KN-30-13 (T.P)

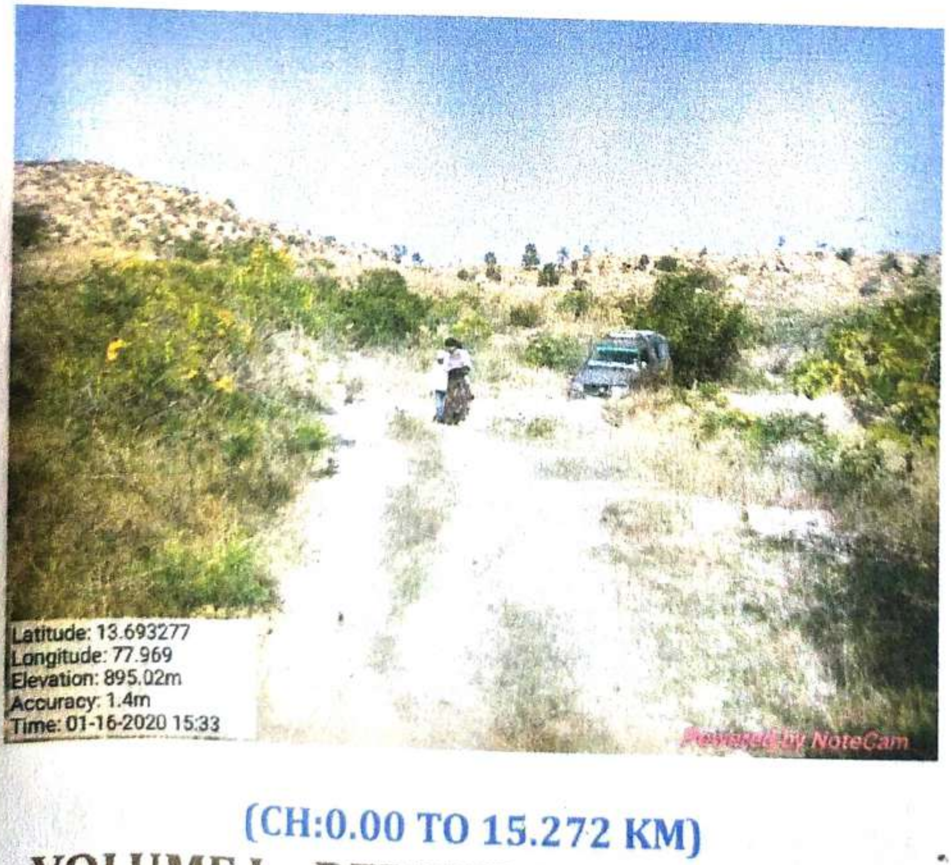
GOI P.No.
KN-30-02

GOVERNMENT OF KARNATAKA
KARNATAKA RURAL ROAD DEVELOPMENT AGENCY
BAGEPALLI

UNDER PMGSY III

PRADHAN MANTRI
GRAM SADAK YOJANA

NAME OF THE WORK : - **IMPROVEMENTS TO THE ROAD CONNECTING FROM PATHAPALYA TO POLANAYAKANAHALLI VIA KAMSANAPALLI, PEDDANAGURLU IN BAGEPALLI TALUK, CHIKKABALLAPUR DISTRICT, KARNATAKA STATE**



(CH:0.00 TO 15.272 KM)

VOLUME I – REPORT AND ESTIMATES

TOTAL COST ₹1120.00 LAKHS

Head of Account : MORD for the year 2019 - 20

DETAILED PROJECT REPORT

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1. Introduction

1.1 Objectives of Pradhan Mantri Gram Sadak Yojana (PMGSY)

- Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched on 25th December, 2000 as a 100% Centrally Sponsored Scheme with the objective to provide All-Weather road connectivity to the eligible unconnected habitations as per Core-Network with a population of 500 persons (as per 2001 Census) and above in plain areas. In respect of 'Special Category States' (North-East, Sikkim, Himachal Pradesh, Jammu & Kashmir and Uttarakhand), the Desert areas, the Tribal (Schedule V) areas and 88 Selected Tribal and Backward districts as identified by the Ministry of Home Affairs/Planning Commission, the population criteria to connect eligible unconnected habitations as per Core-Network was of 250 persons and above (Census 2001). In critical Left Wing Extremism affected blocks (as identified by MHA), additional relaxation has been given to connect habitations with population 100+. The Scheme has also an element of upgradation (to prescribed standards) of existing rural roads in districts where all the eligible habitations of the designated population size have been provided all weather road connectivity, though it is not central to the Programme.

- PMGSY-II was launched in 2013 to allow consolidation of 50,000 km of existing rural roads network in the country on sharing basis between the Centre and the State / UT on 60:40 for plain areas and 90:10 for North-Eastern States and hill areas under PMGSY-II. The length proposed under PMGSY-II was linked to about 20-25% of such upgradation target under PMGSY-I.

PMGSY-III :

The PMGSY envisages consolidation of the existing Rural Road Network by upgradation of existing Through Routes and Major Rural Links that connect habitations to

i. Gramin Agricultural Markets (GrAMs)

ii. Higher Secondary Schools

iii. Hospitals

PMGSY-III will include such linkages.

PMGSY-III programme focus on Up-gradation of existing Through Routes and Major Rural Links based on priority giving importance to critical facilities like the rural markets and education & health facilities. This programme provides connectivity, easy access and faster movement from the habitations to Mandis, Agricultural Markets, other farmer related enterprises, higher secondary schools, colleges, hospitals etc in order to improve the quality life of rural populous. This is a 5 years programme from 2019-20.

1.2 ALL Weather Road

An all-weather road is one which is negotiable during all weathers, with some permitted interruptions. Essentially this means that at cross-drainage structures, the duration of overflow or interruption at one stretch shall not exceed 12 hours for ODRs and 24 hours for VRs in hilly terrain, and 3 days in the case of roads in plain terrain. The total period of interruption during the year should not exceed 10 days for ODRs and 15 days for VRs.

1.3 Core Network & District Rural Road Plan

PMGSY-I programme is based on the Core Network. The Core Network is the network of all the Rural Roads that are necessary to provide basic access to all the Habitations. A Core Network is extracted out of the total Network mentioned in the DRRP and consists of existing roads as well as the roads required to be constructed to the unconnected Habitations.

The DRRP is a road network in a district, showing the entire existing road network with updated surface conditions, the habitations of various population size and roads proposed for connecting the habitations from another connected habitations/ all-weather roads in an economic and efficient way in terms of cost and utility. It is also known as the Master Plan for Rural Roads for the district. The Census data of 2011 is being used for PMGSY-II and PMGSY-III as well. Under PMGSY II and PMGSY-III, District Rural Road Plan is the basis for selection of roads. The DRRP comprises of Through routes and Link routes. Under PMGSY-II and PMGSY-III, the DRRP includes identification of candidate roads among the existing Through routes (TRs) and Link Routes (LRs) based on utility value per unit road length of candidate road. The candidate roads are to be selected based on the ranking generated by the Trace Maps using Q-GIS software.

The Sub-project road Pathapalya to Polanayakanahalli, is a link road with Code VR-153, 138 & VR-128 in Bagepalli block of Chikkaballapur District. This road connects the habitations of Pathapalya with Population of 3689, Kamsanapalli with Population of 562, Singarappagaripalli with Population of 257, Gumalpalli with Population of 368, Peddanagurlu with Population of 362, Kolaparalapalli with Population of 136, Dugginayakanapalli with Population of 482, Yagavamarappagarapalli with Population of 377, poolkundlapalli with Population of 1350 and Polanaikanapalli with Population of 1560 respectively. Also, for indirectly beneitted habitations namely Nallacheruvu with Population of 252, Yelagalapalli with population of 456, Gundamvaripalli with population of 134, and Digavamarapparapalli with population of 302 are located within 3 Km/5 Km path distance. Thus this through road/Major Rural Link/link road serves the total population of **10981**.

SL. No.	Habitation Benifited	Population Benifited		Chainage (km)		
		Directly	Indirectly	From	To	Length
1	Pathapalya	3689		0.000	0.220	0.220
2	Kamsanapalli	562		0.760	1.230	0.470
3	Singarappagaripalli	257		5.500	5.720	0.220
4	Gumalpalli	368		10.658	10.700	0.042
5	Peddanagurulu	362				0.000
6	Kolaparalapalli	136		10.810	10.980	0.170
7	Dugginayakanapalli	482		11.980	12.180	0.200
8	Yagavamarappagarapalli	265		12.880	12.990	0.110
9	Poolkundlapalli	1350		14.350	14.610	0.260
10	Polanaikanapalli	1560		15.230	15.272	0.042
11	Nallacheruvu		1076			
12	Yelagalapalli		456			
13	Gundamvaripalli		116			
14	Digavamarappagarapalli		302			
	Total	**10981**				**1.734**

1.4 Geography

The Project road runs in hilly terrain (Rocky Area) from North to South in Bagepalli Taluk of Chikkaballapur District. The area contains BC Soil and also Red Soil.

1.5 Climatic Condition

The Chikkaballapura lies on 920m above sea level The **climate** here is tropical. When compared with winter, the summers have much more rainfall. This location is classified as Aw by Köppen and Geiger. The average annual temperature is 23.9 °C/ 75.0 °F in Chikkaballapura. The annual rainfall is 785 mm/ 30.9 inch.
It is very hot summer in Bagepalli Taluk, Since it is Rocky hills.

1.6 The Sub-Project Road

The project road is in a hilly terrain. The project Road Starts from Pathapalli Village and ends in Polanayakanahalli Crossing the habitations directly are Pathapalya, Kamsanapalli, Singappagaripalli, Gumalpalli, Peddanaurulu, Kolaparalapalli, Duginayakanapalli, Yagavamarappagarapalli, Poolkundlapalli & Polanaikanahalli and indirect habitations like Nallacheruvu, Yelgalapalli, Gundamvaripalli and Digavamarappaarapalli.
Since there is damaged Asphalted surface from 0.00 to 6.96 Km and road travels in BC Soil and also red soil, it is provided to reconstruction. From 6.960 to 10.660 Km,

its completely earthen surface. From 10.660 to 14.85 km, the present surface is asphalted and provided resurfacing. In Village limits, CC road is provided with CC Drains. In Hard rock reach from 10.25 to 10.660Km, CC road is provided. Protection works like revetment, Crash barrier, etc are provided in Tank reach.

District: Chikkaballapur
Block: Gudipalli
Road Name: Pathapalya to Polanayakanahalli
Road Code: VR153, VR138 & VR128
Package No:
Road Length: 15.2~~68~~72Km

Start Point: The road starts from Pathapalya @ 0.00Km.
latitude – 13°45'17.89"N&
longitude – 77°56'55.63"E
End Point: ends in Polanayakanahalli @ 15.2~~68~~72Km
latitude – 13°38'43.77"N &
longitude – 77°58'59.81"E
Existing surface details of proposed road: Asphalted Surface from 0 – 6.96Km, 10.658 – 15.272Km and Earthen Surface from 6.96Km to 10.658Km.
Pavement Condition Index (PCI) of the proposed road:

If existing PMGSY road is proposed partly or fully for upgradation/reconstruction, the following details need to be updated in the DPR.
Category of road sanctioned under PMGSY : New Connectivity / Upgradation
Year and Batch of sanction:
Name of the road as per sanction:
T route/L route no. as per sanction:
Sanctioned length : Km
Sanctioned cost: Rs. lakhs
Date of completion as per OMMAS:
PCI of the PMGSY road:
This road is proposed for Up-gradation/Riding quality Improvement.
The road is proposed for both Up-gradation and Riding Quality Improvement. Upgradation is proposed for the chainage from ----- to ----- Km
Riding Quality Improvement for the chainage from ----- to ----- Km
Total length: 15.272Km

2. Planning and Basic Design Consideration

2.1 Key maps

Figure-1 **Road Map of India and State**

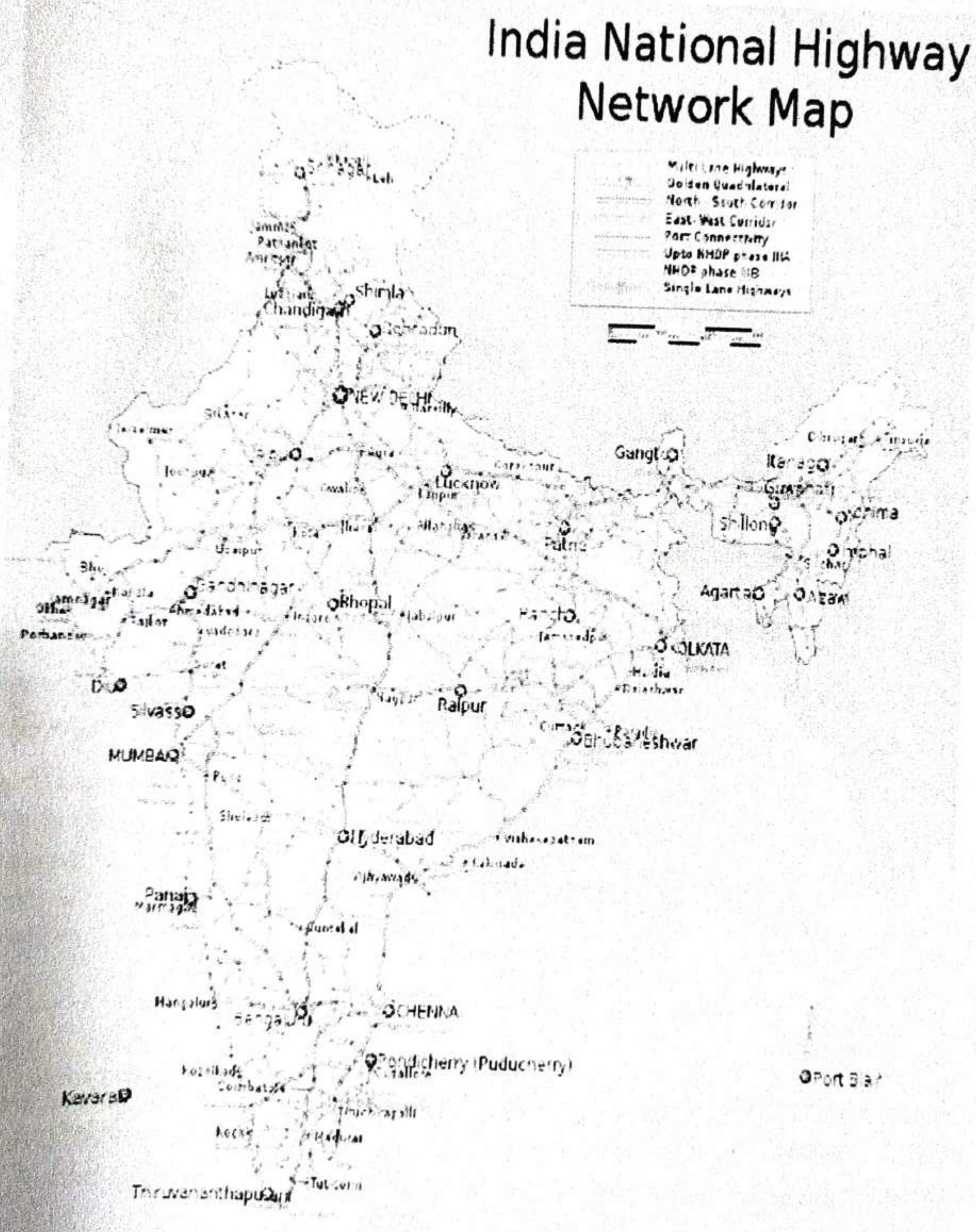
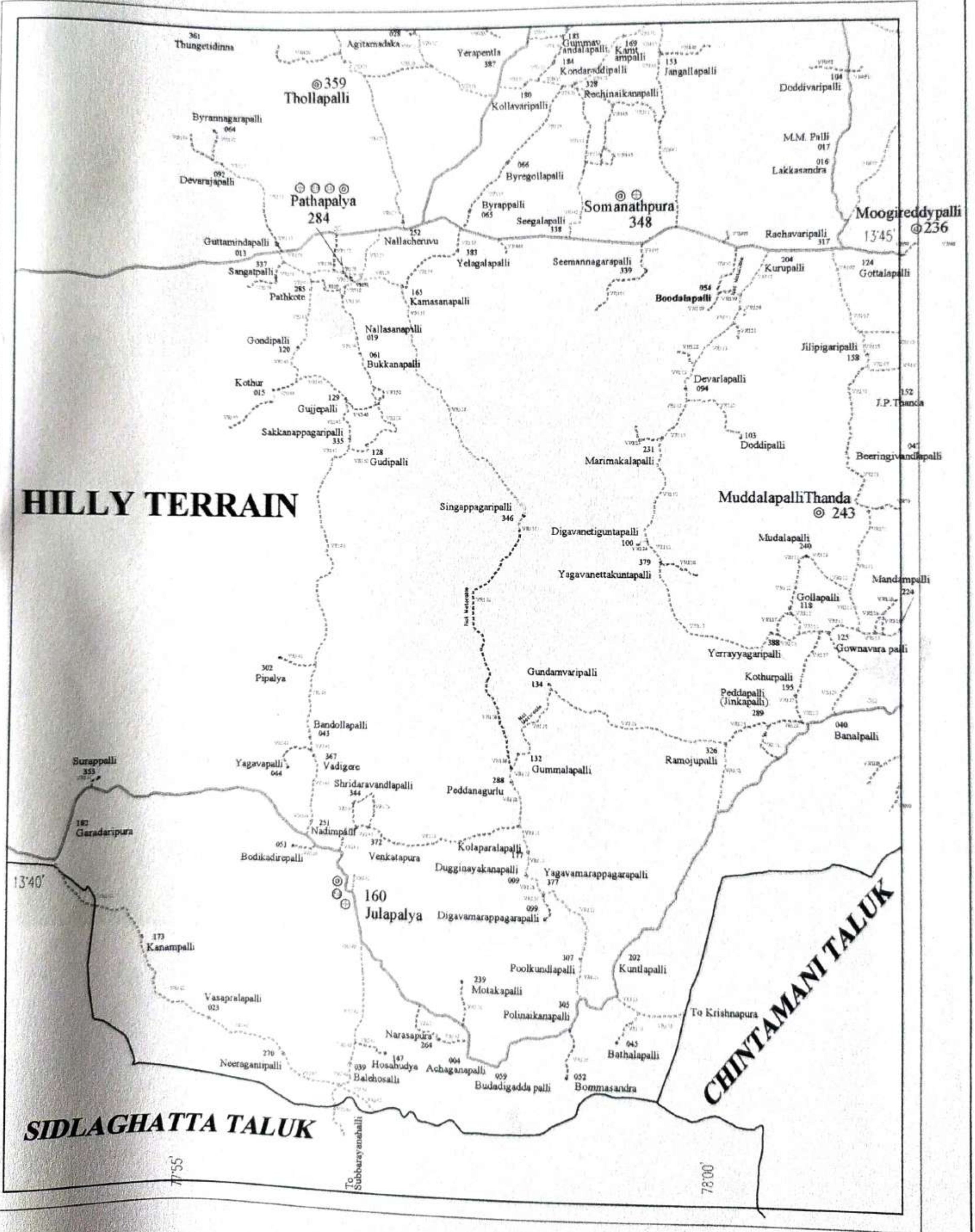


Figure-2 District Map

Figure-3 Section of Block Maps showing all existing connectivity like District/block HQ, new townships, National and State highway network, Mandis, GrAMs, Ruban Growth Cluster, hospitals, colleges, Higher Secondary schools, High school, Bus Stand etc.

CORE NETWORK MAP OF PATHAPALLI TO POLANAYAKANAHALLI BAGEPALLI TALUK, CHIKKABALLAPUR DISTRICT




Pathapalya
Mandampalli
Machanapal
Polanayakanapa
Polanayakanahalli
Image © 2020 Maxar Technologies
© 2019 Google
Image © 2020 Maxar Technologies
T.Gollahalli
Google Earth

ಪಥ ಸಂಚಲನ ವರದಿ(TRANSECT WALK REPORT)

Patha Palya to Polanayakanahalli ರಸ್ತೆಯು ಯೋಜನೆಯಡಿ (PMGSY-III ಅನುಮೋದನೆಯಾಗಿದ್ದು, ಈ ರಸ್ತೆಯು ಸರ್ವೆ ಮತ್ತು ಅಂದಾಜು ಪಟ್ಟಿ ತಯಾರಿಸುವ ಹಂತದಲ್ಲಿದ್ದು, ಸದರಿ ರಸ್ತೆಯನ್ನು ದಿನಾಂಕ: 21/01/20 ರಂದು ಸಂಬಂಧಪಟ್ಟ ಯೋಜನಾ ವಿಭಾಗ, ಇಂಜಿನಿಯರುಗಳು ಹಾಗು ಸರ್ವೆ ಕಾರ್ಯ ಮಾಡುತ್ತಿರುವ ಸಮದ್ರುತ್ತ ಸಮಾಲೋಚಕರು ಮತ್ತು ಈ ಕೆಳಕಂಡ ಜನ ಪ್ರತಿನಿಧಿಗಳ ಸಮ್ಮುಖದಲ್ಲಿ (Transect walk) ಪಥ ಸಂಚಲನ ಕಾರ್ಯ ಹಮ್ಮಿಕೊಂಡಿದ್ದು, ಜನ ಪ್ರತಿನಿದಿಗಳ ಜೊತೆ ಸಮಾಲೋಚಿಸಿ ಉತ್ತಮ ರಸ್ತೆ ನಿರ್ಮಾಣ ಮಾಡುವ ಅಂಶಗಳನ್ನು ಅಳವಡಿಸಿ ಅಂದಾಜು ಪಟ್ಟಿ ತಯಾರಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಯಿತು ಹಾಗೂ ಸದರಿ ರಸ್ತೆ ನಿರ್ಮಾಣ ಮಾಡುವ ಜಾಗವನ್ನು ರೈತರ ಮನವೊಲಿಸಿ ಬಿಟ್ಟುಕೊಡಲು ಸಹ ಸಹಕರಿಸಲಾಗುವುದು ಎಂದು ಗ್ರಾಮಸ್ಥರು ಮತ್ತು ಜನಪ್ರತಿನಿಧಿಗಳು ಪ್ರಮಾಣಿಕರಿಸಿರುತ್ತಾರೆ.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್	ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಇಂಜಿನಿಯರ್ ಯೋಜನೆ ಉಪ ವಿಭಾಗ	ಕಾರ್ಯಪಾಲಕ ಇಂಜಿನಿಯರ್ ಯೋಜನೆ ವಿಭಾಗ

ಜನಪ್ರತಿನಿಧಿಗಳು ಹಾಗೂ ಗ್ರಾಮಸ್ಥರು. [illegible]

ವೆಂಕಟರೆಡ್ಡಿ
ವೆಮರೆಡ್ಡಿ
2. ನಾಗರಾಜ್. ಲೈನ್‌ಮ್ಯಾನ್ ಪಾತಪಾಳ್ಯ.
3. V. ರಾಧಮ್ಮ
ಶ್ರೀನಿವಾಸರೆಡ್ಡಿ
ರಾಮಪ್ಪ
5. ByraReddy
7. Venkatramareddy
8. ಶಂಕರರೆಡ್ಡಿ

Bhagepalli.

ಪಥ ಸಂಚಲನ ವರದಿ(TRANSECT WALK REPORT)

Patha Palya to Polanayakanahalli ರಸ್ತೆಯು ಯೋಜನೆಯಡಿ (PMGSY III) ಅನುಮೋದನೆಯಾಗಿದ್ದು, ಈ ರಸ್ತೆಯು ಸರ್ವೆ ಮತ್ತು ಅಂದಾಜು ಪಟ್ಟಿ ತಯಾರಿಸುವ ಹಂತದಲ್ಲಿದ್ದು, ಸದರಿ ರಸ್ತೆಯನ್ನು ದಿನಾಂಕ: 21/01/2020 ರಂದು ಸಂಬಂಧಪಟ್ಟ ಯೋಜನಾ ವಿಭಾಗ, ಇಂಜಿನಿಯರುಗಳು ಹಾಗು ಸರ್ವೆ ಕಾರ್ಯ ಮಾಡುತ್ತಿರುವ ಸಮದ್ಯತ್ತ ಸಮಾಲೋಚಕರು ಮತ್ತು ಈ ಕೆಳಕಂಡ ಜನ ಪ್ರತಿನಿಧಿಗಳ ಸಮ್ಮುಖದಲ್ಲಿ (Transect walk) ಪಥ ಸಂಚಲನ ಕಾರ್ಯ ಹಮ್ಮಿಕೊಂಡಿದ್ದು, ಜನ ಪ್ರತಿನಿದಿಗಳ ಜೊತೆ ಸಮಾಲೋಚಿಸಿ ಉತ್ತಮ ರಸ್ತೆ ನಿರ್ಮಾಣ ಮಾಡುವ ಅಂಶಗಳನ್ನು ಅಳವಡಿಸಿ ಅಂದಾಜು ಪಟ್ಟಿ ತಯಾರಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಯಿತು ಹಾಗೂ ಸದರಿ ರಸ್ತೆ ನಿರ್ಮಾಣ ಮಾಡುವ ಜಾಗವನ್ನು ರೈತರ ಮನವೊಲಿಸಿ ಬಿಟ್ಟುಕೊಡಲು ಸಹ ಸಹಕರಿಸಲಾಗುವುದು ಎಂದು ಗ್ರಾಮಸ್ಥರು ಮತ್ತು ಜನಪ್ರತಿನಿಧಿಗಳು ಪ್ರಮಾಣಿಕರಿಸಿರುತ್ತಾರೆ.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್

ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಇಂಜಿನಿಯರ್
ಯೋಜನೆ ಉಪ ವಿಭಾಗ

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ಯೋಜನೆ ವಿಭಾಗ

ಜನಪ್ರತಿನಿಧಿಗಳು ಹಾಗೂ ಗ್ರಾಮಸ್ಥರು.

K.V. Venkatarayanappa

S. ఈశ్వర రెడ్డి
G. నారాయణ రెడ్డి
సుబ్బారెడ్డి
వెంకటరమణప్ప
గంగులప్ప
రాజగోపాలప్ప
వెంకటరమణ
N. Subba Reddy
G. వెంకటరెడ్డి
P.S. [illegible]

Bhagepalli.

ಪಥ ಸಂಚಲನ ವರದಿ(TRANSECT WALK REPORT)

Pathapalya to Polanayakanahalli ರಸ್ತೆಯು ಯೋಜನೆಯಡಿ (PMGSY III) ಅನುಮೋದನೆಯಾಗಿದ್ದು, ಈ ರಸ್ತೆಯು ಸರ್ವೆ ಮತ್ತು ಅಂದಾಜು ಪಟ್ಟಿ ತಯಾರಿಸುವ ಹಂತದಲ್ಲಿದ್ದು, ಸದರಿ ರಸ್ತೆಯನ್ನು ದಿನಾಂಕ 21/01/20 ರಂದು ಸಂಬಂಧಪಟ್ಟ ಯೋಜನಾ ವಿಭಾಗ, ಇಂಜಿನಿಯರುಗಳು ಹಾಗು ಸರ್ವೆ ಕಾರ್ಯ ಮಾಡುತ್ತಿರುವ ಸಂಸ್ಥೆ ಸಮಾಲೋಚಕರು ಮತ್ತು ಈ ಕ್ಷೇತ್ರದ ಜನ ಪ್ರತಿನಿಧಿಗಳ ಸಮ್ಮುಖದಲ್ಲಿ (Transect walk) ಪಥ ಸಂಚಲನ ಕಾರ್ಯ ಹಮ್ಮಿಕೊಂಡಿದ್ದು, ಜನ ಪ್ರತಿನಿಧಿಗಳ ಜೊತೆ ಸಮಾಲೋಚಿಸಿ, ಉತ್ತಮ ರಸ್ತೆ ನಿರ್ಮಾಣ ಮಾಡುವ ಅಂಶಗಳನ್ನು ಅಳವಡಿಸಿ, ಅಂದಾಜು ಪಟ್ಟಿ ತಯಾರಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಯಿತು ಹಾಗೂ ಸದರಿ ರಸ್ತೆ ನಿರ್ಮಾಣ ಮಾಡುವ ಜಾಗವನ್ನು ರೈತರ ಮನವೊಲಿಸಿ ಬಿಟ್ಟುಕೊಡಲು ಸಹ ಸಹಕರಿಸಲಾಗುವುದು ಎಂದು ಗ್ರಾಮಸ್ಥರು ಮತ್ತು ಜನಪ್ರತಿನಿಧಿಗಳು ಪ್ರಮಾಣೀಕರಿಸಿರುತ್ತಾರೆ.

ಸಹಾಯಕ ಇಂಜಿನಿಯರ್

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ಕಾರ್ಯಪಾಲಕ ಇಂಜಿನಿಯರ್
ಯೋಜನೆ ವಿಭಾಗ

ಜನಪ್ರತಿನಿಧಿಗಳು ಹಾಗೂ ಗ್ರಾಮಸ್ಥರು.

1)

MAHABooB

S. Baba

2.4 Road Design Brief

SL. No	Location	Issue	Design Solutions	Deficiency in view of road safety and remedies proposed
1	0+000 to 0+220	Pathapalya Village Limit, Road Passing in Built up area	CC Pavement is provided	
2	0+210 to 0+760	Wornout Asphalted Surface	Flexible Pavement is provided as per design	
3	0+760 to 1+230	Kamsanapalli Village limit	CC Pavement is provided	
4	1+230 to 5+500	Wornout Asphalted Surface passing in hilly terrain	Flexible Pavement is provided as per design	
5	5+500 to 5+700	Singappagaripalli Village limit	CC Pavement is provided	
6	5+700 to 7+030	Wornout Asphalted Surface passing in hilly terrain	Flexible Pavement is provided as per design	
7	6+960 to 10+250	Earthen Surface (Cart Track) passing in hilly terrain	Flexible Pavement is provided as per design	
8	10+250 to 10+660	Hard rock reach	CC Pavement is provided	
9	10+658 to 10+810	Asphalted Surface	Resurfacing is provided	
10	10+810 to 10+980	Kolaparalapalli Villge limit	CC Pavement is provided	
11	10+980 to 12+880	Asphalted Surface	Resurfacing is provided	
12	11+700 to 12+150	Tank Reach	Protection works are provieded	
13	12+880 to12+990	Yagavamarappagarapalli village	CC Pavement is provided	
14	12+990 to 14+350	Asphalted Surface	Resurfacing is provided	
15	14+350 to 14+610	Existing CC	Road Markings are provided	
16	14+610 to 14+850	Asphalted Surface	Resurfacing is provided	
17	14+850 to 14+910	Polanayakanahalli	CC Pavement is provided	
18	14+910 to 15+230	Asphalted Surface damaged	Flexible Pavement is provided as per design	
19	15+230 to 15+272	Polanayakanahalli	CC Pavement is provided	

2.5 Transect Walk Summary

Table 2.2 Transect Walk Summary

Chainage	Existing Land Width*	Additional Land Required		Type of Loss		Village	Remarks/Suggestions
		LHS	RHS	LHS	RHS		
0+000	6			Builtup	Builtup	Pathapalya	CC Pavement is Provided
0+210	6			Builtup	Builtup		
0+760	6			Builtup	Builtup	kamsanapalli	CC Pavement is Provided
1+230	6			Builtup	Builtup		
1+230	8.5				Hill		Flexible Pavement is provided as per design
5+500	8.5				Hill	Singappagaripalli	
5+700	6			Builtup	Builtup		CC Pavement is Provided
6+960	8.5			Hill	Hill		Flexible Pavement is provided as per design
10+658	8.5			Hill	Hill		
10+810	6			Builtup	Builtup	Kolaparalapalli	CC Pavement is Provided
10+980	6			Builtup	Builtup		
11+700	8.5			Tank			Protection works are provided
12+150	8.5			Tank			
12+88	6			Builtup	Builtup	Yagavamarappagarapalli	CC Pavement is Provided
12+99	6			Builtup	Builtup		
							Resurfacing is provide
14+85	6			Builtup	Builtup	Polanayakanahalli	CC Pavement is Provided
14+91	6			Builtup	Builtup		
15+268	8.5						End point @ Polanayakanahalli

- Total No. of People present for the Transect walk :
  Male : 30 , Female: 15 , Total : 45
- Demographic information where the Walk was conducted :
- No. of Govt. Employees present : 3
  No. of participants from Minority community :
  SC/ ST : , Women :
- No. of SHG members participated:
- Enclose a separate sheet with names, designation (if Govt. Employee, or Elected Representative, SHG members) and Signatures of participants of transect walk

Sl. No.	Name of Govt. Employee	Designation	Signature
1	**Ravindra Singh**	**AE**	
2	K. Muthappa	**AEE**	
3	Sunanda A	EE	

2.6 Checklist

Transect walk done	Yes ☒	No ☐
Photographs of Transect walk attached	Yes ☒	No ☐
Transect walk summary table included	Yes ☒	No ☐
Minutes of Transect walk attached	Yes ☒	No ☐
Geo-tagged Photographs at 100m intervals taken	Yes ☐	No ☒
Photographs taken	Yes ☒	No ☐
Major changes in alignment perceived	Yes ☐	No ☒
Design brief provided	Yes ☒	No ☐
Photos of Grama Sabha Attached	Yes ☒	No ☐

3. Topographic Survey

3.1 General

Topographic survey true to ground realties have been done using Total Station Topographic survey, is one of the most important preliminary tasks in the road survey project. **The Survey is conducted by using Total Station**. Survey is the technique, profession, and science of accurately determining the terrestrial or three-dimensional position of points and the distances and angles between them.

The in-house standards, work procedures and quality plan prepared with reference to IRC: SP 48-1984, IRC:73-1980, IRC: SP 19-2001, IRC: SP 20-2002, IRC: SP 13-2004 (in respect of surveys for rivers/streams) and current practices have been followed while conducting the above survey.

The survey work has been divided into the three basic sub divisions

1. Reconnaissance
2. Preliminary Survey and
3. Final Location Surveys.

Reconnaissance starts with a field inspection by walking and all information of value, either in design, construction, maintenance or operation of the facility has been collected.

During the preliminary survey all the requirements of cross-drainage works – type, number and length and other relevant details are collected.

During the Final topographical survey has been conducted using a total station. The Bench marks have been established at salient points and at regular intervals and the topographic survey has been conducted and all the features of the ground and the road has been recorded.

- Road length passing through different terrains
- Cross sections and longitudinal section at regular intervals
- Villages, hamlets and market centers and their location
- Crossing with railway lines and other existing roads.

Position of ancient monuments, burial grounds, cremation grounds, religious structures, hospitals and schools etc.

3.2 Traversing

The traverse consists of a series of straight lines with their lengths and intermediates angles measured very carefully. In difficult terrain, the alignment may have to be negotiated through a series of short chords, preferably, the traverse should be done with a Theodolite with Electronic Distance Measurement (EDM) and all angles measured with double reversal method. Global Positioning System (GPS) is also very useful and appropriate for preliminary survey. The GPS will give locations in coordinates all the necessary points on the traverse. GPS is very fast and reasonably accurate for preliminary system and computer friendly for data transfer. Control pillars in cement concrete should be fixed at suitable interval (ranging from 500 m to 2 kms) to have control on accuracy. It also helps in repeating the survey, if required, within the control pillars.

Traverse is to be done preferably by total station having angular measurement accuracy of ± 1 sec.

3.3 Leveling

Leveling has been using total station having angular measurement accuracy of ± 1 sec.

3.4 Cross Section & Detailing

Cross sections were taken at 30 m interval and at closer interval of 5 m to 10 m in curved portion of the existing road. All physical features of the road have been recorded and the same is processed using software's.

3.5 Data Processing

All data from topographic survey recorded by total station have been processed by appropriate software's and the longitudinal and cross section and other details.

3.6 To facilitate the Levelling work, Benchmarks, either temporary or permanent, should be established at intervals of 250 to 500 metres with proper marking, painting as per code. The levels should be connected to GTS datum.

Description	Location of BM/TBM	Levels	Longitude	Latitude
TBM0	@ 0.02Km Pathapalya Village	707.73	818901.12	1522559.98
TBM1	@ 0.270Km on rock	706.11	819090.17	1522542.05
TBM2	@ 1.230 Km on road edge	706.72	819738.29	1522052.91
TBM3	@ 1.680 on rock	718.4	819778.76	1521611.77
TBM4	@ 2.100 on Sump	716.69	819897.64	1521217.11
TBM5	@ 2.670 Km	724.3	820069.34	1520716.84
TBM6	@ 3.300Km	738.23	820460.64	1520317.77
TBM7	On waste weir @ 3.450Km	742.1	820510.73	1520168.01
TBM8	@ 4.260Km	755.37	820880.34	1519521.43
TBM9	@ 5.040Km on Rock	763.79	821420.69	1519040.84
TBM10	@ 5.460Km on Waste weir	777.57	821709.34	1518720.56
TBM11	@ 6.360Km	812.24	821585.02	1517936.41
TBM12	@ 6.720Km	809.11	821382.2	1517657.91
TBM13	@ 7.200Km	794.85	821063.37	1517343.41
TBM14	@ 7.720 Km	795.93	820899.56	1516888.67
TBM15	@ 8.130Km	811.33	821005.72	1516544.42
TBM16	@ 8.580Km	802.74	821071.13	1516142.44
TBM17	@ 9.150Km	796.37	821125.83	1515630.71
TBM18	@ 9.810Km	778.88	821356.01	1515068.14
TBM19	@ 10.400 on Rock	771.64	821534.66	1514507.14
TBM20	@ 10.860Km on water tank	769.62	821575.88	1514061.61
TBM21	@ 11.370Km on rock	759.59	821732.19	1513601.02
TBM22	@11.790Km on rock	758.9	821783.37	1513189.8
TBM23	@ 12.270Km	755.41	821870.8	1512733.72
TBM24	@ 12.690Km	749.19	821997.59	1512417.64
TBM26	@ 13.430Km on road edge	746.33	822465.51	1512068.87
TBM27	@ 14.010	739.14	822889.24	1511680.08
TBM28	@ 14.260Km	739.47	822875.89	1511424.18
TBM29	@ 14.620Km on water sump	741.64	822774.79	1511087.91
TBM30	@ end ch: 15.270Km	736.96	822775.71	1510509.22
RBM	@ 5.760Km near Temple	796	821755.55	1518480.78

3.7 Checklist

BM/TBM with northing – easting given Yes ☒ No ☐
Traverse survey carried out Yes ☒ No ☐
Cross section and detailing carried out Yes ☒ No ☐
L-S details attached with the Part II of the DPR Yes ☒ No ☐

4. Soil and Materials Survey

4.1 General

The soil and material investigations were done following the guidelines of IRC: SP: 20-2015 and IRC: SP: 72-2015 and other relevant IS code. The potential sources of borrow areas for soil and probable quarry sites are identified with the section Engineers.

4.2 Soil sample collection and Testing

Soil samples are collected along and around the road alignment at three (3) locations per km, from the adjoining borrow areas, as well as one sample is collected from the existing road. Soil Classification tests like grain size analysis and Atterberg's limit are conducted for all the samples collected. Standard Proctor test and the corresponding 4 day soaked CBR test were conducted for a minimum of one test per km for soil samples of same group or more tests due to variation of soil type. The following tests have been conducted as detailed below:

- Grain size analysis as per IS : 272 (Part 4) – 1985
- Atterberg's limit as per IS : 2720 (Part 5) – 2010
- Standard Proctor density test as per IS : 2720 (Part 7) – 2011
- 4 day soaked CBR test as per IS : 2720 (Part 16) – 2011

The California Bearing ratio (CBR) is made in **Bangalore University, Jnanabharathi,** for 3 Soil samples per Km collected during the survey. Soil classification tests like grain size analysis and Atterberg's limit are carried out for 3 samples. Standard compaction test like maximum dry density, optimum moisture content and 4 day soaked CBR test are carried out for 1 soil sample of same group. The same test reports are attached along the DPR.

4.3 Analysis of Test Results

The laboratory soaked CBR value is 5% & 8%. The soil laboratory test results are summarized in the following Table.

Sl. No	Chainage		CBR
	From	To	
1	0.00	1.000	6.20%
2	1.000	2.00	6.00%
3	2.00	3.00	5.30%
4	3.00	4.00	5.10%
5	4.00	5.00	6.30%
6	5.00	6.00	6.10%
7	6.00	7.00	5.10%
8	7.00	8.00	5.20%
9	8.00	9.00	6.30%
10	9.00	10.00	6.10%
11	10.00	11.00	6.00%
12	11.00	12.00	7.20%
13	12.00	13.00	7.00%
14	13.00	14.00	7.30%
15	14.00	15.30	8.20%

4.4 Coarse and Fine Aggregates

The available information regarding the source of aggregate and sand have been gathered. The stone aggregates will be procured from the nearest quarry whereas the locally available sand will be used. The source and the lead distance from the quarry to project site has been finalized in discussion with the PIU. The aggregates and sand where available and acceptable are recommended to be used for bituminous work, concrete works, other pavement works.

Regarding the Stone quarries as the approved quarries are not available very near to the located road it is suggested that the, metal can be brought from the nearest quarries conforming to the standards.

4.5 Sub-soil investigation for bridges

The Alignment of the road does not have any bridges at present and no bridge proposed in the DPR.

4.6 Checklist

Borrow pit suitable	Yes ☒	No ☐
Sub grade Soil Investigation for existing ground	Yes ☒	No ☐
Investigation for coarse/fine aggregate	Yes ☒	No ☐
Sub soil investigation for CD/Minor Bridge	Yes ☐	No ☒

5. Traffic Survey

5.1 General

The traffic survey is conducted. The Classified Volume Count survey has been carried out in accordance with the requirements of the TOR and relevant codes (IRC: SP: 19-2001, IRC: SP: 20-2015, IRC: SP: 72-2015).The surveys have been carried out by trained enumerators manually under the monitoring of Engineering Supervisor.

5.2 Traffic Data and Analysis

The traffic count done was classified into different vehicle category as given below:

- Motorized vehicle comprising of light commercial vehicle, medium commercial vehicle, heavy commercial vehicle, trucks, buses, agricultural tractors with trailers, car, jeep, two wheelers etc.
- Non- motorized vehicles comprising of cycle, rickshaw, cycle, van, animal drawn vehicle etc.

The number of laden and un-laden commercial vehicles recorded during the traffic counts. Traffic volume count for this project road was done during winter season. The seasonal variation is based on local enquiry.

Average of 3 day traffic data is presented in Table 5.1.

Table 5.1 Average Daily Traffic at Kamsanapalli (both ways)

Day		Day – 1	Day – 2	Day – 3	Total	Average
Animal Drawn Vehicles		0	0	0	0	0
Cycles		60	41	22	123	41
Motorised Two wheelers		10	24	14	48	16
Truck	Laden	53	51	37	141	47
	Unladen	16	20	14	50	17
Buses	Laden	29	21	16	66	22
	Unladen	7	0	0	7	2
Agricultural Tractor Trailers	Laden	55	40	42	137	46
	Unladen	30	9	8	47	16
Medium Commercial Vehicle	Laden	44	0	41	85	28
	Unladen	11	16	16	43	14

Average Daily Traffic from 10.660 to 15.272Km

Day		Day – 1	Day – 2	Day – 3	Total	Average
Animal Drawn Vehicles		0	0	0	0	0
Cycles		4	5	5	14	5
Motorised Two wheelers		9	10	5	24	8
Truck	Laden	2	2	2	6	2
	Unladen	2	2	2	6	2
Buses	Laden	2	2	2	6	2
	Unladen	2	2	2	6	2
Agricultural Tractor Trailers	Laden	8	6	5	19	6
	Unladen	7	6	6	19	6
Medium Commercial Vehicle	Laden	10	0	7	17	6
	Unladen	6	6	4	16	5
Cars, Jeeps, Vans, Three Wheelers		7	6	6	19	6

5.3 Traffic Growth Rate and forecast

The Average Annual Growth rate of 6% over the design life is adopted.

Table 5.2 Average Annual Daily Traffic at Kamsanapalli

Sl. No.	Type of Vehicle	ADT	AADT	Growth Rate
1	Car, Jeep, Van	42	52	6.00%
2	Auto Rickshaw	43	53	6.00%
3	Scooters/Motorbikes	16	20	6.00%
4	Bus / Minibus	24	30	6.00%
5	Trucks	64	79	6.00%
6	Tractors with trailers	46	57	6.00%
7	Tractors without trailers	16	20	6.00%
8	Cycles	41	51	6.00%
9	Cycle Rickshaw / Hand Cart	0	0	6.00%
10	Horse cart / Bullock Cart	0	0	6.00%
11	Pedestrian	23		
Total commercial vehicle per day (cvpd)		291	363	6.00%
Total motorised vehicle per day		234	292	6.00%
Total non-motorised vehicle per day		57		
ESAL			1549094	

Average Annual Daily Traffic from 10.660 to 15.272Km

Sl. No.	**Type of Vehicle**	**ADT**	**AADT**	**Growth Rate**
1	Car, Jeep, Van	6	7	6.00%
2	Auto Rickshaw	11	14	6.00%
3	Scooters/Motorbikes	8	10	6.00%
4	Bus / Minibus	4	5	6.00%
5	Trucks	4	5	6.00%
6	Tractors with trailers	6	7	6.00%
7	Tractors without trailers	6	7	6.00%
8	Cycles	5	6	6.00%
9	Cycle Rickshaw / Hand Cart	0	0	6.00%
10	Horse cart / Bullock Cart	0	0	6.00%
11	Pedestrian	0		
Total commercial vehicle per day (cvpd)		50	62	6.00%
Total motorised vehicle per day		37	46	6.00%
Total non-motorised vehicle per day		13		
ESAL		120757		

Independent traffic survey details shall be attached where the projected traffic is more than 1 MSA duly certified by the STA. Further, Axle load survey should be carried out on such proposed roads which are to be designed for projected traffic of 2 MSA or more and carriageway width of 5.5 m. The geo-tagged photographs and videography for the peak hour traffic should be attached with the DPR to justify the traffic plying on the proposed road.

Traffic volume and mix do not vary along the road Yes ☐ No ☐
Traffic volume and mix vary along the road Yes ☐ No ☐
Traffic volume and mix will vary along the road in the future Yes ☐ No ☐
There is a potential for through traffic using the road Yes ☐ No ☐
% of loaded vehicles Yes ☐ No ☐
Third Party traffic count attached (Projected Traffic > 1 MSA) Yes ☐ No ☐Axle
load test conducted (2 MSA or more and 5.50 m) Yes ☐ No ☐

6. Hydrological Survey

6.1 General

Hydrological data collection and the survey is necessary for design of Cross Drainage Structures so that the rain water can pass as per natural slope. Hydrological survey of the proposed road is based on the available topographic maps of the Survey of India and the catchment area of the cross drainage works has been derived and the analysis is done. Hydrological survey of the proposed road is based on the following observations.

- Rainfall Data
- Catchment Areas
- Time of Concentration
- Existing Cross Drainage Structures

6.2 Rainfall Data

Rainfall Data has been obtained from the local authorities and the same is used in the computation of the flow across the cross drainage works and the computation of the volume of flow. Kolar Falls in **Eastern Dry Agro Clamatic Zone** it experience a semi-arid climate, characteristiced by typical manson tropical weather with hot summers and mild winters. The year is normally divided into 4 seasons

- Dry season – during January to February.
- Pre-mansoon season – during March to may
- South - West mansoon season – during June to September
- Post or North - East mansoon season – during October to December
- based on rainfall data pertaining, there are 11 rainaguage stations in each of the taluks.
- Rainy season starts from June to September.
- Average rainfall – 654 mm.
- Near Rain guage

6.3 Catchment Area

The Catchment area is calculated by local information and also studying the Topo sheets procured from Survey of India. The location of the cross drainage works marked in the respective Topo sheets along with catchment area are attached to the DPR.

6.4 Time of Concentration

Time of concentration (T_c) in hours is calculated from the formula of $(0.87 \times L^3/H)^{0.385}$, where L is distance from the critical point to the structure site in km and H is the difference in elevation between the critical point and the structure site in meters.

6.5 Existing Cross Drainage Structures

There are 38 numbers of cross drainage structures along the existing project road as listed below.

Table-6.1 List and condition of existing CD structures

SL. No.	Chainage in Km	Description of existing structure				
		Type	Span / Dia in m	Vent	Condition	Repair/Reconstruction
1	0.722	Box	0.8 x 0.5	1	BS Slab Culvert	Reconstruction
2	1.741	Box	1 x 1	1	BS Slab Culvert	Reconstruction
3	2.078	Box	1 x 1	1	BS Slab Culvert	Reconstruction
4	2.254	Box	1 x 1	1	BS Slab Culvert	Reconstruction
5	2.720				Hardpath (26m)	Reconstruction
6	2.833	Box	1 x 1	1	BS Slab Culvert	Reconstruction
7	3.093	Pipe	1m	3	HP Culvert	Reconstruction
8	4.063	Box	1x1.5	1	RCC Slab Culvert	RETAIN
9	4.439	Box	3x1.5	1	RCC Slab Culvert	RETAIN
10	4.930				Hardpath	Reconstruction
11	5.343	Box	1 x 1.5	1	RCC Slab Culvert	RETAIN
12	5.469	Pipe	0.6m	2	HP Culvert	Reconstruction
13	6.240				Hardpath	Reconstruction
14	7.420	Pipe	1.2m	3	HP Culvert	Reconstruction
15	7.632	Pipe	1m	2	HP Culvert	Reconstruction
16	9.277	Pipe	1m	3	HP Culvert	Reconstruction
17	10.245	Box	1.5x1	1	BS Slab Culvert	Reconstruction
18	10.747	Pipe	0.9m	4	HP Culvert	RETAIN
19	10.918	Pipe	0.9m	1	HP Culvert	Reconstruction
20	11.324	Box	1 x 1	1	RCC Slab Culvert	RETAIN
21	11.453	Pipe	0.6m	1	HP Culvert	Reconstruction
22	11.633	Pipe	1m	3	HP Culvert	Reconstruction
23	11.865	Box	1.2x1	1	RCC Slab Culvert	RETAIN
24	12.065	Box	1.2x1	1	RCC Slab Culvert	RETAIN
25	12.429	Pipe	1m	2	HP Culvert	RETAIN
26	12.888	Pipe	1m	1	HP Culvert	Reconstruction
27	13.094				Hardpath (42m)	CC+WC
28	13.121	Pipe	0.6m	1	HP Culvert	Reconstruction
29	13.179	Pipe	1m	1	HP Culvert	RETAIN
30	13.459	Box	1.2x0.5	3	BS Slab Culvert	Reconstruction
31	13.624	Pipe	1m	1	HP Culvert	RETAIN
32	14.027	Box	1.2x0.5	1	RCC Slab Culvert	RETAIN
33	14.144	Box	1.2x0.5	1	RCC Slab Culvert	RETAIN
34	14.223	Pipe	0.6m	1	HP Culvert	RETAIN
35	14.288	Pipe	0.6m	1	HP Culvert	RETAIN
36	14.385	Box	1.2x1	5	BS Slab Culvert	RETAIN
37	14.872	Pipe	0.6m	1	HP Culvert	RETAIN
38	15.142	Pipe	0.6m	2	HP Culvert	RETAIN

7. Adopted Geometric Design Standards

7.1 General

The geometric design standards for this project confirm to PMGSY guidelines and the guidelines as stated in IRC-SP 20:2015. Recommended design standards vis-à-vis the standards followed for this road are described below. {PIU/Consultants shall review these guidelines with respect to the Expert Committee recommendations to review Standards, Specifications and Design of Rural Roads issued vide letter no. Lr.#P-17035/1/2007-Tech dated 13th October, 2010 shall be followed.

7.2 Terrain

The classification of terrain is selected from plain/rolling/hilly/steep classification for which following criteria will be applicable.

Terrain classification	**Cross slope of the country**	
Mountainous	25-60%	1 in 4 to 1 in 1.67

7.3 Design Speed

The proposed design speed along this project road will be selected from the following table:

Road classification	**Mountainous terrain**	
	Ruling	**Min.**
Rural Roads (ODR and VR)	25	20

7.4 Right of Way (ROW)

The requirement of ROW for this road is as follows (as specified in IRC-SP 20:2015):

Road classification	Mountainous and Steep Terrain			
	Open Area		Built-up Area	
	Normal	Exceptional	Normal	Exceptional
Rural roads (ODR and VR)	12	12	12	9

7.5 Roadway Width

Roadway width proposed for this road is given below:

Carriageway (m)	Mountainous and Steep	
	Desired	Minimum
3.75	6	4.75
5.5	7.5	7

7.6 Carriageway Width

The proposed width of carriageway for this project road is 3.75m.

7.7 Shoulders

It is proposed to have 1.875m wide shoulder as the case may be on both sides of which at least 1.00 m is hard shoulder with well compacted unscreened gravel. Shoulder width will be one half of the difference between the roadway width and carriageway width. The earthen / hard shoulder can be proposed as per the site requirements.

7.8 Roadway width at cross-drainage structures

The roadway width at culvert locations for this road shall be 7.5m. Roadway width at bridges will be 7.5m in through routes

7.9 Sight Distance

The safe stopping sight distance is applicable in the geometric design. The sight distance values for this road as per IRC recommendations are presented below:

Design Speed (km/hr)	Safe Stopping Sight Distance (m)
20	20
30	30
40	45
50	60

7.10 Radius of Horizontal Curve

According to IRC recommendations/standards, the minimum radius of horizontal curve for this project road is given below

Terrain Category	Radius of Horizontal Curve (m)	
	Ruling Minimum	Absolute Minimum
Mountainous	30	20

To minimize extra land arrangement, minimum radius used is 20m and design speed in these curves are also restricted to 20 km/hr.

7.11 Camber & Super elevation

A camber adopted on this road section is given below. The maximum super elevation is 4% for this project road.

Surface type	Camber (%)	
	Low rainfall (Annual rainfall <1000mm)	High rainfall (Annual rainfall >1000mm)
Earth road	4.00	5.00
WBM Gravel road	3.50	4.00
Thin bituminous road	3.00	3.50
Rigid Pavement	2.00	2.50

7.12 Vertical Alignment

The present road is in plain terrain and vertical alignment has been designed well within ruling gradient. Minimum gradient of 0.3% for drainage purpose is considered for designing the vertical alignment of this road. Vertical curves are not required when grade change is less than 1%, however a minimum vertical curve is provided to avoid vertical kink.

7.13 Vertical Curves

For satisfactory appearance, the minimum length of vertical curve for different design speed is given in IRC-SP 20:2015 and Expert committee recommendations of PMGSY roads to be referred. Vertical curves are to be designed to provide the visibility at least corresponding to the safe stopping sight distance. Valley curves to be designed for headlight sight distance.

7.14 Side slope

Side slope for this proposed road where embankment height is less than 3.0m is given in the table below.

Condition	Slope (H:V)
Embankment in silty/sandy/gravel soil	2.00:1.00
Cutting in silty/sandy/gravelly soil	1:1 to 0.5:1

7.15 Extra Widening of Pavement

The Extra Widening of Pavement at Curve as per IRC guideline is given below:

Radius of Curve (m)	Up to 20	21 - 60	Above 60
Extra Widening for 3.75 m wide single lane carriageway, (m)	0.9	0.6	Nil

8. Alignment Design

8.1 General

The basic aim of highway design is to identify technically sound, environment-friendly and economically feasible highway alignment. The most appropriate alignment is to be proposed considering the effect of climate change and past history of natural disasters in the area. The selection of the alignment is to be made after economic, social and environmental analysis, the details of the same is presented in succeeding chapters. The ensuing sections deals with obligatory points, which control highway alignment, design of cross-section, highway geometric design & methodology, design of miscellaneous items.

The main components included in the highway design are:

- Cross-sectional elements
- Embankment
- Horizontal alignment
- Vertical profile
- Junctions and/or Interchanges
- Road furniture etc.
- Miscellaneous items

8.2 Horizontal alignment

Physical features of the existing alignment are computed in the below table for the design of the road.

Table 8.1 – Features of Horizontal Alignment

CHAINAGE (M)		LENGTH (m)	Description	REASON FOR DEVIATION FROM EXISTING ALIGNMENT IF NECESSARY
FROM	TO			
0.00	15.27	15.272	Existing Alignment & Horizontal Alignemtn Coincide	No Deviation

Checklist:

a) Centre line of the existing and proposed horizontal alignment coincide ☒

b) Centre line of the existing and proposed horizontal alignment deviate at ☐ certain sections

Table 8.2 – Horizontal Curve Details

Curve No.	Curve radius in m	Design Speed kmph	Actual super elevation	Allowable super elevation	Co-efficient of friction	Restricted speed	Restricted Speed	Curve angle	Curve length	*CHAINAGE (M)*	
	R	V	$V^2 / (225xR)$ %	e	$V^2 / (127xR)$	$\sqrt{27.94xR}$		Deg	*Meter*	*FROM*	*TO*
1	7.000	50	158.73	7%	281.21	13.98	10.00	101°04'18"	12.35	43.31	55.66
2	7.000	50	158.73	7%	281.21	13.98	10.00	24°21'05"	2.97	332.97	335.94
3	4.000	50	277.78	7%	492.13	10.57	10.00	41°10'40"	2.87	644.02	646.89
4	7.000	50	158.73	7%	281.21	13.98	10.00	79°59'31"	9.77	846.69	856.46
5	40.000	50	27.78	7%	49.21	33.43	30.00	20°05'44"	14.03	1232.16	1246.19
6	30.000	50	37.04	7%	65.62	28.95	25.00	36°20'32"	19.03	1904.36	1923.39
7	35.000	50	31.75	7%	56.24	31.27	30.00	18°12'00"	11.12	2077.35	2088.47
8	35.000	50	31.75	7%	56.24	31.27	30.00	25°47'42"	15.76	2224.78	2240.54
9	65.000	50	17.09	7%	30.28	42.62	40.00	29°04'07"	32.98	2468.93	2501.91
10	20.000	50	55.56	7%	98.43	23.64	20.00	19°22'41"	6.76	2514.51	2521.27
11	70.000	50	15.87	7%	28.12	44.22	40.00	28°23'01"	34.68	2632.34	2667.02
12	25.000	50	44.44	7%	78.74	26.43	25.00	63°28'36"	27.70	2935.03	2962.73
13	32.000	50	34.72	7%	61.52	29.90	25.00	35°21'14"	19.75	3280.74	3300.49
14	25.000	50	44.44	7%	78.74	26.43	25.00	34°39'19"	15.12	3322.56	3337.68
15	15.000	50	74.07	7%	131.23	20.47	20.00	63°25'45"	16.60	3560.41	3577.01
16	10.000	50	111.11	7%	196.85	16.72	15.00	29°46'40"	5.20	3651.51	3656.71
17	10.000	50	111.11	7%	196.85	16.72	15.00	26°28'43"	4.62	3778.63	3783.25
18	60.000	50	18.52	7%	32.81	40.94	40.00	31°42'39"	33.21	4076.73	4109.94

8.3 Vertical alignment

No vertical curves are proposed in the project road.

8.4 Design of Junctions

The proposed alignment intersects cross roads and forms junctions. The locations of junctions are mentioned below:

Table 8.4 – List intersections, type and proposed modifications

Type of intersection	**Location (km)**	**Existing Side**	**Proposed Modifications**
T – Junction	0.000	Starting Chainage	Providing Road Marking, Road Studs, Bellmouths
T – Junction	10.658	Left Side	
T – Junction	15.272	Right Side	

9. Pavement Design

9.1 General

Considering the sub grade strength , projected traffic and the design life, the pavement design for low volume Rural roads is carried out as per guidelines of IRC: SP: 72 – 2015, or IRC SP:77-2008 "Design of Gravel Road" and SP:62-2014 "Cement Concrete roads". In built up area for hygienic and safety reasons, C.C. pavement to be provided with a hard shoulder and drain appropriate line drain. Drainage plan needs to be attached with the DPR.

- Pavement roughness measurement using bump integrator (or alternative calibrated instrument) and measurement of rutting, cracking and ravelling
- Measurement of road deflections utilizing the Benkelman Beam Deflection Test
- CBR tests at sufficient intervals to indicate extent and severity of the problem when pavements are too distressed to give meaningful deflection results
- Survey for assessment of the surface, sub-surface and roadside drainage condition of the road section
- Detailed subsurface investigations for all the road sections where there has been subgrade failure

Overlay thickness clause2.2.3 of IRC SP72:2015 should be referred

9.2 Pavement Design Approach

9.2.1 Design Life

A design life of 10 years is to be considered for the purpose of pavement design of flexible and granular pavements. In respect of Rigid pavement, a design life of 20 years is to be considered for the purpose of pavement design.

9.2.2 Design Traffic

The average annual daily traffic (AADT) for the opening year as well as the total commercial vehicle per day (CVPD) is to be presented in Table 5.2.

9.2.3 Determination of ESAL applications

Commercial vehicles with a gross laden weight of 3 tons or more are considered for the design. The design traffic is considered in terms of cumulative number of standard axles to be carried during the design life of the road. The number of commercial vehicles of different axle loads are converted to number of standard axle repetitions by a multiplier called the Vehicle Damage Factor (VDF). An indicative VDF value considered as the traffic volume of rural road does not warrant axle load survey.

For calculating the VDF, the following categories of vehicles are considered as er paragraph IRC: SP: 72 – 2015.

- Laden heavy/medium commercial vehicles
- Un-laden /partially loaded heavy/medium commercial vehicles
- Over loaded heavy/medium commercial vehicles

Indicative VDF values considered 10% of laden MCV and 10% laden HCV as overloaded & given below

Vehicle type	**Laden**	**Un-laden /Partially laden**
HCV	2.86	0.31
MCV	0.34	0.02

1. From 0.00 to 10.66Km

AADT = T + (S x nT x t x 0.6) / 365

(Ref:3.4.1 (ii),SP-72)

Where, T	= Average no. of commercial vehicles per day	=	291
S	= No. of Harvesting Season	=	2
t	= Duration of Single Harvesting Season	=	75 days

$= 291 + (2 \times 291 \times 0.6 \times 75) / 365$

AADT = 362.75

Before opening of the road to the traffic AADT $= \text{AADT} \times (1.06)^2$

$= 362.75 \times 1.06^2$

$= 407.6$

ESAL Applications per Day				
Type	**HCV Laden**	**HCV Unladen**	**MCV Laden**	**MCV Unladen**
No. of Vehicles	69	19	74	30
Proposed of projected AADT/ ADT	1.4	1.4	1.4	1.4
No. of Vehicles Based on daily count	97.00	27.00	104.00	42.00
VDF per Vehicles	2.86	0.31	0.34	0.02
VDF Consolidated	277.42	8.37	35.36	0.84
ESAL / DAY	321.99			
4811	(97 x 2.86 + 27 x 0.31 + 104 x 0.34 + 42 x 0.02)			

Cumulative ESAL Applications over 10 Years @ 6 % Growth Rate

= 4811 x 321.99

ESAL = **1549094** T – 9

2. From 10.66 to 15.272Km

AADT = T + (S x nT x t x 0.6) / 365

(Ref:3.4.1 (ii),SP-72)

Where, T = Average no. of commercial vehicles per day = 291
S = No. of Harvesting Season = 2
t = Duration of Single Harvesting Season = 75 days

= 50 + (2 x 50 x 0.6 x 75) / 365
AADT = 62.33

Before opening of the road to the traffic AADT = AADT x (1.06)^2
= 62.33 x 1.06^2
= 70.03

ESAL Applications per Day				
Type	HCV Laden	HCV Unladen	MCV Laden	MCV Unladen
No. of Vehicles	4	4	12	11
Proposed of projected AADT/ ADT	1.4	1.4	1.4	1.4
No. of Vehicles Based on daily count	6.00	6.00	17.00	15.00
VDF per Vehicles	2.86	0.31	0.34	0.02
VDF Consolidated	17.16	1.86	5.78	0.30
ESAL / DAY	25.1			
4811	(6 x 2.86 + 6 x 0.31 + 17 x 0.34 + 15 x 0.02)			

Cumulative ESAL Applications over 10 Years @ 6 % Growth Rate

= 4811 x 25.1

ESAL = **120757** T – 4

Cumulative ESAL Applications over 10 Years @ 6 % Growth Rate

= 4811 x 321.99

ESAL = **1549094** **T – 9**

9.2.4 Subgrade CBR

CBR range considering the report and the CBR 5% to 7% is considered and the traffic falls in the T-9 category.

9.3 Design Alternatives

Design alternatives considered

Chainage in m		**Design alternatives considered**						**Specify design alternative selected**	**Justification**
		Pavement		**Shoulders**			**Soil Stabilization and use of locally available marginal materials**		
From	**To**	**Flexible**	**Rigid**	**Earthen Full Width**	**Hard Full Width**	**Hard Shoulder 0.875m each side**			
0.000	0.220		0.220						Village
0.220	0.760	0.540		0.540					
0.760	1.270		0.510						Village
1.270	5.520	4.250		4.250					
5.520	5.720		0.200						Village
5.720	10.250	4.530		4.530					
10.250	10.660		0.410						Village
10.660	10.810	0.150		0.150					
10.810	10.980		0.170						Village
10.980	12.880	1.900		1.900					
12.880	12.990		0.110						Village
12.990	14.360	1.370		1.370					
14.360	14.610		0.250						Village
14.610	14.850	0.240		0.240					
14.850	14.910		0.060						Village
14.910	15.230	0.320		0.320					
15.230	15.272		0.042						Village

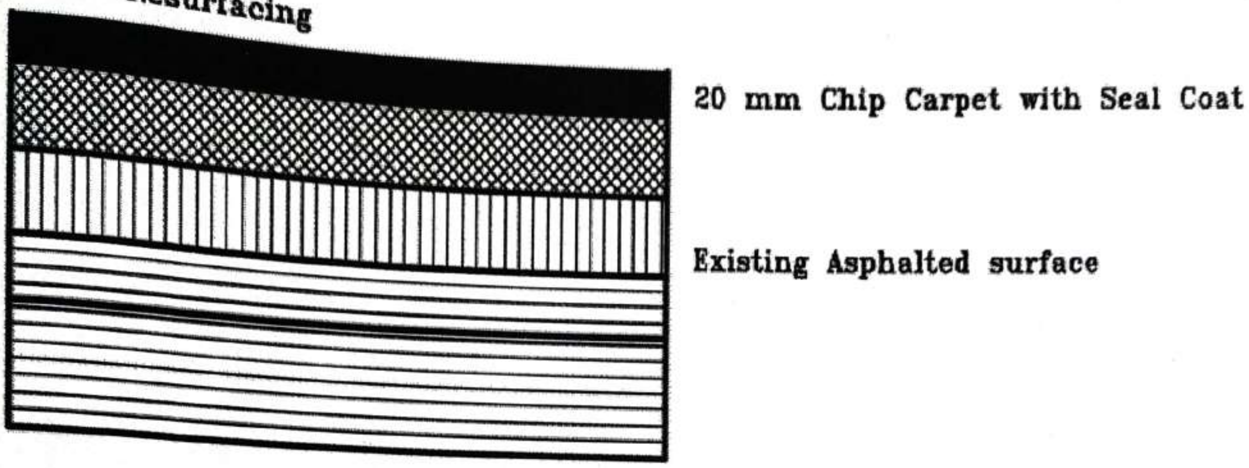
9.4 Pavement composition

i. Flexible Pavement: The designed flexible pavement thickness and composition are calculated by referring Figure-4 (Pavement design catalogue) of IRC:SP:72-2015. The ratio between heavy commercial vehicles and medium commercial vehicles as given in Chapter 5 should be maintained as far as possible.

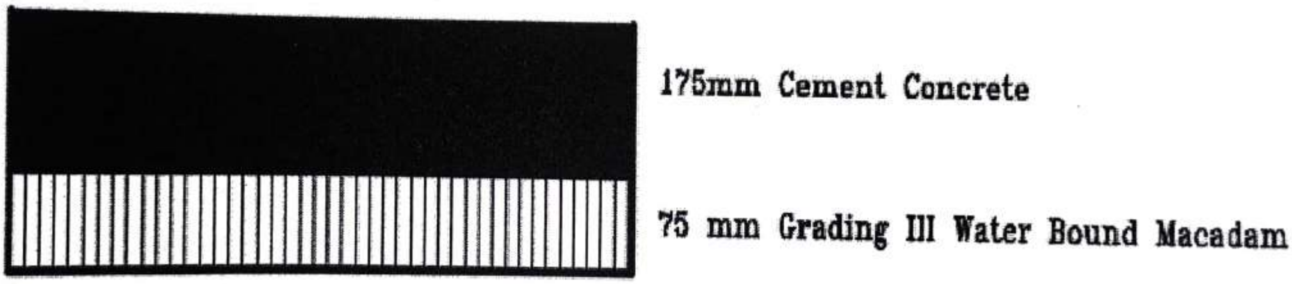
The pavement layers are provided.

Top layer of WBM will be treated with Bituminous surface.

Resurfacing



CC Reach



12. Land Requirement

12.1 General

Since the project road is not a new connectivity, Upgradation is proposed hence there is no proposal for land requirement.

12.2 Proposed ROW

The width of carriageway has been considered as 3.75 m in accordance with the IRC-SP 20: 2015 The total roadway width is limited to 7.50 m with 1.875 m earthen shoulder on either side of carriage way. The proposed ROW generally varies from 9 m – 10 m depending upon the embankment height and the proposed ROW is even less than 10 m in some stretches of habitation area and in areas having tree plantation.

12.3 Additional Land

Local administration and local panchayat need to apprise the villagers about requirement of minor areas in places for development of the road. Villagers are generally highly enthusiastic during site visits for selection of the road. Table 12.1 provides the chainage-wise additional land required.

Table 12.1 Additional land requirements

SL no	Chainage		Additional land width in m	**Additional width Required in m**	Measures proposed to obtain additional land
	From	To			
1	0.000	15.272	-	-	-

Since land width is sufficient there is no requirement for additional land width.

13. Utility shifting/relocation

13.1 Existing utilities

Electric Poles, Telephone lines and Water Supply lines are present along the road and at village limits, in which some utilities needs shifting.

13.2 Insert list of departments responsible for utility shifting

- Karnataka Power Transmission Corporation Limited (KPTCL) for shifting Power lines/Electric poles
- Karnataka Urban Water Supply and Drainage Board (KUWSB) for shifting Water Supply and Sewer Lines

13.3 Insert rules pertaining to shifting of utilities

For shifting of Power lines/Electric poles, line estimates are made according to the BESCOM and cost will be deposited to concerned department for shifting.

13.4 Provide an estimate with breakdown of costs for relocation of utilities

Table 13.1 Estimated Cost for Relocation of Utilities

SL. No	Utility type	Estimation Cost
1	Electric Poles, Telephone lines and Water Supply lines	882667.96
Estimated Total Cost		**882667.96**