Executive Summary

Introduction

The Project stretch starts from km 368.920 of NH-63 (KNT/AP Border) and terminates at km 424.225 (Gooty). The Road was declared as National Highways No 63. The Total length of Project Stretch is 55.305 km entirely lying in Andhra Pradesh. The project stretch passes through Anantapur district in Andhra Pradesh. The alignment passes through plain terrain for the entire length of the project. The Project Road mainly passes through Donekal, Gadekallu, Hanchanahal, Guntakal, Patha Kotha Cheruvu, Golla Doddi, Raja Puram and Gooty.

Pursuant to submission of inception and feasibility reports, the Consultant submits herewith the Final Feasibility cum Preliminary Project Report.

Award of consultancy contract and this report

The NHAI has appointed M/s. Feedback Infrastructures Services Pvt. Ltd. for providing the required consultancy services for preparation of Feasibility cum Preliminary Project Report (PPR) for 4/6 laning of KNT/ AP Border-Gooty Section of NH-63 in the states of Andhra Pradesh having a length of 55.305 km.

The Contract Agreement for the assignment was signed on 3rd September 2008 and the project activities commenced thereafter. Subsequently, inception report was submitted in September 2008 followed by draft and final feasibility reports in the months of February 2009 and January 2010, respectively. On approval of feasibility report, further studies and investigations were started and the draft preliminary project report is prepared.

In developing the Work Plan for completing the assignment, the activities have been categorized under four stages as follows:

Stage I	-	*Quality Assurance Plan and Inception Report*
Stage II	-	*Draft Feasibility Report*
	-	*Final Feasibility Report*
Stage III	-	*Draft Preliminary Project Report*
Stage IV	-	*Final Preliminary Project Report*

These stages will generally follow a sequence, though each stage is inter-related and inter-dependent on each other. The related reports for each stage will be submitted to NHAI, Government of India as stipulated in the ToR.

This report covers stage – IV, which is identified as Final Preliminary Project Report.

The PPR contains 8 volumes; the volumes are briefly described below.

Volume I – Main Report

Volume II – Design Report

Volume III – Rate Analysis

Volume IV – Cost Estimate

Volume V – Bill Of Quantities

Volume VI – Drawings (Highway & Structures)

Volume VII – SA & RAP

Volume VIII – EIA & EMP

The ensuing sections in this chapter of the Final PPR will light the torch to the salient features of the project and proposals.

Description of project

Project Road from km 368.920 (KNT/AP Border) and terminates at km 424.225 (Gooty) where it joins NH-7. The Road was declared as National Highways No 63. The Total length of Project Stretch is 55.305km.

The alignment of highway is in plain terrain and passes through settlements and villages/towns like Donekal, Gadekallu, Hanchanahal, Guntakal, Pathakothacheruvu, Golladoddi, Rajapuram and Gooty. The existing 2-lane carriageway alignment comprises of many sharp horizontal and vertical curves which require geometric corrections. A total of 73 horizontal curves and about 110 vertical curves exist along the alignment. Among these some curves are observed to have insufficient sight distance. Railway line from Guntakal to Gooty runs parallel to this highway. From Km 397.000 to km 398.000 the railway line runs close to roadway on the left side. Apart from this, one level crossing at km 393.900 and one ROB at km 423.600 are present on this alignment.

The existing road is generally having two lane undivided carriageway width with a few stretches varying from 7.0 m to 10.0 m width. The condition of the existing pavement varies from excellent to very poor.

There are 111 culverts (both pipe and box) present in 55.305 km length of highway. It also includes one ROB, 6 causeways and 14 minor bridges. The ROB is located at km 423.600 across Kurnool – Anantapur railway line.

Right of Way (RoW) of 15 to 35 m observed in the project stretch and additional land is required to be acquired to obtain prescribed and recommended 60 m RoW in rural stretches.

The existing traffic on this stretch of NH 63 is of mixed type. Large number of multi axle trucks and buses ply on this road in addition to private vehicles. Approximate average speed is 60.0 kmph.

The predominant land use is agricultural (79.14 %) followed by residential, barren and industrial. Many important institutions like hospitals, schools, government offices, police stations etc. are situated along the alignment.

There are 16 intersections present along the project stretch that includes 2 major and 14 minor junctions.

Large number of utilities viz. electric / telephone lines & OFCs are present along the route, which need to be relocated for facilitating the widening.

HT lines are present parallel to the existing alignment at a distance of about 10m to 60m at Existing Ch: 368.920 to 371+950, 380+350 to 381+000 and the lines are crossing the carriageway at 370+450, 374+700 and 373+425 on left hand side of the National Highway. The existing HT lines govern the

widening option in the above stretches.

Large numbers of mature trees are present along the highway and required to be felled for widening purposes. However, efforts will be made to minimize nos of tree felling. New trees are required to be planted to compensate for felled trees to minimize environmental impact.

There are 20 religious structures close to the highway, of which few may required to be relocated for widening.

Traffic Survey and Analysis

Traffic surveys and analyses were carried out for addressing various objectives and issues pertaining to widening of the project stretch. The surveys conducted include seven day volume counts, intersection, origin – destination, willingness to pay, pedestrian crossing, axle load, speed and delay surveys etc. The study aims at understanding existing traffic and travel characteristics on the project corridor and forecasting for project horizon year considering various constituent streams and for various scenarios. The results of analysis would form inputs for designing the pavement, developing capacity augmentation proposals, carrying out economic and financial analysis, decisions regarding grade separators, pedestrian facilities, planning the tolling strategy, designing the toll plaza, wayside amenities along with design of intersections on the widened project road. For the study of traffic, the project stretch is divided into two homogenous sections.

Midblock volume count survey and traffic forecast

The average daily traffic (ADT) was converted to average annual daily traffic (AADT) using seasonal factors. The AADT is the input for various analyses like traffic forecast, economic and financial analyses, capacity augmentation, pavement design etc. Table below depicts AADT at two traffic count locations on project stretch.

Summary of AADT at count locations

Location	Nos.	PCUs
km 409.500	5105	11984

Traffic is forecasted by determining the past trend of traffic flow along the corridor and by use of economic models developed to co-relate past vehicle registration data and economic indices such as per capita income (PCI), net state domestic product (NSDP), population and gross domestic product (GDP). By using the elasticity values obtained from the econometric models and the likely rate of growth of indices, population and regional influences, the mode wise growth rates are established. The established growth rates for most likely scenario are presented in Table below.

Recommended traffic growth rates

Vehicle type	TW	Car / jeep	Bus	LCV	2A truck	3A truck	MAV
2010-2014	7.76	8.71	4.24	7.95	5.00	7.95	7.95
2015-2019	7.26	8.21	3.74	7.45	4.50	7.45	7.45
2020-2024	6.76	7.71	3.24	6.95	4.00	6.95	6.95
2025-2029	6.26	7.21	2.74	6.45	3.50	6.45	6.45
2030-2034	5.76	6.71	2.24	5.95	3.00	5.95	5.95
2035-2039	5.26	6.21	1.74	5.45	2.50	5.45	5.45
2040-2044	4.76	5.71	1.24	4.95	2.00	4.95	4.95

Axle load survey

Axle load survey has been conducted at km 409.500 using portable electronic weigh pads in order to plot actual loading spectrum of commercial vehicles, which create potential damage to pavement.

This damage to pavement normally qualified by a factor termed as vehicle Damage Factor (VDF). The VDF for project stretch is worked out using equivalency factors and damaging power of different axle loads as mentioned in Annexure -2, IRC: 37-2001. The VDF values adopted for MSA calculation are shown in Table below.

VDF values, observed and recommended

Location	km 409.500			Recommended VDF
Direction Wise	* B-G	* G-B	Ave	
LCV	0.73	0.64	0.685	0.690
2-axle truck	7.08	6.94	7.01	7.100
3-axle truck	6.98	6.37	6.675	6.730
Multi-axle truck	6.41	5.97	6.19	6.110
Bus	-	-	-	0.900

** B-G: Border to Gooty G-B: Gooty to Border*

The VDF worked out for various modes of commercial vehicles found to be in conformity with national average and recommended values. The cumulative million standard axles at count locations have been calculated and are used in the overlay and new pavement design.

Origin - Destination Survey

Origin - Destination surveys has been carried out at km 409.500 by road side interview method on random sample basis. The data collected include commodity type, origin and destination of trip, occupancy, purpose and number of trips. The data has been used in preparation of trip matrices of each vehicle type. The data also used in working out lead and load characteristics of the commercial vehicles. Commodity-wise trip matrices are also checked.

Willingness to pay survey

Willingness to pay surveys has been carried out at km 409.500 along the project by road side interview on random sample basis. The acceptance of toll rates by road users is examined by this study and found that generally the acceptance level of passenger vehicles are slightly below the prescribed rates whereas commercial vehicles are ready to pay the prescribed amount.

Other traffic surveys

Speed and delay survey has been carried out using moving car method during peak and off peak hours. It is analysed based on the data that peak hour speed of 43.61 kmph and off-peak hour speed of 49.5 kmph. The suggested design speed for the project road is 100 kmph. Pedestrian crossing survey has been carried out at 3 locations (km 395.6, km 397.5, &km 409.5). The first two locations are falling in bypassed section in Guntakal. At third location, the pedestrian activity is comparatively low.

Engineering Surveys and Investigations

The general engineering studies conducted along the project stretch include topographic survey, Pavement composition, pavement condition surveys, pavement roughness and pavement structural strength.

Topographic Survey

The Topographic Survey for improvement of project road was carried out by GPS, electronic Total

Station and Auto level equipments. The detailed survey methodology and specifications followed are as described below.

Initially control points and traverse stations were established using GPS and Total Station equipments. Then using Auto level equipment, Double Tertiary (DT) levelling was carried out to fix temporary benchmarks with respect to GTS Benchmarks available in the area to establish the vertical control to all TBMs and traverse stations. The detailed survey was then carried out and the data was processed for engineering design.

The following specifications were adopted for carrying out the topographic surveys. Traverse points positioning was with accuracy of 1:10,000. All traverse points were marked on ground by punching nails in to surface. TBMs are fixed on BM reference pillars fixed 250 m apart, at top of the kilometre stones, parapets of culverts and on plinth top of the buildings. Double tertiary methods have been used in levelling, taking the sum and average of three wire readings to determine reduced levels.

Cross-sections of roads are taken at an interval of 50 m. Levels were taken at the centre and edges of carriageway, edge of shoulders and levels up to property lines on both sides. Details of drain widths and depths also collected. For all the existing culverts, top levels / road levels and bed levels / sill levels were collected.

Road Inventory

The existing pavement for the entire stretch is of bituminous surface. The pavement width is varies from 7.0 m to 10.0 m. Earthen (unpaved hard) shoulders exist for entire length of the highway with its width ranging from 0.5 m to 1.5 m.

Existing Minor Junctions

There are 14 nos. of minor junctions along the project stretch

S. No	Existing Chainage	Type of Junctions	Destination
1	375+400	3-legged	To Kadadarabenchi
2	377+974	3 Legged (Staggered)	Vidapanakallu
3	378+675	4-legged	To Thimmapuram (RHS)
4	383+780	3 Legged	To village
5	394+700	3 Legged	Guntakal
6	395+400	3 Legged	Pamidi
7	396+050	3 Legged	Guntakal
8	396+350	3 Legged	Guntakal
9	401+415	3 Legged	Village Road
10	405+330	3 Legged	Village Road
11	408+500	4 legged	Village Road
12	409+450	Staggerd	Village Road
13	413+350	4-legged	To Sevaghada (RHS), To Cheravu (LHS)
14	419+575	3 Legged	To Gojjepalli

Pavement Condition

The survey on general pavement condition was primarily a visual exercise undertaken by means of slow drive-over survey, and supplemented with measurements wherever necessary. Visual assessment was carried out at suitable intervals at 200 m and wherever necessary, depending on variations in pavement conditions.

The existing pavement condition based on visual observation varies from excellent to very poor. It has been observed that in most of the stretches heaving / settlements / distress were observed. This may be due to weak subgrade, improper compaction or movement of heavy loaded trucks. Summary of pavement condition is given in Table below.

Summary of Pavement Condition

Summary	Length (km)	% of total length
Excellent	32.025	57.91
Good	8.680	15.69
Fair	11.200	20.25
Poor	3.400	6.15
	55.305	**100.00**

Pavement Structural Strength

Benkelman beam deflection studies are carried out for evaluating requirements of strengthening flexible pavements. Performance of flexible pavement is closely related to elastic deflection under the wheel loads. Sampling of subgrade soil from existing carriageway for establishing seasonal correction of BBD values has also been carried out. The soil samples have been tested for their various physical properties. Characteristics deflection values have been worked out to use in preliminary design of overlay on existing pavement. The project road is divided into homogeneous sections based on the BBD survey. The sections and respective characteristic deflections are depicted in Table below.

Homogeneous sections based on characteristic deflection

Section	Existing Chainage		Characteristic Deflection (mm)
	From	To	
1	368+920	389+000	1.231
2	389+000	402+000	1.866
3	402+000	405+000	1.030
4	405+000	421+000	1.723
5	421+000	424+225	2.400

Subgrade Investigation

The laboratory investigations of sub-grade indicate that the existing subgrade varies from location to location along the road. The percentage of gravel, sand and silt and clay are 41.4% to 1.8 %, 76.2% to 32.9 % and 32.2 % to 12.6 % respectively. The liquid limit varies from 31.6 % to 22.0 % with non plastic to plastic limits of 18.8 % to 15.00 %. The maximum dry density and optimum moisture content varies from 8.5 to 7.5 gm/cc and 2.15% to 2.00 % respectively. The soaked CBR values of existing sub-grade varies from 22.0 % to 4.0%**.**

Material Investigation

The material investigation has been carried out to identify the potential sources of construction materials and to assess their general availability, mechanical properties and quantities. This is one of the most important factors for stable and successful implementation of the road program within the stipulated time. For improvement work as well as for new carriageway / bypass the list of materials includes the following:

- *Granular material for lower sub-base works*

- *Crushed stone aggregates for upper sub-base, base, surfacing and cement works*
- *Sand for filter material and cement, concrete works, sub-base and filling material*
- *Borrow material for embankment, subgrade and filling*
- *Manufactured material like cement, steel, bitumen, geo-textiles etc. for other related works*

Potential sources of soil for construction of embankment and subgrade (for reconstruction / new carriageway) were identified on either side of project stretch.

Aggregate quarries located in the vicinity of project area were inspected and the details on numbers of crushers in operation along with production capacity, area spread etc. were gathered. Sufficient quantity of rock for production of crushed aggregates was available from the identified sources within economical lead.

Hydrological investigations

Hydrological investigations have been carried out for the entire project road. It has been verified that majority of the cross drainage structures are hydrologically adequate to carry the discharges of the river / streams. It has been ascertained from local enquiry and from the National Highways department offices of the project road that no portion of road has been overtopped during previous monsoons. There are 14 minor bridges, 111 culverts and 6 causeways along the existing alignment.

Preliminary design

Geometric design

The major length of existing alignment is in plain terrain and adopted design speed as per IRC: 73 - 1980 is 100 kmph. Geometric design viz. horizontal and vertical curves are being designed as per IRC: 73 - 1980 & IRC SP: 23 - 1983 as suggested in Inception Report.

Alignment proposal

After carrying out field investigations and reconnaissance survey of existing alignment, the consultants have arrived at alignment proposals.

Widening proposals have been prepared based on availability of additional land / existing RoW, horizontal geometrics, study of existing bridges and considering road safety parameter measures. The lengths of adopted type of widening details (as per proposed chainage) are given in Table below.

Length of adopted type of Cross section

S. No.	Description	Type of C/S	Length (Km)
1	4 Lane Divided Carriageway Eccentric widening in Rural Area	1	18.135
2	4 Lane Divided Carriageway Concentric widening in Rural area	1A	3.23
3	4 Lane Divided Carriageway New Construction for Bypass and Realignment Locations in Rural Area	1B	27.365
4	4 Lane Divided Carriageway Eccentric widening in Built-up Area	2	0.64
5	4 Lane Divided Carriageway Concentric widening in Built-up Area	2A	0.14
6	4 Lane Divided Carriageway New Construction for Realignment Locations in Built-up Area	2B	3.07
7	Approach Cross section @ VUP without Slip Roads	3	3.85
8	Approach Cross section @ ROB with RE Wall	4	0.86
	Total Design length		**57.29**

Typical Cross Sections

Based on the traffic considerations, geometric standards and existing site conditions, the following typical cross sectional elements are framed for project road.

Details of Proposed Cross Section

Element	Width in meters	Total Width, m
Rural Cross Section (C/S Type 1, 1a, & 1b)		
Main Carriageway	2 X 7.00	14.0
Earthen shoulder	2 X 2.0	4.0
Median	1 X 4.5	4.5
Kerb Shyness	2 X 0.25	0.5
Unlined Drain	2 X 3.00	6.0
Future widening /Utility Corridor/Unlined drain/Slope	2 x 14	31.0
Total width		**60.0**
Urban Cross Section (C/S Type 2, 2a & 2b)		
Main Carriageway	2 X 7.00	14.0
Paved shoulder	2 X 2.00	4.0
Kerb Shyness	2 X 0.25	0.5
Footpath, Drain & Utility Duct	2 X 3.00	6.0
Raised Median	1 X 2.00	2.0
Future widening /Utility Corridor/Unlined drain/Slope	2 x 9.25	18.5
Total width		**45.0**
VUP Approach Cross Section (C/S Type 3)		
Main Carriageway (from median edge to outer crash barrier)	2 X 12	24.0
Median	1 X 4.5	4.5
Future widening /Utility Corridor/Unlined drain/Slope	2 x 15.75	31.5
Total width		**60.0**
ROB Approach Cross Section (C/S Type 4)		
Main Carriageway (from median edge to outer crash barrier)	2 X 12.00	24.0
Median	1 X 4.5	4.5
Future widening /Utility Corridor/Unlined drain/Slope	2 x 15.75	31.5
Total width		**60.0**

The given cross sectional details holds good for majority of length of the project highway. The RoB approaches are proposed for 6 lane configuration.

Service Roads

No service roads are proposed for the project road**.**

Pavement Design

Flexible pavement has been adopted for both new carriageways, widening of existing flexible pavement carriageway portion and proposed bypass except toll plaza location. In the toll plaza area, rigid pavement has been adopted for new carriageway portion and reconstruction of existing carriageway.

New Flexible/Rigid Pavement Design

The pavement design basically aims at determining the total thickness of the pavement structure as well as thickness of individual structural components. The following assumptions are considered for the preliminary pavement design. The basic assumptions considered while designing are as follows.

- Design Life is taken as 10 years for BC and DBM; and 15 years for WMM and GSB courses or year up to which 150 MSA is crossed.
- Subgrade CBR (design) of 8 %.
- Overlay in the 10th year

The project road has been divided into two traffic homogeneous sections, design for which are furnished below.

Flexible pavement composition (in mm) recommended

Description	Section I 375+740 to 400+840	Section II 400+840 to 433+030
Bituminous Concrete	40	40
Dense Bituminous Macadam	115	115
Wet Mix Macadam	250	250
Granular Sub Base	200	200
Total	**605**	**605**

One layer of sand blanket with thickness of 225 mm is proposed in locations where the PI value is less than 5. Subgrade of 500 mm thickness of CBR value not less 8 % and sub base material of CBR not less than 30 % shall be used. The pavement composition of paved shoulders and Truck lay-byes has been kept with the same specifications as those of the main carriageway.

Strengthening of the Pavement

Overlay Design

IRC: 81 - 1997 guidelines for strengthening of flexible pavements using Benkelman Beam Deflection (BBD) technique have been essentially followed for the design of overlays. The overlay designed for 10 years is presented in Table below.

Overlay recommended (in mm)

S.No	Existing Chainage (Km)		Characteristic Deflection (mm)	MSA	BM (mm)	Total Overlay Thickness Required	Design Thickness	
	From	To					BC (mm)	DBM (mm)
1	369+000	389+000	1.231	39.00	130	91.00	40	60
2	389+000	402+000	1.866	39.00	187	130.90	40	90
3	402+000	405+000	1.030	37.00	92	64.40	40	60
4	405+000	421+000	1.723	37.00	175	122.50	40	90
5	421+000	424+225	2.400	37.00	211	147.70	40	110

Parking and Rest Areas

One wayside amenity centres are proposed at 421+790 (RHS), This centre should facilitate for restaurant / cafeteria, dormitory / rest areas with toilet facilities, shopping kiosks, ATM facility, petrol stations, tourist information centre, emergency first aid, repair / maintenance facility, parking provisions for trucks and cars, police outpost etc.

Pickup Bus Stops and Bus Bays

Bus Bay with Shelter is proposed at 6 locations on both sides and at one location, the facility on left and right of the carriageway are staggered. Only Bus shelters are proposed at 5 locations on both sides.

Truck Lay-byes

One truck lay-byes are proposed at km 404.330 on both sides.

Toll Plaza

The nearest toll plaza on NH 63 is at km 375 in Karnataka, near border. It will not be possible to maintain the minimum instructed distance of 60 km between toll plazas in this particular case. To keep the distance at least as 40 km, the toll plaza is proposed near km 412.300.

The toll plaza will have additional right-of-way, service lanes, toll booths, lighting, weigh-in-motion weighbridge, automatic, semi automatic and manual toll booths, separate lanes for wide bodied vehicles etc. Pavement is designed for the toll plaza locations, as it has longer life and can resist the wear and tear caused by the braking forces exerted by heavy vehicles. The proposed composition of rigid pavement is given in Table below.

Pavement Composition for Rigid Pavement

GSB (mm)	DLC (mm)	PQC (mm)
200	150	320

Proposal for Structures

Box culvert and Pipe culverts

In the proposed alignment, there are 30 Box culvert and 83 pipe culverts. The details proposals are furnished in Design Report, Volume II Chapter 5.

Bridges and ROB

There are totally 17 Minor bridges (3-new construction; 7-widening; 5-reconstruction, 2 Retained), 1 interchange, 2 ROB and no major bridges along the proposed alignment. The details proposals are furnished in Design Report, Volume II Chapter 5.

VUP and Interchange

2 VUP and 1 interchange are proposed along the highway based on avoid interference of local traffic to major flow. The details proposals are furnished in Design Report, Volume II Chapter 5.

The VUP and Interchange proposed are at:

a) Gooty Bypass Ending (Proposed Interchange @ Ch 433+030)
b) VUP Guntakal Bypass - SH 26 Crossing towards Guntakal, Uravakonda (Proposed VUP @ Ch 399+660)
c) VUP Guntakal Bypass - ODR Crossing (Proposed VUP @ Ch 402+322)

Initial Environmental Impact Assessment

The Environmental Impact Assessment (EIA) is aimed at determining the environmental impacts due to the construction and operation of the project road. The major environmental disciplines in the EIA study include topography and land use, soil and agriculture, geology and seismicity, water quality, climate and meteorology, air quality, noise level, terrestrial and aquatic ecology.

Project specific environmental management plan shall be prepared for ensuring the implementation of the proposed measures during construction phase of the project.

The NHAI has certain organizational and institutional capacity, for satisfactory implementation of the EMP.

Social Assessment

The main objective of conducting social screening is to provide inputs of social concerns to be

detailed in project design and to avoid or minimise the adverse social impacts with the best possible engineering solutions at minimum cost in close coordination between engineering, environmental and social experts during the entire design process. The social screening exercise is intended to assess the negative impacts (direct, indirect or cumulative) and to suggest mitigation measures to avoid or at least minimise the adverse impacts on nearby communities and natural environment, peoples and properties falling on the direct path of road development, people indirectly affected by the way of disruption of livelihood, breakage in community linkages, impacts arising from land acquisition and resettlement, on indigenous people (SC, ST etc.) and on human safety etc.

Cost Estimation

The cost estimation for the project is extremely important as the viability and implementation of a project depends on the project cost. Therefore, cost estimates have been carried out with due care. Estimation of preliminary cost, a primary pre-requisite for economic and financial evaluation, has been carried out for widening the existing road to a four lane carriageway including strengthening of the existing pavement, strengthening / widening of existing bridge structures, construction of new bridges, rehabilitation and reconstruction / widening of cross drainage structures, longitudinal drains, junction improvements, road furniture, bus bays, truck bays, way side amenities, toll plazas, etc. and is presented in Table below.

Project Cost

Total Civil Cost	3,968,500,406.00
Total Project Cost	4,960,625,507.50
Preconstruction Cost	
Utility Shifting	99,212,510.00
Land Acquisition, Resettlement Cost	415,152,441.00
Environmental Cost	55,798,908.00
Establishment Charges	59,527,506.00
Project Management and Quality Control	158,740,016.00

Economic Evaluation

Economic Analysis was carried out following the methodology and input data using HDM-4 software. HDM-4 output on annual agency and user cost streams.

The life cycle economic benefits and costs, ENPV and EIRR are calculated considering:

- *VOC savings as project benefit*
- *With all savings (VOC and travel time) as project benefit*
- *Agency capital costs*
- *Agency recurrent costs*

Economic analysis of the project road has been carried out and the summary of findings is provided in following Table.

Summary of NPV and EIRR of the Project Road

Section	Proposed Length (km)	NPV Discounted (Rs. million)	EIRR (%)
KNT/AP Border-Gooty section of NH 63, including bypasses	57.290	1838.37	14.4

Sensitivity analysis was carried out for the project road analysis option using the following scenarios:

1) Base Cost and Base benefits – Case I
2) 15% increase in Cost and base benefits – Case II
3) Base cost and 15% reduction in benefits – Case III
4) 15% increase in cost and 15% reduction in benefits- Case IV

The output of the sensitivity analysis is presented in Table**.**

Sensitivity Analysis

Scenario	EIRR (in %)
Case-I	14.4
Case-II	13.0
Case-III	12.0
Case-IV	10.8

The Economic internal rate of return (EIRR) for the base cost (case I) works out to 14.4% whereas that in the EIRR in worst case works out to 10.8%. The project is therefore, economically justifiable and recommended for implementation, with Case I to III. Hence upgrading of the project as four - lane divided road including construction of new bypasses for Guntakal and Gooty is recommended. The HDM output sheets are provided as Annexure 3.1 to this chapter.

Financial evaluation

To assess whether the project is a profitable proposition, the return to investors is measured in terms of the equity IRR, which is estimated on discounted cash flow technique. The returns expected by investors are function of the value of equity issued in Indian stock markets, interest rates on commercial loans, the risk profile of the investment and alternative investment opportunities. The concession period is taken considering traffic capping.

Summary of Financial Analysis

Concession period	Grant %	Debt %	Equity %	IRR project %	IRR equity %	Project NPV @ 10 %	Equity NPV @ 10 %
29 years	40	70	30	13.50	15.01	47.72	66.48

The project is viable on commercial format with 40 % grant for a concession periods of 29 years including construction period.

Conclusion

In order to explore the possibility of financing the project on DBFOT basis, financial feasibility analysis has been carried out based on traffic study and toll analysis to ascertain the existence of sustainable project returns.

It is concluded that the project is viable on commercial format with 40 % grant for a concession periods of 29 years with stated civil cost and hence it recommended to take up the project on BOT / DBFOT (Toll) basis.