&" with all lead and lift as per the directions of engineer in charge & Scaffolding								
	PW,P& IWTD SR 2021-22, Appendix I, Page no-115, I-2 Corrigendum - 3 WEF. 01.09.2022 Vol-I"								
	Vide Item no 4						0.00	328.24	-
6	Supplying, Fitting and Placing un-coated TMT Fe550 bar Reinforcement in sub-structure complete as per Drawing and Technical Specifications.								
	PWD SR 2021-22, Pg No 99 Item No.13.1, Vol-III. Issue rate WEF 09.11.2022								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Tonne	980			25.00	24500.00		
	25 Kg per Pole						24.50	96,864.90	23,73,190.05

Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth,m	Quantity	Rate	Amount
7	Fabricating, supplying and erection of 8 mts long hot dip Galvanized Conical hot dip Pole with BSEN 10025 grade S355JO steel plate for shaft, IS 2062 for base plate with door opening arrangements, including suitable boards, Bakelite sheet and MCBs as per IS specifications suitable to withstand the wind speed of 47 m/s for 8 m Pole in single section and single joint welded as per IS 9595/IS10178AWS having dimensions bottom 155 mm , top 75 mm with 3 mm thick , suitable base plate and 4Nos of 550mm long J bolts along with template and the Pole shall be hot dip galvanized in single dipping with not less than 65micron as per ASTM-A123 and 153 etc.,(excluding foundation) as per drawing appended. 8 m - Top 75 mm and Bottom 155 mm dia								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 8, Item No. 4.4.6								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Each	2	12220.00	Spacing	25.0m	980.00		
	At 25m interval						980.00	25,924.00	2,54,05,520.00
8	Fixing halogen/metal halide /SVL/IL/LED floodlight fitting over existing pole / wall ceiling including cIA, bolts, nuts and								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 45, Item No. 13.5								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Each	2	12220.00	Spacing	25.0m	1960.00		
							1960.00	189.00	3,70,440.00
8	Supplying and fixing telescopic M.S. bracket fabricated by using 0.5m length 4" dia telescopic M. S. pipe, with 2" dia1.5m long M.S.Bracket and are welded with suitable angle, using 6mm thick M. S. sheet, grip bolts & nuts, as required, suitable for 9 to 12 ms. M. S. tubular pole, with necessary two coats of painting, with all other accessories.. - Double bracket 2x1.5 m. Length								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 45, Item No. 13.4.3								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Each	2	12220.00	Spacing	25.0m	980.00		
	At 25m interval						980.00	2,119.00	20,76,620.00
9	1.1 kV, XLPE or Heat resistant PVC insulated, PVC extruded Inner Seath Armoured LTUG Cable as per IS-1554 (Part- 1) or IS-7098 Part-1, Armouring strip thickness and resistivity as per IS-3975 25 Sqmm, 3.5 Core, (12 GI Strips - 4 x 0.8 mm)								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 9, Item No. 32.07								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		KM	2	12220.00			24440.00		
	Extra 1m cable per pole for connection						980.00		
	providing Connection from source			20.00			20.00		
							25.440	1,53,772.88	39,11,982.07
10	Laying of cable in Existing Trench/GI pipe/Stone Ware/RCC Hume pipe using Wooden/Aluminum Rollers as directed by the departmental staff - LT Cable - 2.5 to 25 Sqmm								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-4, Page No.- 9, Item No. 31.05								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		KM	2	12220.00			24440.00		
	Extra 1m cable per pole for connection						980.00		
	providing Connection from source			20.00			20.00		
							25.440	16,159.00	4,11,084.96
11	Earth work excavation for cable trench of 0.5 to 0.75 Mtr. Width and Depth upto 1 Mtr including trial pits, depositing on bank upto a lead of 50 Mtr, Supplying and Displaying necessary Danger Boards and Lighting, Using sight Rails and Sign Boards at every 100 Mtr wherever necessary as directed. In Ordinary Soil								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-4, Page No.- 8, Item No. 29.02								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		m³	2	12220.00	0.6	0.60	8798.40		
							8798.40	338.00	29,73,859.20
12	Supplying, laying and jointing HDPE pipes of specified grade and conforming to IS 4984-2016 with latest ammendments and conveying to work site including loading and unloading at both destinations and rolling and lowering into trenches, laying true to line and jointing of pipes and specials with electrofusion welding, giving hydraulic test as per relevant ISS with all lead and lifts including encasing the pipe around to a depth of not less than 15 cms. with soft gravel or selected earth available from the excation, testing and commissioning. The rate is exclusive of required specials and fittings wherever necessary like saddle Tee, stub ends, flanged sets, bedns, reducers etc. complete (Contractor will make his own arrangements for procuring water for testing) etc. - HDPE Grade PE80-PN6.0, 63mm dia								
	Water supply & UGD Works SR 2021-22, Pg No 121 Item No.1.1, K010A, Vol-V. Issue Rate WEF 05.04.2022								

Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth ,m	Quantity	Rate	Amount
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	m	2	12220.00			24440.00		
							24440.00	185.90	45,43,396.00
13	Straight Through Jointing Kit Suitable for 1.1 kV Class LTUG Cable as per IS-13573 - Epoxy Type - 25 Sqmm, 4 Core								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 10, Item No. 34.06								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Set	2	12220.00	Spacing	100.0m	246.00		
							246.00	620.34	1,52,603.64
14	Supplying and drawing Flexible Multicore Cable manufactured with electrolytic grade flexible copper with low conductor conforming to IS:8130-1984 and (Virgin) PVC insulation sheathed suitable for working voltage upto 1100Volts as per IS-694:1990 3C X 4Sq.mm								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 4, Item No. 2.5.15								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m								
		Mtr	2	12220.00	Cable Per Pole	12.0m	11760.00		
							11760.00	119.00	13,99,440.00
15	Digging of Pit for providing GI Pipe type Earthing - Ordinary Soil								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-4, Page No.- 1, Item No. 1.6.1								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	Per pit	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	578.00	47,396.00
16	Grounding Material - Pipe Grounding GI Grounding pipe, B - Class, 42 mm dia, 2.5 Mtr long, 3.2 mm thick with bolt, nut, GI Strips and washer complete. Minimum Weight of GI Pipe: 7.3 Kg								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 17, Item No. 54.01								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	No	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	652.54	53,508.47
17	Good Quality well burnt Charcoal for grounding purposes packed in non returnable gunny bag of 30 Kg each								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 17, Item No. 54.02								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	No	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	559.32	45,864.24
18	Good Quality Salt for grounding purposes packed in 50 Kg gunny bag								
	PWD Vol-6,Electrical SR 2021-22, Distribution, BESCOM-Part-3, Page No.- 17, Item No. 54.03								
	LHS and RHS in Footpath								
	From Ch. 0.00m to Ch. 11620.00m	Bag	2	12220.00	300 m Spacing Per pit		82.00		
							82.00	256.78	21,055.96
19	Supplying and fixing Microprocessor based Electronic timer (without contactor, Din Mounting using necessary bolts, nuts and washers etc...) 3-120sec setting.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 16, Item No. 5.47								
		Each	25				25.00		
							25.00	2,079.00	51,975.00
20	Supplying of on load change over switches 4 poles, AC 23Amps duty 415V, 50HZ, AC Supply. (Open Execution) Upto 63Amps								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 11, Item No. 5.11.1								
		Each	25				25.00		
							25.00	5,185.00	1,29,625.00
21	Supply and fixing of 4Pole Power Contactor With No/NC Contacts on existing wood/panel board using necessary bolts, nuts, washers and wiring etc., complete with AC-3 Rating and as per IS-13947. 40AMPS								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 11, Item No. 5.13.2								
		Each	25				25.00		
							25.00	2,126.00	53,150.00
22	Supplying and fixing Moulded Case Circuit Breaker (MCCB) over the existing wood/panel board using necessary screws, bolts, nuts, necessary phase separators, handle and wiring complete. Protection of Overload and Short circuit with thermal Magnetic/Micro processor release and Earth Fault as per IS-13947. (Icu = Ics) THREE POLE 100Amps 25KA.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 12, Item No. 5.14.1								
		Each	25				25.00		

Street Lighting Estimate									
SI No	Item Description	Unit	No	Length,m	Width,m	Breadth ,m	Quantity	Rate	Amount
							25.00	5,641.00	1,41,025.00
23	Supplying and Fixing of shunt trip suitable for MCCB/CBCT.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 12, Item No. 5.15								
		Each	25				25.00		
							25.00	1,512.00	37,800.00
24	Supplying and fixing miniature circuit breakers on existing MCB distribution boards using necessary fixing materials and 'C' cure, indicator ON/OFF, energy cross-3 with Short circuit breaking cappacity of 10K and complete wiring as required. Confirming to IEC 60898. 6-32 AMPS TPN.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 13, Item No. 5.17.7								
		Each	50				50.00		
							50.00	1,777.00	88,850.00
25	Supplying, fixing and wiring rotary selector switch suitable for Ammeter.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.27								
		Each	25				25.00		
							25.00	178.00	4,450.00
26	Supplying, fixing and wiring rotary selector switch suitable for Voltmeter.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.28								
		Each	25				25.00		
							25.00	146.00	3,650.00
27	Supplying, fixing and wiring 3 phase Digital Ammeter/ Voltmeter								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.29								
		Each	50				50.00		
							50.00	1,280.00	64,000.00
28	Supplying, fixing and wiring Electronic Trivector Meter (ETV) 5 to 32/63 Amps three phase 4 wire whole current class-1 Accuracy Energy Meter.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.35								
		Each	25				25.00		
							25.00	5,125.00	1,28,125.00
29	Supplying and fixing of LED type panel board indicating lamp with required colour suitable for 230/440v A.C. 50 Hz 12/24v D.C.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 14, Item No. 5.38								
		Each	50				50.00		
							50.00	464.00	23,200.00
30	Supplying 100Amps rated 3phase with neutral bus bar using required capacity electrolytic alluminium strips covered with heat shrinkable coloured PVC sleeve, mounted on phenolic/FRP/DMC insulator which are mounted on powder coated 40x6mm M.S.flat frame work in existing panel board. The bus bar shall have suitable holes for termination of incoming and outgoing cables as per IS specification with necessary bolts,nuts and washers 100Amps 4x30x6mm Alluminium Strips								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 15, Item No. 5.40.1								
		Mtr	25				25.00		
							25.00	2,214.00	55,350.00
31	Supplying and fixing angle iron frame work fabricated out of M.S. angle iron.. and M.S. flat 50X50X6MM with bolts, washers etc., and painted with 2 coats of red oxide and then two coats of approved paint. - 50X50X6MM								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 15, Item No. 5.41.2								
		Mtr	50				50.00		
							50.00	356.00	17,800.00
32	Fabricating supplying and mounting MS box made out 14 SWG suitable for floor / wall mounting, fully weather proof with provision for better heat dissipation, provided with hinged front cover, equipped with tamper proof locking arrangements, with suitable size clamps with necessary cable entry pipe with gland and box should be finished with 7tanks treatment with powder coated paint and finally finished with approved colour etc., complete. 14SWG.								
	PWD Vol-6,Electrical SR 2022-23, Utilization, PWD-Part-1 Electrical Item, Page No.- 15, Item No. 5.42.1								
		Sqcm	25	800.00	120.00		2400000.00		
							2400000.00	0.43	10,32,000.00
								Total	7.59.83.942.43

Name of work: “Improvements of Outer Ring Road from KR Puram to Silk board Junction (Total Length 17.01 Km) in Bangalore City.” Package 02 : KR Puram to Iblur Junction - Length (11.57 Km)								
ITMS								
Sl.no	Description of Items	Unit of measurement (UOM)	3 Lane 1 approach Qty / Loc	BTP	3 Lane Raod 1 Approach	Quantity	Unit Price	Total Price
				1	12			
1	Supply, installation, testing and commissioning of Automatic Number Plate Recognition Camera & Traffic Violation Detection Camera as per specifications set forth	No's	3		36	36	₹ 2,10,000	₹ 75,60,000
2	Supply, installation, testing and commissioning of Overview/Evidence Cameras per specifications set forth	No's	1		12	12	₹ 40,800	₹ 4,89,600
3	Supply, Installation, Testing And Commissioning Of Standard Pole Including Foundation With 5 Years Of Maintenance for Overview/Evidence Cameras per specifications set forth	No's	1		12	12	₹ 16,093	₹ 2,897
4	Supply, installation, testing and commissioning of Local Processing Unit as per specifications set forth	No's	1		12	12	₹ 1,58,400	₹ 19,00,800
5	Supply, installation, testing and commissioning of 4D Speed Radar as per specifications set forth	No's	1		12	12	₹ 5,04,000	₹ 60,48,000
6	Supply, installation, testing and commissioning of Speed Display as per specifications set forth	No's	3		36	36	₹ 72,000	₹ 25,92,000
7	Supply, installation, testing and commissioning of Outdoor Controller Cabinet as per specifications set forth	No's	1		12	12	₹ 84,000	₹ 10,08,000
8	Supply, installation, testing and commissioning of Power Management Module as per specifications set forth	No's	1		12	12	₹ 1,14,000	₹ 13,68,000
9	Supply, installation, testing and commissioning of Traffic Violation Detection System Software License as per specifications set forth	No's	3		36	36	₹ 60,000	₹ 21,60,000
10	Supply, installation, testing and commissioning of Speed Violation Detection System software Licenses per specifications set forth	No's	3		36	36	₹ 1,08,000	₹ 38,88,000
11	Supply, installation, testing and commissioning of Automatic Traffic Counting and Classification System Licenses per specifications set forth	No's	1		12	12	₹ 84,000	₹ 10,08,000
12	Supply, installation, testing and commissioning of Wakable Gantry as per the specifications set forth	No's	1		12	12	₹ 7,20,000	₹ 86,40,000
13	Supply, installation, testing and commissioning of Gantry Foundation as per specifications set forth	No's	1		12	12	₹ 60,000	₹ 7,20,000
14	Supply, installation, testing and commissioning of Cabling for equipment as required at each location	No's	1		12	12	₹ 15,000	₹ 1,80,000
15	Supply, installation, testing and commissioning of Earthing as per specifications set forth	No's	1		12	12	₹ 18,000	₹ 2,16,000
16	Supply, installation, testing and commissioning of Network connectivity as per specifications set forth	No's	1		12	12	₹ 36,000	₹ 4,32,000
17	Supply, installation, testing and commissioning of KEB power supply and Necessary items (Deposit + Meter + Meter box + Fuse + MCB)	No's	1		12	12	₹ 36,000	₹ 4,32,000
18	Supply, installation, testing and commissioning of 4 sqmm power cable for electrical meter with overhead installation	meter	200		2400	2400	₹ 240	₹ 5,76,000
19	Supply, installation, testing and commissioning of Central Server and Storage to Store event Data for 6 months as per specifications set forth (For ITMS Locations and For Analytics Licenses)	No's	1	1		1	₹ 16,32,000	₹ 16,32,000

“Development of Outer Ring Road to International Standards including Main Carriageway and Service Roads in Bangalore City”

Package 02 : KR Puram to Iblur Junction

Cost Estimate

Sl.no	Description of Items	Unit of measurement (UOM)	3 Lane 1 approach Qty / Loc	BTP	3 Lane Road 1 Approach	Quantity	Unit Price	Total Price
20	Supply, installation, testing and commissioning of Workstation at Control Center as per specifications set forth	No's	2	2		2	₹ 1,22,400	₹ 2,44,800
21	Supply, installation, testing and commissioning of Network equipment and Server Rack	No's	1	1		1	₹ 2,04,000	₹ 2,04,000
22	Supply, installation, testing and commissioning of ITMS Central Software as per specifications set forth	No's	1	1		1	₹ 12,24,000	₹ 12,24,000
23	Supply, installation, testing and commissioning of ITMS Central Software Validation/Auditing Module user license as per specifications set forth	No's	2	2		2	₹ 40,800	₹ 81,600
24	Maintenance of Systems for 5 years	Months	60	60		60	₹ 1,30,560	₹ 78,33,600
25	Providing Manpower- System Engineer as per qualifications set forth in Clause- 1 no for 60 months	Months	60	60		60	₹ 43,248	₹ 25,94,880
26	Providing Validators as per qualifications set forth in Clause - 2 members for 60 months	Months	60	60		60	₹ 48,960	₹ 29,37,600
							Total	₹ 5,59,73,777

