

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

EXECUTIVE SUMMARY

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
1. INTRODUCTION	5
2. PROJECT OVERVIEW	6
2.1 Key Features of the project.....	9
2.2 Key plan of existing project stretch	11
3. TRAFFIC DEMAND ON PROJECT ROAD.....	12
3.1 Traffic Volume Surveys	12
3.2 Axle load Surveys	13
3.3 Traffic volume forecast	13
3.4 Turning Movement Surveys.....	14
3.5. Origin and Destination Surveys.....	15
4. PAVEMENT AND CORRIDOR SURVEY	16
4.1 Pavement condition and distress seen	16
4.2 Pavement composition	17
4.3 Sub-grade soil survey	17
5. IMPROVEMENT PROPOSALS	18
5.1 Proposed alignment.....	18
5.2 Bypass proposed	20
5.3 Road geometry.....	21
5.4 Widening scheme.....	21
5.5 Pavement design.....	22
5.6 Design of structures	24
5.7 Intersections and grade separators	24
5.8 Toll Plazas.....	25
5.9 Wayside amenities proposed.....	26
6. ENVIRONMENTAL IMPACT ASSESSMENT	26
6.1 Impact and clearances needed	26
6.2 Cost of environmental mitigation	27
7. SOCIAL IMPACT ASSESSMENT AND LAND ACQUISITION	27
7.1 Social impact assessment	27
7.2 Land acquisition requirements	27
7.3 Key risks envisaged in land acquisition.....	29
8. UTILITIES SHIFTING AND CLEARANCES	29
8.1 Utilities shifting estimates	29
9. PROJECT COST ESTIMATES	30
10. MATERIAL INVESTIGATION	32
10.1 Borrow for soil/Moorum.....	32
10.2 Sand	33
10.3 Gravel	34
10.4 Fly ash	34
10.5 Cement.....	34
10.6 Key risks	35
10.7. Location of material sources.....	35
11. POTENTIAL FOR VALUE ENGINEERING AND INNOVATIVE TECHNOLOGIES.....	35

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

12. ECONOMIC AND FINANCIAL ANALYSIS	36
12.1 Economic analysis of the project	36
12.2 Financial analysis.....	36
13. EXECUTION PLAN	37
13.1 Packaging	37
13.2 Bidding mode and timelines	37
13.3 Construction time and Planning	37
14. CONCLUSION AND RECOMMENDATION	37
15. IMPROVEMENT PROPOSALS:	38

List of Tables

Table 1: Description of Project stretch as per TOR	5
Table 2: Key Features of Existing/Proposed project Stretch	9
Table 3: Traffic survey Locations.....	12
Table 4: Traffic Volume count (AADT).....	13
Table 5: Vehicle Damage Factor at Shirady Existing Ch:264+700	13
Table 6: Projected traffic growth rate on project road.....	14
Table 7: Projected traffic on project road in MSA	14
Table 8: Turning movement survey result (Junction volume)	14
Table 9 : Zone influence Factor	15
Table 10: Condition survey of existing pavement.....	16
Table 11: Composition of existing pavement	17
Table 12: Soil investigation survey results.....	17
Table 13: Soil types observed	17
Table 14: Proposed by-passes along project length	20
Table 15: Proposed carriage way Details.....	20
Table 16: Service roads & Slip roads Details	20
Table 17: Existing road details	21
Table 18: Summary of widening type proposed	21
Table 19: Flexible pavement Design	22
Table 20: Proposed Pavement Composition of the main carriageway.....	23
Table 21: Pavement Composition for Bus bays, and Rest Area	23
Table 22: Overlay thickness required	23
Table 23: Adopted Pavement Composition for Service Road.....	23
Table 24: Proposed improvement to structures along project road	24
Table 25: Proposed intersections improvement.....	24
Table 26: Grade separators.....	25
Table 27: Location of Toll Plaza.....	25

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

Table 28: Proposed user amenities along project stretch	26
Table 29: Details of Proposed ROW	26
Table 30: Affected trees along project stretch	27
Table 31: Environmental Impact and clearances required	27
Table 32: Villages wise land to be Acquired Details.	28
Table 33: Quantities of Electrical Utility Shifting	29
Table 34: Project Cost Estimate	30
Table 35: Borrow area Details from Ch: 255+140 to Ch:270+270	32
Table 36: Schematic Locations of Sand quarries	33
Table 37: Coarse aggregate test results summary.....	34
Table 38: Key risks envisaged in material procurement	35
Table 39: Key value engineering opportunities identified.....	36
Table 40: Sensitivity Analysis Results.....	36
Table 41: The results of financial analysis.....	36
Table 42: Salient features and key financial aspects of the project road	37
Table 43: Minor Bridges along the project stretch	38
Table 44: Details of Proposed Elephant Under passes	39
Table 44: Details of Pedestrian Under passes.....	39
Table 45: Details of Bus bays with Bus Shelter and Rest area	39
Table 46: List of Box culverts Falling in Forest area	40

List of Figures

Fig 1: Location Of Project Road	7
Fig 2 : Forest Area Map (With Design Chainages).....	8
Fig 3: Key Plan Of Existing Project Road.....	11
Fig 4: Traffic Survey Locations Map	12
Fig 5: Alternative Alignment Options.....	18
Fig 6: Map Showing The Proposed Alignment (Option 3) Of Project Road	19

EXECUTIVESUMMARY

1. INTRODUCTION

The Ministry of Road Transport and Highways (MORT&H), Government of India (GOI) is engaged in the development of National Highways across the Nation has decided to undertake Up-gradation and Rehabilitation of Bengaluru-Mangaluru highway in the State of Karnataka. National Highways Authority of India (NHAI) of Government of India (GOI) has been entrusted to up-grade and rehabilitate. National Highways in principle, approved the 15.130 Km stretch of 2/4-lane with paved shoulder configuration with National Highway standards in the State of Karnataka.

The following stretch has been approved for preparation of DPR.

Table 1: Description of Project stretch as per TOR

S. No	Description	Proposed Length (Approx.)
1	Addahole (Near Gundya) to Periyasanti (Near Kukke Subramanya junction cross)	15.130 Km (13.257 Km is coming under Reserve Forest)

In its' endeavour, NHAI has retained the services of **M/s. Yongma Engineering Co. Ltd, In JV with DONG-IL Engineering Consultants Co., Ltd. And in association with Cho & Kim Engineering Pvt. Ltd.** a pioneer in the Roads and Bridges sector, for the preparation of Feasibility Report as well as Detailed Project Report for the project under study. The Client's notice to begin carrying out the services was issued to the Consultant vide letter No. NHAI/RO-BNG/23017/Tender/2019-20/4042 dated 3rd January 2020. The Services were commenced on 31st January 2020.

The Project Road Description:

Addahole (Near Gundya) to Bantwal cross Section:

The Project road starts from Addahole (Near Gundya) (Existing chainage 263+000) and ends at Periyasanti (Near Kukke Subramanya junction) road (Existing chainage 278+600) on NH-75 (old NH-48) Mangaluru-Bengaluru highway. The carriageway width of the existing two-lane bituminous pavement is observed as 6.7 to 7.3 m throughout the stretch. The project road passes through major villages like Shirady, Konaje, Shirabajilu, Rekhyia, Nujubalithila and Ichalampady.

Importance of the project:

The proposed project road of length around 15.130 Km (13.257 Km is coming under Reserve Forest) from Addahole (Near Gundya) to Periyasanti (Near Kukke Subramanya junction) road is a part of existing National Highway-75 connecting Bengaluru and Mangaluru passing through major towns like Hassan, Sakleshpur, Shirady and Uppinangadi. Mangaluru, officially known as Mangaluru, is the largest city and administrative headquarters of the Dakshina Kannada

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district. Mangaluru is the chief port city of Karnataka and it is located about 352 km west of the state capital Bengaluru. There are two major routes to travel from Bengaluru to Mangaluru out of which one route is driving through Hassan and the other is driving through Mysuru. As the driving distance between Bengaluru to Mangaluru through Hassan is lesser by 33km when compared with driving through Mysuru this project stretch saves time and fuel. Travelling through Hassan route will save a travel time of around 60 min.

There is a Railway line from Bengaluru to Mangaluru passing through Hassan Sakleshpur, Kukke, and the Railway line length is 418 km which is about 70 km more than our Project section through NH-75. It takes 10 hours by Train whereas it takes only 7 hours through road, the proposed project stretch is even more important and economical when compared to the Train route. Most of the exports and imports through Mangaluru port have been transported through NH-75 as it is the shortest route to reach Mangaluru port. All the improvement proposals are as per Wildlife Mitigation Plan suggested by Principal Chief Conservator of Forests, Karnataka.

2. PROJECT OVERVIEW

The Project road starts from Addahole (Near Gundya) (Existing chainage 263+000) and ends at Periyasanti (Near Kukke Subramanya junction) road (Existing chainage 278+600) on NH-75 (old NH-48) Mangaluru-Bengaluru highway. The carriageway width of the existing two-lane bituminous pavement is observed as 6.7 to 7.3 m throughout the stretch. The project road passes through major villages like Shirady, Konaje, Shirabajilu, Rekhyia, Nujubalithila, and Ichalampady.

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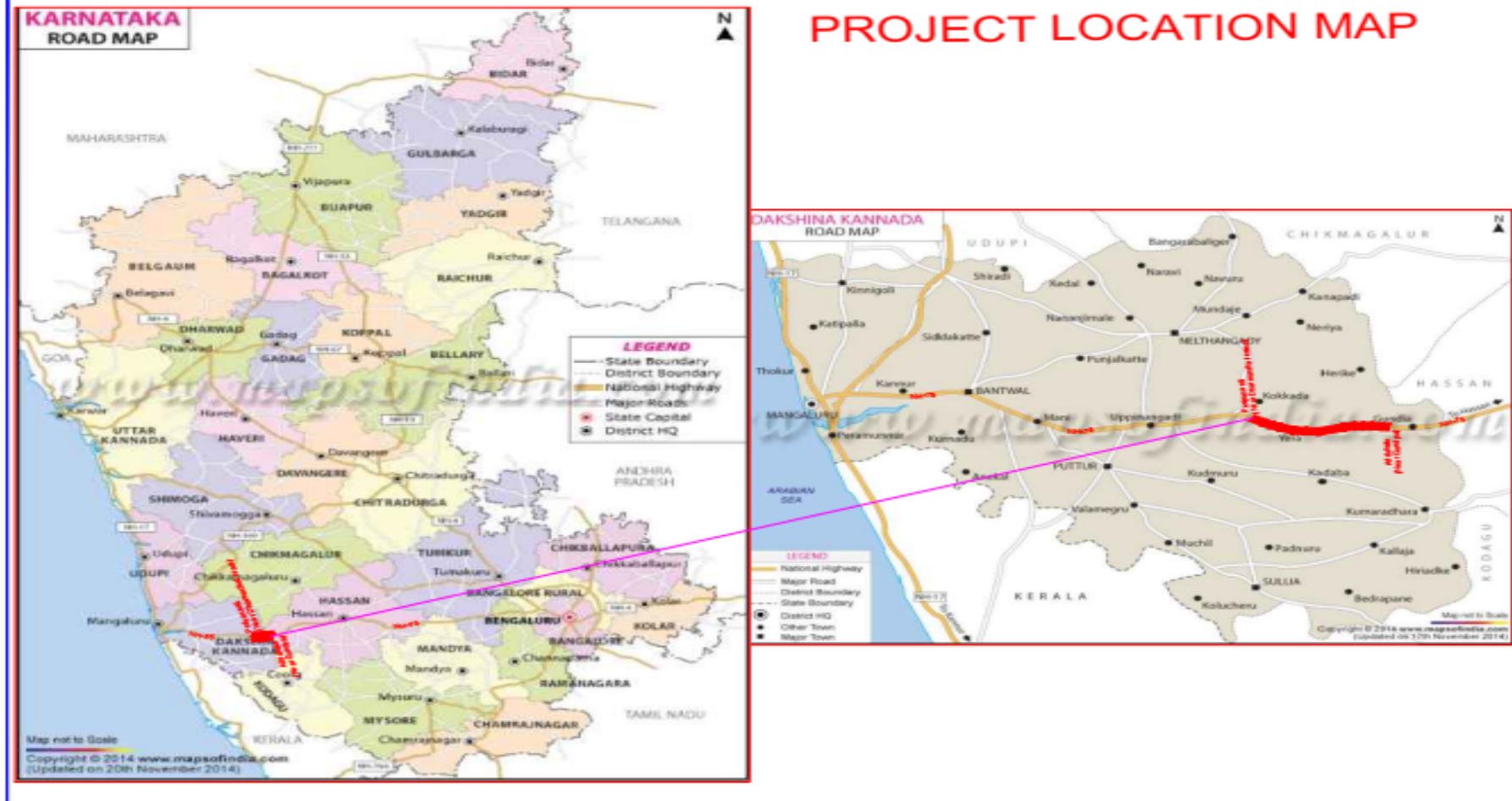


Fig 1: location of Project Road

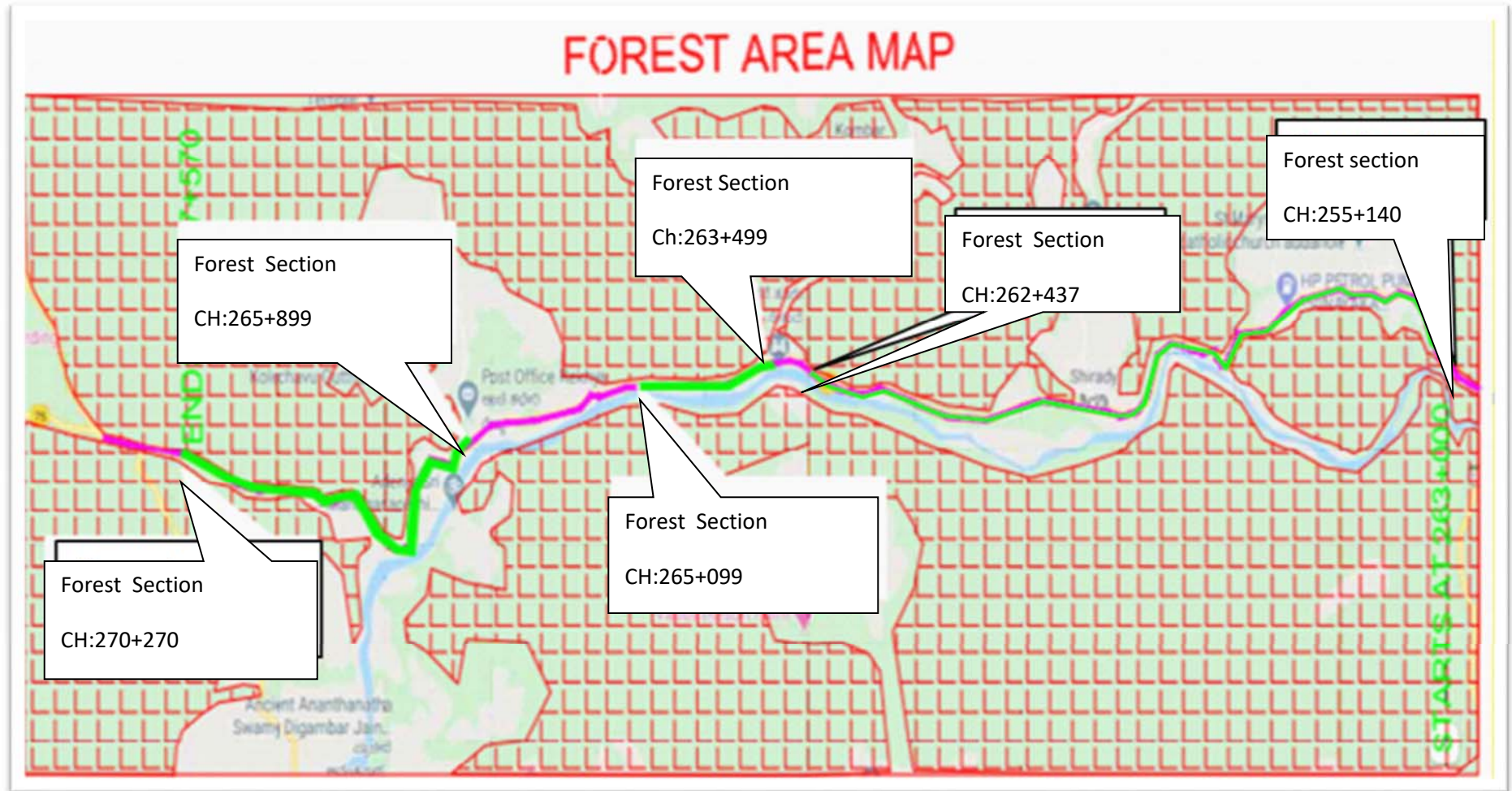


Fig 2:Forest area Map(with Design Chainages)

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

2.1 Key Features of the project

Table 2:Key Features of Existing/Proposed project Stretch

S.No	Attributes	Details
Proposed Road Details		
1	Proposed Length of the Project Road	15.130 Km
2	Origin-Destination	Start Point – Latitude 12°50'10.59"N Longitude 75°33'38.58"E End Point – Latitude 12°49'30.38"N Longitude 75°26'13.73"E
3	Via. Villages	Shirady, Konaje, Shirabajilu, Rekhyra, Nujubalithila, Ichalampady
4	Carriageway(m)	Proposed 4-Lane LHS-7.0m & RHS-7.0m
5	Service lanes and Slip roads (m)	LHS-5.5m & RHS-5.5m
6	Shoulder (PS & ES) (m)	Fully Paved Shoulder-2.5m
7	Toll infrastructure Proposed	Nil
8	Structures along stretch (No's)	Proposed Minor Bridge- 4, Box culverts - 72, Pipe culverts – 27 As per Wildlife Mitigation Plan.
9	User amenities along a stretch (Proposed) No's	06Bus Bays
10	EUP (Elephant Under passes) No's	02(3 x 25 x 6) as per Wildlife Mitigation Plan.
11	VUP No's	01(1x20x5.5)
12	Other clearances related aspects	Forest clearance is required.
Existing Road Details		
1	Structures along stretch	Existing=32 Box and 20 Pipe and 4 Minor Bridges
2	Key utilities in the Proposed ROW	125 Numbers -Electric Poles 08 Numbers –Transformer
3	Forest stretches along ROW	Design Ch:255+140 to Ch:262+437 DesignCh:263+499 toCh:265+099 DesignCH:265+899 toCH:270+270 Total length of the Reserve Forest = 13.268 km
4	Carriageway(m)	Existing 2-lane -7.3 m carriageway.
5	Shoulder (PS & ES) (m)	Existing ES=LHS-0.5 & RHS-0.7

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6	Terrain	Rolling/Mountainous
7	Right of way (m)	30/45 (Most of the length is 30 m only)
8	Drainage	Nil
9	Condition of existing pavement	Fair/Good
10	Land use along the project road	Predominantly land use in the areas is agricultural (60%) and forest area (40%) and built up sections.
11	Traffic on the stretch	Traffic on stretch: Largely commercial with trucks accounting to 80%.

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2.2 Key plan of existing project stretch

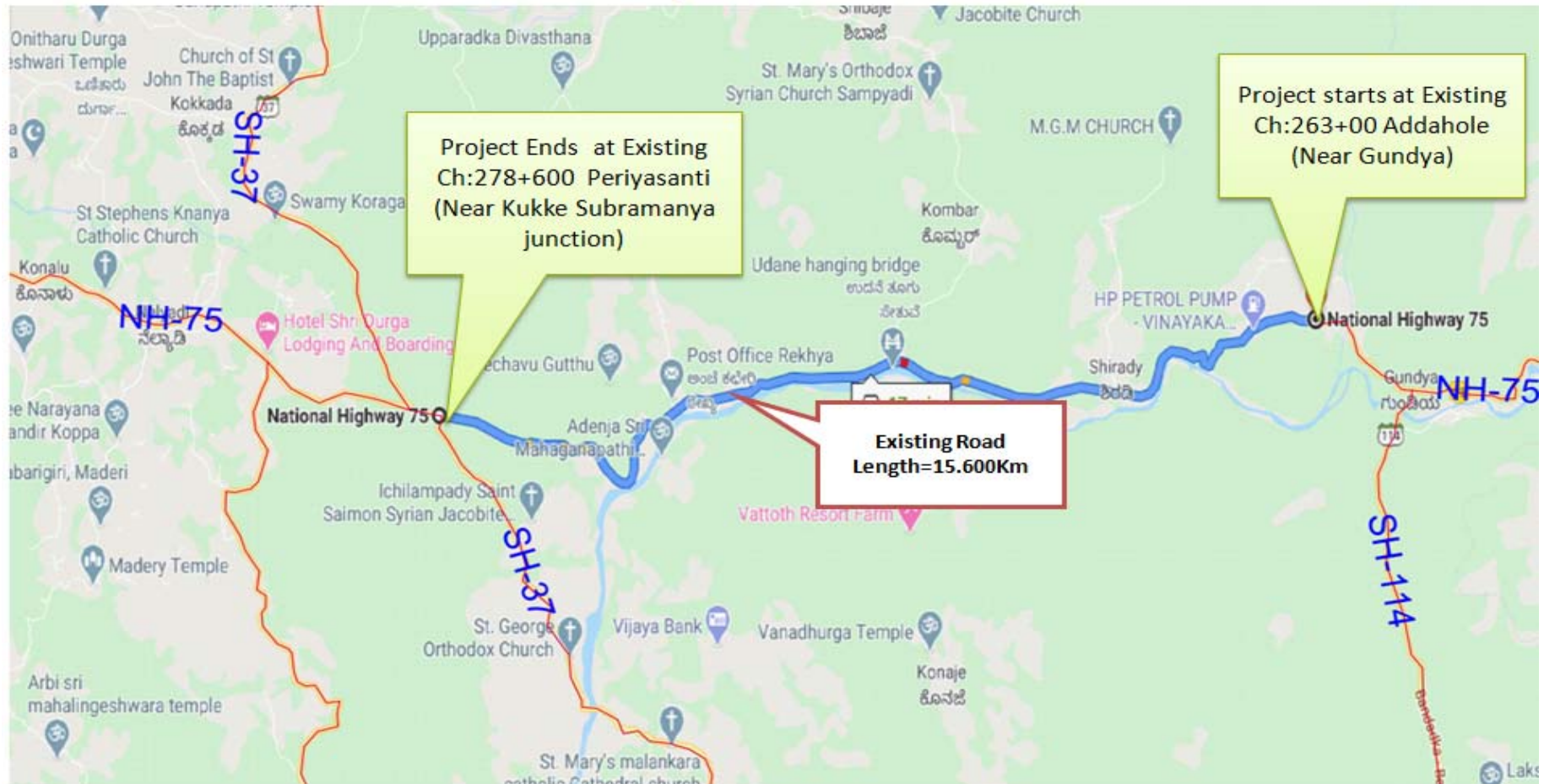


Fig 3: Key plan of existing project road

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

3. TRAFFIC DEMAND ON PROJECT ROAD

3.1 Traffic Volume Surveys

For traffic projections and lane design, the following individual Homogeneous sections of the road as considered. Is as given in the **Table.3**

Table 3: Traffic survey Locations

S No.	Ex.Chainage	Type of Survey	Name of the Villages	Date
1	264+700	Classified Traffic volume count	Shiradi	17-02-20 to 23-02-20
2	278+240	Classified Traffic volume count	Ichlampady	17-02-20to 23-02-20
3	267+000	Turning moment count	shirady	20-02-20
4	270+359	Turning moment count	Konaje	21-02-20
5	273+713	Turning moment count	Rekhya	22-02-20
6	276+147	Turning moment count	Ichlampady	23-02-20
7	264+700	Origin- Destination	Shirady	22-02-20
8	264+700	Axle-load Survey	Shirady	22-02-20

Traffic studies are carried out as per the Indian standards. Specifically, the mid-block counts are surveyed for 24 hours a day and continuously for 7 days. The results are as follows:

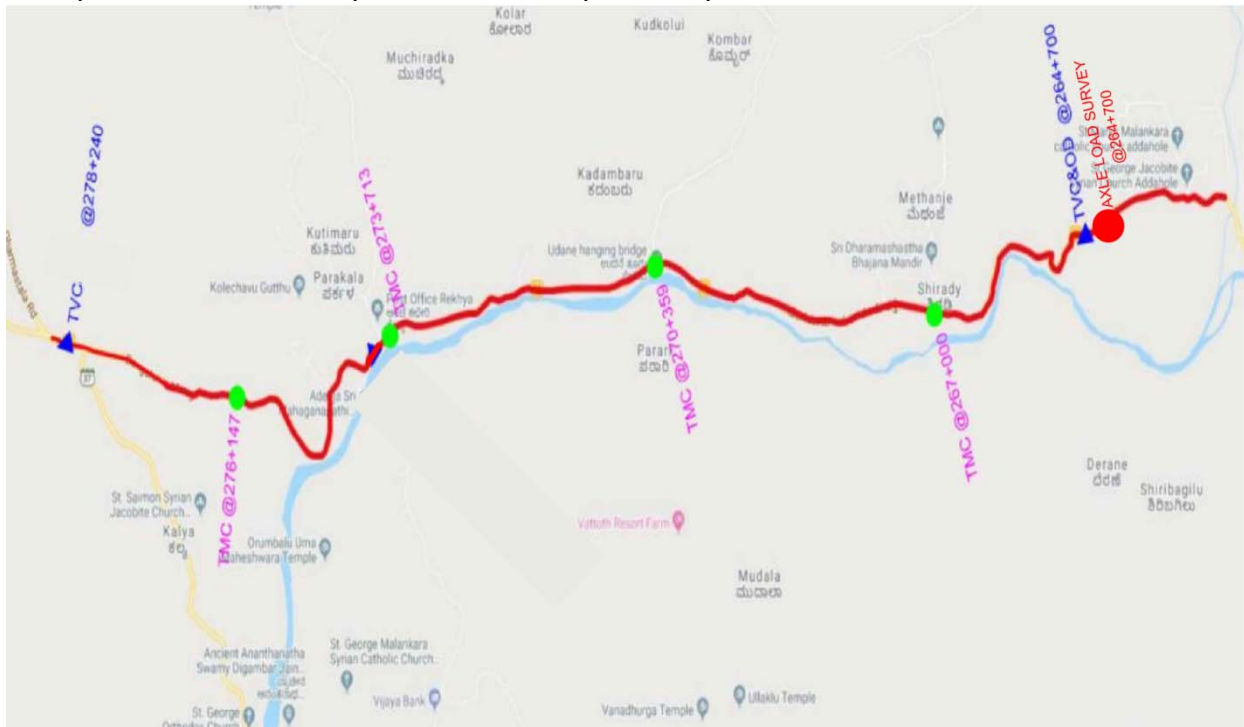


Fig 4: Traffic survey Locations map

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Table 4: TrafficVolume count (AADT)

Vehicle Type	PCU	Near Gundya at Ch:264+700		Near Dharmasthala Cross Road at Ch:278+240	
	Factor	AADT	PCU	AADT	PCU
Car/Taxi	1	3139	3196	4863	4863
Mini Bus	1.5	98	147	187	281
Bus	3	909	2727	1005	3016
LMV	1	319	319	458	458
LCV	1.5	553	830	579	869
2-A Trucks	3	279	838	347	1040
3-A Trucks	3	262	786	273	818
MAV (4-6 Axles)	4.5	830	3734	775	3486
Auto	1	99	99	276	276
Two-Wheeler	0.5	767	383	2047	1023
Others	4.5	4	17	8	35
Total Tollable AADT/PCU		6389(88%)	12577(96%)	8487(78%)	14831(92%)
Total Non-Tollable Vehicles/PCUs		870	499	2331	1334
Total Vehicles/PCUs		7259	13076	10818	16165

3.2 Axle load Surveys

Axle load surveys were conducted at one location using two portable axle load pads the actual load spectrum of commercial vehicles plying on the project road. The results of the load survey were converted to Vehicle Damage Factor (VDF) using equivalency factors from IRC 37-2018 for MSA calculations.

Table 5: Vehicle Damage Factor at Shirady Existing Ch:264+700

VDF at Addahole (Near Gundya)						
S.No	Direction	Bus	LCV	2 Axle	3 Axle	MAV
1	Hassan-Mangaluru	0.93	2.03	3.46	2.34	5.58
2	Mangaluru-Hassan	1.03	0.70	2.61	5.15	9.28
	Adopted VDF	1.03	2.03	3.46	5.15	9.28

3.3 Traffic volume forecast

Traffic volume forecast was developed using the Elasticity of transport demand method and converted into MSA for the purpose of Pavement design. The cumulative load in MSA for is given as under for various horizon years:

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Table 6: Projected traffic growth rate on project road

Time Period	Car/Jee p/Taxi	Mini Bus	Bus	LCV	2-A Truck s	3-A Trucks	MAV	Tractor & Trailer	Two whee ler	Others
Up to 2025	8.8%	7.8%	7.8%	8.2%	5.4%	7.4%	7.2%	8.4%	9.9%	6.8%
2025-2030	7.9%	7.0%	7.0%	7.4%	4.9%	6.7%	6.5%	7.5%	8.9%	6.1%
2030-2035	7.1%	6.3%	6.3%	6.7%	4.4%	6.0%	5.8%	6.8%	8.0%	5.5%
2035-2040	6.4%	5.7%	5.7%	6.0%	3.9%	5.4%	5.2%	6.1%	7.2%	5.0%
2040-2045	5.8%	5.1%	5.1%	5.4%	3.5%	4.9%	4.7%	5.5%	6.5%	4.5%
Beyond 2045	5.2%	4.6%	4.6%	4.9%	3.2%	4.4%	4.2%	5.0%	5.9%	4.0%




Table 7: Projected traffic on project road in MSA

MSA	In 2043		In 2053	
Section	LHS	RHS	LHS	RHS
Addahole (Near Gundya) to Periyasanti (Near Kukke Subramanya junction)	69	69	135	135


3.4 Turning Movement Surveys

The Turning Movement Survey was conducted at 4 Minor Intersection on the project highway to obtain information on the directional movement of traffic at intersections along the highway. Classified traffic volume counts of all vehicle types were made separately for all turning movements from each approach as per guidelines are given in IRC Code SP-41:1994. The survey was conducted recording traffic for each successive 60 minutes interval, for 24 hours on a working day with the help of trained enumerators.

Table 8: Turning movement survey result (Junction volume)

S. No	Junction	Existing Ch:	Type of Intersection	Peak Hour Traffic		Peak Hour	Peak Hour Factor
				Vehicles	PCU		
1	Shirady	267+000		628	844	8.00-9.00	0.785
2	Konaje	270+359		523	775	16.00-17.00	0.821
3	Rekhya	273+713		558	786	9.00-10.00	0.80

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4	Ichlampady	276+174		653	771	11.00-12.00	0.85
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3.5. Origin and Destination Surveys

An origin-destination survey was conducted to obtain trip data that would be useful in analysing information on trip origin and destination, trip purpose, and other data from a selected sample of drivers. It was observed that major traffic influence zones are Mangaluru, Bengaluru and Hassan as described in the below table.

Table 9: Zone influence Factor

ZONE No	Zone Name	Trip Generated	Trip Distributed	Total	Zone influence factor
2	MANGALURU	2,452	2,452	4,905	36.90%
1	BENGALURU	1,927	1,927	3,854	29.00%
4	HASSAN	747	747	1,494	11.24%
9	UDIPI	476	476	953	7.17%
5	ANDHRA PRADESH	323	323	646	4.86%
8	GUNDYA	233	233	467	3.51%
6	HOSEPET	182	182	365	2.75%
10	TAMIL NADU	118	118	236	1.78%
11	SIRADY	89	89	179	1.34%
3	KERALA	46	46	92	0.70%
7	SHIVAMOGGA	40	40	79	0.60%
12	HYDERABAD	10	10	21	0.16%
Total		6,645	6,645	13,290	100.0%

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4. PAVEMENTAND CORRIDOR SURVEY

4.1 Pavement condition and distress seen

Table 10: Condition survey of existing pavement

Chainage		Shoulder		Riding Quality		Pavement Condition						Pavement	Embankment	Road side	Remarks
												Edge drop	Condition	Drain	
From	To	Type	Condition	Speed	Quality	Type	Cracking %	Bleeding %	Potholing	Rut	Patching	(mm)	(Good/Fair /	(NE/PF/	
(km)	(km)		(Fair/Poor /Failed)	(km/hr)	(G/F/P /VP)				(No. and % 100m)**	(None/ Moderate /Severe)	(No. and % 100m)**		Poor)	F)***	
263	265	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
265	267	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
267	269	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
269	271	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
271	273	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
273	275	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
275	276	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
276	278	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	
278	278.6	ER	P	40-50	G	BT	-	-	-	-	-	100	G	-	

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

4.2 Pavement composition

The Flexible pavement is consisting of the granular sub-base, wet mix macadam, subgrade, and additional layers. The summary of pavement composition seen is as follows:

Table 11: Composition of existing pavement

S.No	Test Pit Number	Existing Chainage	Direction	BT	WBM	Total
1	TP-1	263+000	LHS	110	100	210
2	TP-2	268+400	RHS	140	200	340

4.3 Sub-grade soil survey

An extensive review of available soil information and testing was done to understand the subgrade characteristics. Summary of soil investigation surveys is as follows:

Table 12: Soil investigation survey results

Attribute	Results
Sub-grade CBR range (%)	12.30-13.17%
Degree of compaction (% of MDD)	1.800-2.022%
Swelling ratio (%)	20-20%

Table 13: Soil types observed

Soil type	% of length	Plasticity index
Clayey sand (SC)	60	12.975
Silty sand (SM)	55	13.526
Clayey gravel (GC)	63	10.352

5. IMPROVEMENT PROPOSALS

5.1 Proposed alignment

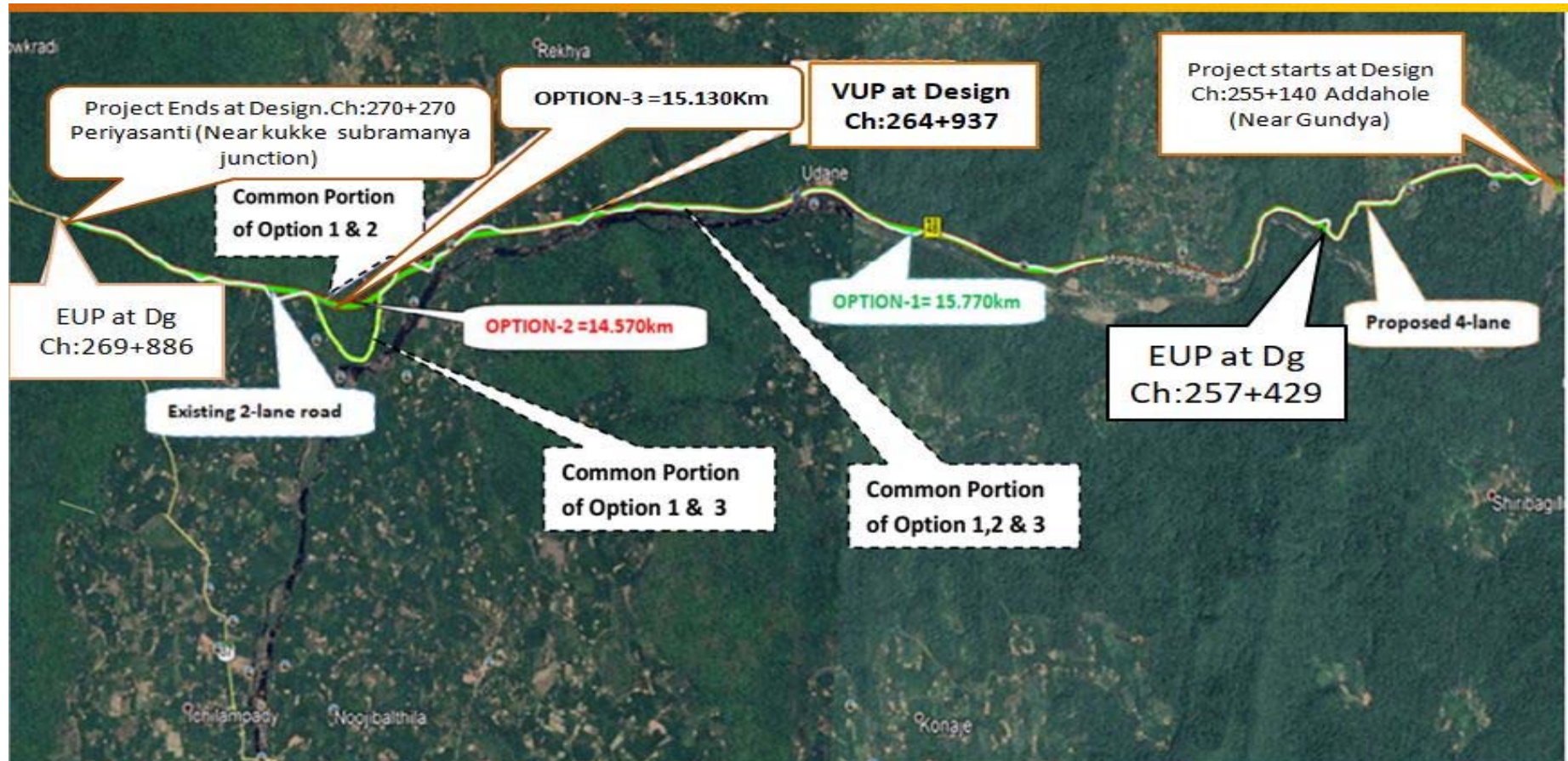


Fig 5: Alternative Alignment Options

A comparative statement of the three alignment options are made and most feasible alignment is recommended. Considering the available existing ROW, the slope protection measurements to be taken, our preferred option is 3 in **YELLOW Color**. 2.4 Ha forest land is required for this option and it may take considerable time to acquire this land for execution of this project.

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

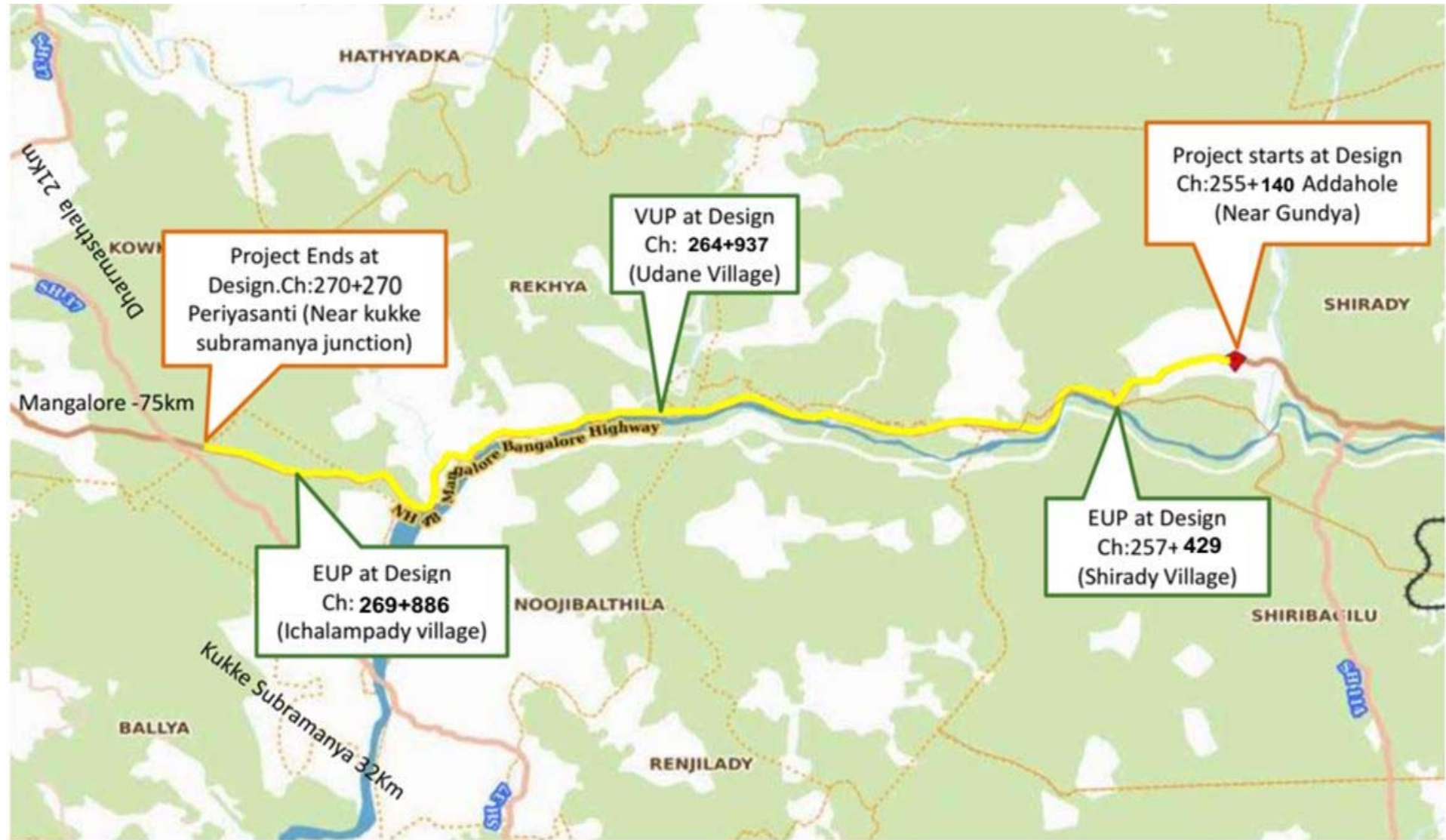


Fig6: Map showing the proposed alignment (option 3) of project road

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

5.2 Bypass proposed

Table 14: Proposed by-passes along project length

S. No.	Bypass Location	Design Chainage (In km)		Bypass Length	ROW to be acquired (m)
		From	To	(km)	
There is no Bypasses along the project stretch.					

Proposed carriageway details along the project stretch. Details are provided in the below Table:

Table 15: Proposed carriage way Details

Sl. No	Design Chainage		Length in Km	Width of Carriage way, m	Paved Shoulder m	Remarks
	From	To				
1	255+140	270+270	15.130	7.0 (Both sides)	1.5 (Both sides)	-
Total Length			15.130			

Service roads & Slip roads:

Total length of service roads is 1.600km (both sides). Details are provided in the below Table:

Table 16: Service roads & Slip roads Details

Sr. No.	Draft Design Chainage (km)		Length (km)		Width (m)	Side	Remarks
	From	To	LHS	RHS			
1	262+562	262+812	0.250	0.250	5.5	Both	
2	264+662	265+212	0.550	0.550	5.5	Both	
3	270+237	270+270	0.033		5.5	Left	
Total Length			0.833	0.800			

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

5.3 Road geometry

In the following sections, where improvement of existing road geometrics is not required as per prescribed standards, it shall be improved to the possible extent within the given right of way. Proper road signs and safety measures shall be provided for safe regulation of fast-moving, slow-moving, and pedestrian traffic.

Table 17: Existing road details

Section	Existing Chainage		Lane Configuration	Service Lanes	Remarks
	Start	End			
Addahole(Near Gundya) to Periyasanti (Near Kukke Subramanya junction)	263+000	278+600	2-Lane	-	BT road

5.4 Widening scheme

Considering availability of ROW and land acquisition constrains, a widening scheme has been proposed that makes optimum use of existing ROW and minimized need for land acquisition in built up areas, a summary of which is given below.

Table 18: Summary of widening type proposed

Sl no	Type of widening	Length, Km
1	Eccentric Right	6.897
2	Eccentric Left	3.213
3	Realignment, Right Side Hill area	1.160
4	Concentric Widening Reconstruction Right side Hilly area	0.110
5	Service road both sides	1.600
7	Realignment with Concentric widening	1.890
8	Realignment, Hill Cut Both side	0.260

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

5.5 Pavement design

5.5.1 Design period, loading and pavement type

As per life cycle cost analysis NPV of Flexible pavement is less when compared to rigid pavement. Even then Rigid pavement is preferred because climatic/environmental considerations such as heavy rainfall /water logged areas, road stretch passing through village portion, having cement and fly ash in close proximity, forest area with more than 14 km and before and after stretch is also Rigid pavement. Hence Rigid Pavement is preferable.

5.5.2 Design sub grade strength

Considering the soil investigations conducted in the project road area, and the availability of suitable soil in the region, the following sub-grade strength has been assumed to vary from 12.30% to 13.17% for various sections of the highway.

Flexible pavement Design:

Table 19: Flexible pavement Design

S.No	Section	Design Chainage		Sub-grade Strength min % CBR	Pavement loading MSA	Layer thickness(mm)			
		Start(Ch)	End(Ch)			GSB	WMM	DBM	BC
1	Addahole to Periyasanti	255+140	270+270	10	100	200	250	110	50

5.5.3 Pavement Composition for new carriageway (Rigid Pavement)

The methodology is given in IRC: 58 2015 “Guidelines for the Design of Rigid Pavements” is used for the design of Rigid pavement. Based on observed CBR results of existing subgrade soil, 10% CBR value is recommended for the design of Rigid pavement and minimum design traffic of 100 MSA for the section from design km 255+140 to 270+270 of NH-75 for 4 lanes for the main carriageway.

Service roads and Slip roads will have design traffic of 10 MSA and shall be designed for a design period of 30 (Thirty) years and minimum CBR of sub-grade should be 10%. The pavement composition shall not be less than the minimum pavement thicknesses as follows.

Design Thickness of the New Construction Pavement

Pavement composition for Construction of Four-Lane Section of the main carriageway from– Design Chainage Km 255+140 to 270+270, is given in **Table 20**.

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

Table 20: Proposed Pavement Composition of the main carriageway

S.No	Section	Design Chainage		Sub-grade % CBR	MSA	Layer thickness(mm)			
		Start(Ch)	End(Ch)			SG	GSB	DLC	PQC
1	Addahole to Periyasanti	255+140	270+270	10	100	500	150	150	305

PAVEMENT COMPOSITION FOR BUS BAY, TRUCK LAY BYE AND REST AREA

The Pavement Composition for Bus bays, Truck Lay bye and Rest Area are given in below table.

Table 21: Pavement Composition for Bus bays, and Rest Area

Designation of the Pavement Layer	Layer Thickness in “mm”
Pavement Quality Concrete-PQC (M-40)	305
Dry Lean Concrete	150
Granular Sub-base (GSB)	150
Select Sub-grade	500

5.5.4 Strengthening of existing pavement

The Strengthening requirements for the existing pavement have been estimated from deflection measurements and estimated traffic loadings. The designated overlay proposed is as below:

Table 22: Overlay thickness required

Section	Chainage		Distance Km	Overlay thickness(mm)	
	Start	End		DBM	BC
Overlay Thickness Not required					

Table 23: Adopted Pavement Composition for Service Road

Designation of the Pavement Layer	Layer Thickness in “mm”
Pavement Quality Concrete-PQC (M-40)	305
Dry Lean Concrete	150
Granular Sub-base (GSB)	150
Select Sub-grade	500

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

5.6 Design of structures

1. All the structures are located in the marine environment. Corrosion prevention monitoring and remedial measures as required may be taken as per IRC: SP: 80 – 2008.
2. All new structures shall be designed for severe conditions as per IRC: 112. In addition, fusion-bonded Epoxy coating not less than 175 microns' thickness and up to 300 microns or equivalent shall be provided to the reinforcement of all diameters as per IS 13620: 1993. The Details of which are given below.

Table 24: Proposed improvement to structures along project road

Structures	Proposed – 4 Lane					
	New (4 –Lane)	Reconstruction (4-Lane)	New (2- Lane)	Existing Structure (Widening)	Retained with Repair	Total
Major Bridges		-		-		
Minor Bridges		4				4
VUP	1	-		-		1
LVUP		-		-		-
EUP	2	-		-		2
VOP		-		-		
FOB		-		-		
Pipe Culverts		27		-		27
Pipe Culverts (Junction)		-		-		
Box Culverts		72		-		72
Total						106

5.7 Intersections and grade separators

Based on the traffic and turning movement surveys conducted at junctions have been identified for redesign or grade separation, the details of which are given below.

Table 25: Proposed intersections improvement

Sl.No.	Design Chainage	Type of intersection	Side	
1	255.150	T	LHS	Shirady Village
2	255.537	T	RHS	Shirady Village
3	255.892	T	RHS	Shirady Village
4	256.137	T	RHS	Shirady Village
5	256.737	T	RHS	Shirady Village
6	258.537	T	RHS	Shirady Village
7	258.837	T	LHS	Shirady Village
8	259.027	T	RHS	Shirady Village
9	259.487	T	RHS	Konaje

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

10	259.737	T	RHS	Konaje
11	262.537	T	RHS	Konaje
12	262.827	T	RHS	Konaje
13	263.587	T	RHS	Noojibalithila
14	264.207	T	RHS	Noojibalithila
15	264.427	T	RHS	Noojibalithila
16	265.487	T	RHS	Noojibalithila
17	265.787	T	RHS	Noojibalithila
18	265.917	T	RHS	Enjira Village
19	266.007	T	RHS	Noojibalithila
20	266.117	T	RHS	Noojibalithila
21	266.257	T	RHS	Noojibalithila
22	266.487	T	RHS	Noojibalithila
23	266.637	T	RHS	Noojibalithila
24	267.537	T	LHS	Rekhya
25	267.937	T	LHS	Rekhya
26	268.337	T	LHS	Ichalampady
27	270.242	T	LHS	Ichalampady

Table 26: Grade separators

S.no	Design Chainage:	Proposed Span Arrangement (m)	Remarks
1	257+429	3 x 25 x 6	EUP
2	264+937	1 X 20 x 5.5	VUP
3	269+886	3 x 25 x 6	EUP

5.8 Toll Plazas

Table 27: Location of Toll Plaza

S.No	Tolling Section	Toll Plaza Location	From-To	Tolling section Length	Toll Lanes	Toll Plaza Area (Ha)
Nil						

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

5.9 Wayside amenities proposed

A summary of the improvements proposed is given below.

Table 28: Proposed user amenities along project stretch

S.No	Amenity type	Proposed	Remarks
1	Bus bays with Bus Shelter	06	LHS-03 and RHS-03

S.no	Design Chainage	Side	Location Name	Available ROW
1	262.687	LHS	Shirady	45 m
2	262.717	RHS	Shirady	45 m
3	264.867	LHS	Udane	45 m
4	265.037	RHS	Udane	45 m
5	269.537	RHS	Kowkarady	45 m
6	269.607	LHS	Kowkarady	45 m

Note: As per Wildlife Mitigation plan, Annexure A, clause No.15 the bus bays should not provided inside the forest land and bus bays are provided in 45m ROW at village locations.

5.10 Proposed ROW Details:-

Table 29: Details of Proposed ROW

Sl. No	Design Chainage		Length in m	Proposed ROW (m)	Remarks
	From	to			
1	255+140	262+437	7297	30	Ghat Section & Reserve Forest
2	262+437	262+937	500	45	Plain section (Noojibalithila Village)
3	262+937	264+537	1600	30	Reserve Forest
4	264+537	265+337	800	45	Plain section (Rekhya Village)
5	265+337	269+137	3800	30	Reserve Forest
6	269+137	270+270	1133	45	Plain section (Ichalampady Village)
Total Length			15130		Reserve Forest Length = 13.257 Km.

6. ENVIRONMENTAL IMPACT ASSESSMENT

6.1 Impact and clearances needed`

The proposed project road involves the acquisition of Agricultural land; the felling of trees will hence require individual clearances for each. A Summary of the environmental impact and clearances required is provided in below table.

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

Table 30: Affected trees along project stretch

Sl. No	Nomenclature	No Of Trees
1	Arecanut	157
2	Coconut	112
3	palm	1256
4	Maddi trees	528
	Total	2053

Table 31: Environmental Impact and clearances required

S.No	Impact type	Description	Clearance status
1	Environmental clearance	Not Required due to the nature of project category "B"	Environment clearance is not required as per new notification of MOEF Dt:22/01/2013
2	Diversion of Forestland	Not Applicable	-
3	Trees in ROW	2053 Trees need to be cut enable road construction	To be taken

6.2 Cost of environmental mitigation

The Environment Mitigation and Management Costs were developed based on the estimation of resources required to implement the mitigation measures proposed and also the number of places where intervention is required. The environmental mitigation cost for the proposed project is not required as the length of the project road is less than 100 km.

7. SOCIAL IMPACT ASSESSMENT AND LAND ACQUISITION

7.1 Social impact assessment

The proposed road is from design chainage 255+140 to 270+270 on NH-75. Social impact is studied as there are 6 villages along the project stretch in the district of Dakshina Kannada in Karnataka state.

7.2 Land acquisition requirements

The district, Mandal & Village wise details of land acquisition are as follows:

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

Table 32: Villages wise land to beAcquired Details.

S.No	Name of the village	Design Chainage			Existing ROW in m	Proposed ROW in m	Details of Land Required			Details of Land Availability		Land to be Acquired in Sqm (9-11)	Remarks
		From	To	Length in Km			Existing land available in Sqm	Additional Area Required	Total Land Required	Possession already taken in Sqm	Total Land Available in Sqm (7+10)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Additional Land to be Acquired													
1	Noojibalithila	267.198	268.399	1.200	10	20	12000	24000	36000	0	10000	24000	Land to be acquired Eccentric Right side in Forest area

Preferred option-3

As the project stretch is mountainous and going through forest area, our preferred option is 3 in Yellow colour. Other options require more than 30 m of ROW and will require considerable time to acquire forest land. Cutting cost while considering the slope protection measurements is also the least in 3rd option. Considerable time also can be saved while executing the project if yellow option is considered.

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

7.3 Key risks envisaged in land acquisition

Despite the best efforts of the consultant, it is envisaged that acquiring possession of the ROW for reserved forest section may prove to be difficult or be delayed.

8. UTILITIES SHIFTING AND CLEARANCES

8.1 Utilities shifting estimates

Utilities belonging to Electrical Department have been identified that fall within the project road ROW and will need to be shifted to enable road construction. Shifting proposals have to be submitted to the user agencies and initial estimates have to be received from the concerned agencies. The process of site inspection, review, and revision of the proposals for utility shifting is in process.

To enable better management of utilities and installation going forward, all utilities are being shifted into a utility corridor/ out of the road ROW utility trench is being planned as part of the construction. Details are listed in Table 33.

Table 33: Quantities of Electrical Utility Shifting

The site includes the following electrical utilities:

(a) Extra High Tension Lines (EHT Lines)

Sr. No	Draft Design Chainage		Length (in Km)	Crossings (Nos)
	From	To		
Nil				

(b) Low Tension Lines (LT Lines)

S.no	Chainage		Length in Meters	Crossings (NO.S)	KVS	Transformers
	From	To				
1	264.000	264.200	200			1
2	265.200	265.400	200	1	11	
3	266.000	266.200	200			2
4	266.500	266.600	100	1	LT	
5	266.900	267.000	100	1	LT	
6	267.000	267.100	100	UG+1	11	2

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

7	267.500	267.600	100	1	LT	
8	267.800	267.900	100	1	11	
9	269.000	269.200	200			2
10	269.300	269.400	100	1	11	
11	270.500	270.600	200			1
12	270.700	270.800	100	1	11	
13	271.900	272.100	200	3	LT,11,11	
14	273.000	273.200	200	3	LT,11,11	
15	273.800	273.900	100	2	LT,11	
16	274.100	274.300	200	4	LT-2,11-2	
17	274.300	274.400	100	1	LT	
18	274.500	274.600	100	1	11	
19	274.600	274.700	100	1	11	
20	275.100	275.300	200	2	LT,11	
21	275.800	275.900	100	1	11	
22	276.100	276.300	200	1	11	
23	276.500	276.600	100	1	LT	
24	277.00	277.100	100	1	11	
Total length			3400			

9. PROJECT COST ESTIMATES

Table 34: Project Cost Estimate

NO.	BILL NAME	Total Amount in Rs	Total Amount in Crores
CIVIL CONSTRUCTION COST			
1	Road Works		

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

a	Site clearance and dismantling	1,510,560.19	0.15
b	Earthwork	417,207,177.34	41.72
c	Sub-base and base courses	82,645,488.00	8.26
d	Pavement quality concrete	593,031,493.59	59.30
e	Dry lean concrete	185,003,735.75	18.50
A	Total Cost	1,279,398,454.86	127.94
2	Structures		
a	Culverts	120,388,228.91	12.04
b	Minor bridge	136,650,996.45	13.67
c	Vup & Eup	184,031,314.18	18.40
d	RE wall	161,415,627.70	16.14
B	Total Cost	602,486,167.24	60.25
3	Other Engineering Works		
a	Drainage & protection works	173,122,921.51	17.31
b	Road safety and appurtenances	38,047,290.66	3.80
c	Miscellaneous	45,807,478.13	4.58

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

d	Retaning walls & breast wall	1,837,986,465.75	183.80
e	Electrical utilitys's	75,650,000.00	7.57
f	Safety And Traffic Management During Construction	26,834,811.29	2.68
C	Total Cost	2,197,448,967.34	219.74
4	Total Civil Cost	4,079,333,589.44	407.93
5	GST as applicable on 'A' (@12%) =	489,520,031	48.95
6	Total Civil Cost including GST ['A' + '1']	4,568,853,620	456.89
7	Add Contingency Charges on 'A' @ 2.8 %	114,221,341	11.42
8	Supervision Consultancy Charges on 'A' @ 3 %	122,380,008	12.24
9	Agency Charges on 'A' @ 3 %	122,380,008	12.24
10	Total Civil Cost including Agency, Contingency & Supervision Charges etc. ['2'+ '3' + '4' + '5']	4,927,834,976	492.78
11	Total Project Cost	4,927,834,976	492.78

10. MATERIAL INVESTIGATION

Material investigations were carried out to explore the availability and identify sources of suitable material for the construction of the road.

10.1 Borrow for soil/Moorum

The Borrow area details of selected soil and Moorum is given below in Table 29.

Table 35: Borrow area Details from Ch: 255+140 to Ch:270+270

Material Details From Addahole (Near Gundya) to Periyasanti (Near Kukke Subramanya junction) on NH-75								
Sl.No	Borrow	Existing	Side	Offset	Village and contact	Quantity in	Rate/	Remarks

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

	Area No	Chainage			person	Cum	Tons	
1	MH-BP-01	263.400	RHS	400 m	vill-siradhiaddahole Shaji K J mob no-9480586754	52636	4658/-	Pvt land
2	MH-BP-02	263.700	RHS	200m	vill-siradhiaddahole Shaji K J mob no-9480586754	78952	5026/-	Pvt land
3	MH-BP-03	269.500	RHS	road side	-	-	Royalty cost only	Acquired land
4	MH-BP-04	275.600	both sides	Hill cutting	-	-	Royalty cost only	Acquired land

10.2 Sand

Four Sand samples have been collected from the source and tested. Location details of the sand quarry along with lead to the Project Road are presented in the following table. Schematic locations of these quarries.

Table 36: Schematic Locations of Sand quarries

Sand Source	Village	Name of river	Chainage	Offset	Rate/tons	Remarks
HM- SQ-1	Sakhaleshpur	Hemavati	222.7	within a the radius of 5 km	2650/-	Royalty collected by Mining and Geology when it opens
HM- SQ-2	Koskote	Hemavati	211	16 km	2550/-	Royalty collected by Mining and Geology when it opens

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

10.3 Gravel

Sources of aggregate materials are available from 3 crusher plants identified along the project corridor are located at a lead distance of about 15 km from the project road.

Results from the laboratory tests conducted indicate that the aggregate materials from the two crushers are suitable for the WMM, GSB layers, and concrete works. However, it is suggested that to comply with the specifications on gradation and combined flakiness and elongation parameters the crusher plants need some adjustments and modification to the crushing and screening systems.

Table 37: Coarse aggregate test results summary

Borrow Area No	Chainage	Side	Offset in m	Contact Details	Rate/Tons	Remarks
HM -AQ-1	328.000	RHS	14 km	bantawal kittana quarry kerla c/o-Ganesh mob no-9880721607	1525/-	
HM -AQ-2	328.000	RHS	15 km	bantawal SM crusher,V2 crusher Manager-Praveen 9902518173	1635/-	
HM -AQ-3	316.000	LHS	8 km	Kabakaa stone Crusher Hameed 9945847233	1428/-	

10.4 Fly ash

Fly ash is available in close proximity of the project road due to the presence of Udupi Power Corporation of Adani Group is located in the Udupi District (erstwhile Dakshina Kannada District) of Karnataka, comprising villages of Yelluru, Tenka, Santhuru and Bada and is about 35 km north of MangaluruCity and 120km from project road.Available fly ash will be tested for minimum requirement to use as material forEmbankment and other layers.

10.5Cement

Cement of the required grade is available In Hassan and Mangaluru with an average lead of 80 km from project site.

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

10.6 Key risks

Despite the best efforts of the consultant, there continue to be some materials and sections of the project road where material will have to bring from significant leads.

Table 38: Key risks envisaged in material procurement

SI No	Chainage	Material	Closest source
1	Entire project	Cement	Closest available source is Mangaluru at a lead of 80 km

10.7. Location of material sources

BA of selected soil for subgrade construction is available within 15km lead distance from project road.

The Rate of Analysis and cost estimate has been worked out based on following:

1. The rate analysis has been prepared based on the Standard Data Book for Analysis of Rates year 2018-2019, first Revision published by IRC. The following considerations have been made with regard to the basic inputs of rate analysis:

a) Labour Rate: Labour rates for rate analysis have been based on schedules of rates, National Highway Circle Bangalore for the year of 2018-2019.

b) Plant & Machinery: Hire charges of machineries have been taken from Bangalore Schedule of Rates.

c) Material: The basic rates for materials have been taken on approved quarry rates from Bangalore Schedule of Rates, Central Public works Department, Govt. of India, with Cost Index applicable as per circular issued by Chief Engineer, P.W.D., Roads & Bridges and Administration,

- **Cement** : Mangalore, Karnataka (Penna Cement Industries limited)
- **Coarse Aggregate** : SM Crusher Nellyadi, Karnataka
- **Sand** : Hemavathi River, Sakleshapur, Karnataka.
- **Soil**: Shirady, Karnataka.

11. POTENTIAL FOR VALUE ENGINEERING AND INNOVATIVE TECHNOLOGIES

Throughout the detailed design of the project, several opportunities for value engineering and introduction of new technology were explored that will help in reducing the cost of the project or increase quality and longevity of project road. Approval of these elements as part of the construction design and suitable instructions to all stakeholders of the project can

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

help significantly lower the projected cost of construction. A summary of these opportunities is provided here.

Table 39: Key value engineering opportunities identified

SINo	Value engineering opportunity	Potential impact
1.	Avoiding deep cutting upto 40m height in option 1 and option 2	50 Crores saving in project which is equivalent to 20 percent of TPC.

12. ECONOMIC AND FINANCIAL ANALYSIS

12.1 Economic analysis of the project

Table 40:Sensitivity Analysis Results

Project Corridor	Sensitivity Scenario							
	Case I		Case II		Case III		Case IV	
	EIRR %	NPV (INR Millions)	EIRR %	NPV (INR Millions)	EIRR %	NPV (INR Millions)	EIRR %	NPV (INR Millions)
Total Project Corridor= 15.130 km	13.32	311.02	15.19	332.02	16.21	334.08	15.53	350.40

12.2Financial analysis

12.2.1. Potential for toll revenue

12.2.2 Result of financial analysis

Table 41:The results of financial analysis

Corridor	IRR With LA Cost (%)	IRR Without LA cost (%)
Project Road Starts from Addahole (Near Gundya) at Ch: 255+140 to Ends Periyasanti (Near Kukke Subramanya junction) at Ch: 270+270.	8.48	7.95

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

13. EXECUTION PLAN

In execution with NHAI, it is proposed to complete the project road in a period of 30 months. Planning for the project packaging, bidding process and construction was conducted as part of this project.

13.1 Packaging

13.2 Bidding mode and timelines

As the project FIRR is 8.48% which is more than 6.8% (as indicated in the latest NHAI guidelines), the project is viable. The preparation of Detailed Project report is initiated by NHAI. The project can be initiated with a grant under EPC mode. As per the guidelines issued as office memorandum as per the letter no.143430 dt 30/10/19 the timelines for the bidding process can be decided only after the completion of at least 90% of Land Acquisition. In the DPR these dates would be finalized.

Submission of bid documents to authority

Review and finalization of documents

Launch of tender

Tender close date

The tentative date for the award of the project

13.3 Construction time and Planning

Upon reviewing the improvements planned and in consultation with NHAI, the design and construction period for this project has arrived at 30 months from the date of appointment of the contractor/concessionaire. To enable this construction schedule, a detailed construction plan and timeline will be included in the detailed project report.

14. CONCLUSION AND RECOMMENDATION

A Four lane road is recommended.

It is concluded to build two to four-lane road from Addahole (Near Gundya) at Ch: 255+140 to Periyasanti (Near Kukke Subramanya junction) at Ch: 270+270.

Table42: Salient features and key financial aspects of the project road

Project road	
Proposed Project road length	15.130Km

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

Connecting	Bengaluru - Mangaluru	
On national highway	NH-75 (Old NH-48)	
Proposed features	Current road	Proposed
Lanes	2	4
Bypasses proposed	-	-
Major junctions	0	0
Minor Junctions	04	04
Grade separated interchanges	-	-
Major Bridges	-	-
Minor Bridges	04	04
ROBs	-	-
Culverts	52	99
Elephant / Vehicular under pass	-	03
Toll plazas (no)	-	-
Bus bays (no)	-	06
Truck lay-byes (no)	-	-
Rest areas (no)	-	-
Financial implications		
		INR Cr/%
Total capital cost	528.68	
Total project cost	492.78	
Civil construction cost (incl. contingency)	407.93	
Preconstruction expenses	35.90	
Land acquisition	As Per Forest Department	
Utilities shifting/Trees	9.97	
Other pre-construction expenses	-	
Implementation mode proposed	EPC	
Total project cost	492.78	
Estimated NPV	350.40	
IRR with LA cost	8.48	
IRR with out LA cost	7.95	

15. IMPROVEMENT PROPOSALS:

List of Culverts along the project stretch:

Table 43: Minor Bridges along the project stretch

S. no	Design Chainage	As per contract agreement	As per Mitigation plan finalised on 03.07.2017 after joint visit with Forest department
		No. of Cells x Width x Depth (m)	No. of Cells x Width x Depth (m)

Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

1	256+210	1x10.3 (Minor bridge on LHS)	LHS : (1 x 4 x6) + (Configuration of existing Bridge with depth>7)+(1 x 4 x6) RHS : (1 x 4 x6) + (Configuration of existing Bridge with depth>7)+(1 x 4 x6)
2	261+382	2x19 (Minor bridge on LHS and RHS)	LHS : (1 x 4 x6) + (Configuration of existing Bridge with depth>7)+(1 x 4 x6) RHS : (1 x 4 x6) + (Configuration of existing Bridge with depth>7)+(1 x 4 x6)
3	263+551	2x18.3 (Minor bridge on RHS)	LHS : (1 x 4 x6) +(Existing Bridge)+(1 x 4 x6) RHS : (1 x 4 x6) + (Configuration of existing Bridge)+(1 x 4 x6)
4	266+130	3X8.60(Minor bridge on RHS)	LHS : (1 x 4 x6) +(Existing Bridge)+(1 x 4 x6) RHS : (1 x 4 x6) + (Configuration of existing Bridge)+(1 x 4 x6)

Details of Proposed Elephant under Passes:

Table 44: Details of Proposed Elephant Under passes

S.no	Design Ch:	As per contract agreement	Mitigation plan finalised on 03.07.2017 after joint visit	
		NO. of Spans (m) x Width (m) X Depth (m)	Design Ch:	NO. of Spans (m) x Width (m) X Depth (m)
1	257.992	1x25x4.5	257.429	3x25x6
2	269.882	1x25x4.5	269.886	3x25x6

Vehicular under Passes

Table 44: Details of Vehicular Under passes

S.no	Design Chainage:	NO. of Spans (m) x Width (m) X Depth (m)	Remarks
1	264+937	1x20x5.5	VUP

Details of Bus bays with Bus Shelter and Rest area

Table 45: Details of Bus bays with Bus Shelter and Rest area

S.no	Design Chainage:	Side	Location Name	Remarks
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Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

1	262.687	LHS	Shirady	ROW is 45m
2	262.717	RHS	Shirady	ROW is 45m
3	264.867	LHS	Udane	ROW is 45m
4	265.037	RHS	Udane	ROW is 45m
5	269.537	RHS	Kowkarady	ROW is 45m
6	269.607	LHS	Kowkarady	ROW is 45m

List of Box Culverts Falling in Forest area:

To be reconstructed by dismantling the existing culverts

Table 46: List of Box culverts falling in Forest area

S.no	Design Chainage	As per site requirement	Mitigation plan finalised on 03.07.2017 after joint visit
		No. of Cells x Width x Depth (m)	No. of Cells x Width x Depth (m)
1	256.141	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
2	256.718	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
3	258.067	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
4	258.471	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
5	260.059	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
6	260.831	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
7	261.127	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
8	261.947	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
9	262.380	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
10	263.930	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
11	265.371	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)

To be Newly Reconstructed

S.no	Design Chainage	As per site requirement	Mitigation plan finalised on 03.07.2017 after joint visit
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Four-Laning of the Bangalore-Mangalore section of NH-48 (New NH-75) from Design Chainage Km 255.140 to Km 270.270 passing through reserve forest stretch of Four laning of Addahole (Near Gundya) (Existing Chainage Km. 263.000, Design Chainage Km. 255.140) to Periyashanti (Near Kukke Subramanya junction) (Existing Km. 278.600, Design Chainage Km.270.270) Section of NH-75 (old NH-48) under NHDP Phase-IV on EPC mode in the State of Karnataka

		No. of Cells x Width x Depth (m)	No. of Cells x Width x Depth (m)
1	260.481	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
2	261.451	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
3	261.727	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
4	261.818	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
5	264.399	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
6	264.561	1x6x3	(1x2x2)+(1x6x3)+(1x2x2)
7	265.501	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
8	265.657	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
9	266.090	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
10	267.058	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
11	267.691	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)
12	268.367	1x2x2	(1x2x2)+(1x2x3)+(1x2x2)

Widening of Culverts

S.no	Design Chainage	As per contract agreement	Mitigation plan finalised on 03.07.2017 after joint visit
		No. of Cells x Width x Depth (m)	No. of Cells x Width x Depth (m)
1	257.661	1x2.2x3.5	(1x2x2)+(1x2.2x3.5)+(1x2x2)
2	257.837	1x2.5x3.0	(1x2x2)+(1x2.5x3.0)+(1x2x2)
3	264.107	1x1.8x2.6	(1x2x2)+(1x1.8x3.0)+(1x2x2)

Above improvement proposals are as per Wildlife Mitigation Plan suggested by Principal Chief Conservator of Forests, Karnataka State.