VOLUME – I

MAIN REPORT (DIMAPUR BYPASS – NAGALAND PART)

CONTENTS

EXECUTIVE SUMMARY

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0.1 Background

With the rapid socio-economic development in India, there has been a tremendous growth in industrialization of the country. This has resulted in a spurt of freight and passenger transport movement and increase in demand for better quality of road and transport system.

Govt. of India have undertaken a massive program of development and up-gradation of National Highways in India through improvement and widening to 4/6 lane of the existing National Highways through National Highway Development Project (NHDP). Phase I and II of NHDP comprise Golden Quadrilateral linking four Metros viz. Delhi, Mumbai, Chennai and Kolkata and North-South and East-West corridors of NH network connecting Kashmir to Kanyakumari (North-south) and Silchar to Porbandar (East-West). In NHDP Phase III, about 10000 km of National Highways are proposed to be upgraded to 4-lane standard primarily on B.O.T basis. This project is a part of NHDP Phase IIIB.

Archtech Consultants Pvt. Ltd. (ACPL), Kolkata have been awarded the work of project preparation for Rehabilitation and Upgradation to 4 Lane divided carriageway configuration of NH-36 & 39 from Km 38.000 to Km 168.167 (Daboka - Dimapur). The project preparation is being carried out in 4 stages including all engineering activities i.e., Inception Report, Draft Feasibility Report and Final DPR.

0.2 Overview of NHAI

NHAI has been mandated by the Govt. of India to implement the National Highways Development Project (NHDP). NHDP National Highways comprise less than 2% of India's road network but carry 40% of total traffic.

Golden Quadrilateral: The project envisages widening to 4-lane and improvement of high traffic density corridor along the existing National Highways connecting the four metropolitan cities of Delhi, Kolkata, Chennai and Mumbai. The total length of the project is 5846 km and has been taken up in Phase-I of NHDP.

North South and East West Corridors: The project comprises widening to 4-lane and improvement of the existing National Highways of about 4000km length from Srinagar to Kanyakumari (North-South Corridor) and about 3300km length from Silchar to Porbander (East-West Corridor). Implementation of a part of this project along North South and East West Corridor has been taken up in Phase-I of NHDP along with the Golden Quadrilateral. Implementation of the balance length of NSEW corridor is in different stages of progress.

0.3 Socio Economic Profile of Project Area

Project Area

The Bypass project road stretch passes through two districts, viz. Dimapur & Karbi-Anglong in the State of Nagaland & Assam. The project road passes mainly through hilly terrain The land use on both sides of the corridor is mostly agricultural and rural.

Demographic Features

The Bypass project road stretch, passing through KAAC of the State of Assam & Dimapur of the State of Nagaland, has the following demographic features: -

- The average density of population (persons per square km) was 340, as per 2001 census with an average growth rate of about 6.23 percent per year during 1991-2001.
- The average sex ratio i.e ratio of females per 1000 males, as per 2001 census, was 929.
- The average literacy rate, as per 2001 census, was 64.28 per cent.

Economic Characteristics

- The project area is primarily rural. Agriculture is the primary source of income for vast majority of households. The area is economically quite backward. The principal agricultural crops are paddy, wheat, pulses, potato, different vegetables, horticulture and forest products.
- About 31 % population are engaged in full time occupational persuits and marginal workers are about 5%.

0.4 Deficiencies and Issues

Dimapur Bypass is a new alignment ad hence does not attract any deficiency and issue.

0.5 Investigations & Evaluations

This has been done in Feasibility stages for selection of suitable alignment for 4-laning of Dimapur Bypass road sections based on field data and detail study involving traffic, geo-technical, topographic, pavement and road condition and socio-economic aspects. A few appropriate design applications have been considered for operational efficiency and road safety.

Pavement design options including flexible and rigid pavement structures for new construction have been considered including their life cycle costs using design methods and guidelines of IRC and AASHTO. Flexible pavement is proposed having the following items:

Subgrade	– 500 mm
Drainage Layer/GSB	– 150 mm

DLC – 150 mm

PQC – 300 mm

Various Bypass alignment options have been developed for the highway sections with all major and minor junctions / intersections.

0.6 Project Description and Alignment proposal

a) **Project Road**

The Bypass project road stretch is starting from existing Chainage km 159.400 of NH-36 at Lahorizan and ending at km 124.200 of NH-39 near Patkoi Bridge. The project road is situated in the Districts of KAAC in the State of Assam & Dimapur in the State of Nagaland. The Nagaland part of Bypass is from Km 132.375 to Km 153.058.

b) **Terrain**

The project road in the entire stretch traverses through mountainous terrain. Accordingly, geometric standards for mountainous terrain are to be adopted as per IRC: 73-1980 & IRC:SP:84-2009.

c) **Road Geometrics**

i) The pavement will consist of 2x7.00 m width with 4.50 median throughout the length of the project road. This will be

Median – 1x4.00 = 4.00 m
Carriage Way - 2x7.00 =14.00 m
Kerb Shyness - 2x0.50 = 1.00 m
Soft & hard Shoulder – 2x3.50 = 7.00 m
Total =26.00 m

ii) Horizontal curves are of design speed varying from100 Km/hr to 80 Km/hr.

iii) The gradient along the entire length of the project road is relatively rolling and mountainous, except for the high embankments in the approaches to major/minor bridges, which are on easy grades.

d) **Existing Pavement**

There is no existing pavement as the Bypass will be a new one.

e) Drainage

There is no problem of drainage as the corridor is on hilly terrain. The nos. of culverts provided are:

New/Replaced		Existing	
Box –	81	H.P. -	3
H.P. –	0	Box -	1
Slab -	0		4
	80		

f) Cross-Drainage Structures

There will be new cross-drainage structures. The nos. of major & minor bridges are:-

Major Bridge – 1

Minor Bridge – 2

g) ROW

The ROW will be acquired for 60.00 m width.

h) Land Use

The land adjacent to the proposed road is predominantly agricultural.

i) Relocation of Utilities

Both LT and HT lines run along / across the road at a number of places. At few stretches, telephone lines also exist. Telephone, LT & HT lines will need relocation in consultation with local authorities.

i) Meteorology

The climate is hot and humid in summer and moderate in winter with temperatures varying from 9°C (in winter) to 33°C (in summer).

j) Widening Proposals

One bypass of approximate length 35.008 km have been suggested to avoid the heavily congested Dimapur town connecting NH-36 & NH-39. The Bypass will be to the north of Dimapur town. The Nagaland part is 20.683 Km.

0.7 Traffic Survey

Extra traffic survey has been done for this stretch in April 2015.

a) **Traffic Growth Rate**

Traffic growth rates for the project stretch have been assessed on the basis of the average growth rates of vehicles on road or registered vehicles as well as the growth

rates obtained from Regression Analysis. The growth rates obtained are then compared with the growth rates adopted earlier for similar 4-laning projects on other National highways in Assam to arrive at reasonably realistic and rational growth rates of traffic along N.H 36.

Most probable growth of traffic on NH-36 as analyzed up to the year 2044 is given in the Table below:

Type of Vehicle		Final Growth Rate (%)					
	Upto 2011	Upto 2016	Upto 2021	Upto 2026	Upto 2031	Upto 2036	Upto 2044
Average for vehicle having axle load>3T	7.00	7.50	7.50	7.50	7.00	7.00	7.00

Overall average growth rate for the project road section of NH-36: 7.25 %.

b) Axle Load Survey

As it is a new alignment, no Axle Load Survey has been done.

0.8 Design Standard

a) Terrain

The project road traverses in mountainous & rolling terrain and, therefore, geometric standards are adopted as per IRC: 73-1980 and IRC:SP:84-2014.

b) Design speed

Ruling speed is varying from 100 Km/hr. to 80 Km/hr. These design speeds will govern the geometric parameters.

c) Cross Section

i) 4- Lane carriageway will be 2 x 7.00 m with raised median.

ii) Width of the median is generally proposed as 4.00 m. The Roadway proposed is

Median –	4.00 m x 1 = 4.00 m
Carriageway -	7.00 m x 2 = 14.00 m
Kerb Shyness -	0.50 m x 2 = 1.00 m
Hard Shoulder -	1.50 m x 2 = 3.00 m
Soft Shoulder -	2.00 m x 2 = 4.00 m
Total	**= 26.00 m**

iii) Shoulder width is 3.50 m including 1.50 m paved shoulder on either side.

iv) Cross fall for carriageway is 2.00% with paved shoulder, 2.50% for unpaved shoulder and 3.00% for median.

d) Horizontal Curves

The horizontal curves are proposed as per IRC:73-1980 & IRC:SP:84-2014 and designed in accordance with IRC:38.

e) Gradient

i) Ruling - 3.3% (1 in 30)

ii) Limiting - 5% (1 in 20) to be adopted in exceptional cases, where Ruling gradient will be uneconomical.

f) Bridges and Cross Drainage Structures

New 4-lane bridges & culverts will be designed for two lanes of traffic, as per IRC Standards & MORTH Guidelines and Specifications adopting one lane of Class 70R plus one lane of Class A or two lanes of Class A live load, whichever produces worst effect. All bridges are to be provided with crash barriers.

g) Road Junctions

There are 2 nos. major at grade junctions of the Bypass project road with mainly National Highways. In Nagaland part, there is 1 no. major junction.

h) Service Road, Footpath and Drains

No Footpath/Drains are proposed. Only Service Roads of width 7.00 m are proposed at 4 corners at crossing of NH – 39. In Nagaland part of Dimapur Bypass where one Flyover is proposed and at 4 corners of the Flyover where Dimapur Bypass crosses road to Airport.

i) Underpass

Traffic warrant Underpass for Vehicular & Cattle. There are Underpasses 5 nos Cattle & Pedestrian. In Nagaland part, there is 3 nos. Underpass.

Pedestrian – 1

Cattle – 2

j) ROB/Flyover

There is one R.O.B on the Bypass project road stretch and two Flyovers on NH-39 & road to Airport. In Nagaland part, there is one Flyover.

0.9 Pavement Structure

Pavement option studies will be carried out for both rigid and flexible pavements based on the design standards of IRC and AASTHO methods. Generally, the rigid pavement option works out to be economical based on the life cycle costing. However, considering the facts that the existing road has Rigid pavement, traffic volume on the project road is rather low

and the choice of a Rigid pavement for the new 4-lane road pavement seems preferable. Rigid pavement has been proposed for the Service Roads due to their very low volume of traffic. Following pavement structures have been proposed for the project stretch:

Rigid pavement for new construction	Drainage Layer/GSB -	150 mm
	DLC -	150 mm
	PQC -	300 mm

0.10 Environmental Impact Assessment

The objectives of the Environmental Impact Assessment study are: 1) to establish the existing environmental settings of the project area through generation of primary data and collection of secondary data, 2) to evaluate potential environmental impacts from the project during pre-construction, construction and operational phases and identify appropriate mitigation measures, 3) to prepare an effective Environment Management Plan and to propose an Institutional Framework.

Present report deals with the project "Consultancy Services for Feasibility Study and Detailed Project Report for Rehabilitation & Upgrading to 4/6-lane divided carriageway configuration of East-West corridor", which starts from km 38.00 (Daboka) and terminate at km 168.167 (Dimapur) of National Highway No. 36 in the state of Assam / Nagaland and will have some direct impact on the Environment. A reconnaissance survey was accordingly carried out to study the present environmental set up of the study corridor, which is the corridor for environmental concern, in general and proposed ROW in particular, on the basis of which screening exercises were undertaken to identify the environmentally sensitive issues and areas. The purpose of the PESS (Preliminary Environmental and Social Study) is " to determine any significant economic, social and environmental issues, which could require further analysis (including the analysis of bypass, short realignments, improvement of junctions etc.) to resolve such issues". The social and environmental screening will include, but not be limited to, the analysis of available information (supplemented where appropriate by site assessment) concerning:

- Areas of significance within right-of-way (ROW).
- Sensitive and/or critical natural habitats (e.g., national park, wild life reserves, sanctuaries, social groves, reserve and protected forest, social forest, wetlands etc.).
- Major rivers and waterways.
- Recorded religious and cultural heritage sites.
- And any potentially sensitive areas, based on recent GOI census, official data and information from NGOs and site visit.

No separate assessment for Nagaland part of Dimapur Bypass has been done.

Salient Environmental Features:

- The new ROW generally will be 60.00 m wide.
- Bypass Road passes through / side by Kushiabill village, Henevi, Kukuri, Nihoto, Khelokhu, Sethkema 'A', Lahorijan, Gautam Basti, Khatkhati etc. Possibility of generation of gaseous and particulate pollutants in these urban and semi urban areas is more.
- The main drainage system of the area are Dhansiri and Chate River. Besides, there are numerous tributaries of these drainage systems, which cut across Bypass at different chainages from Lahorijan to Patkoi Bridge resulting in 8 nos. of minor Bridges and 4 nos major bridges. In Nagaland part, there are 1 no. of Major Bridges and 2 nos. minor bridges.
- There are number of plantation trees, mainly, Ahat (Pipal), Caseasima, Segun (Teak), Rubber, Gamari, Sonaru, Mango, Simur, Gulmohar, Sirish, Sesam, Eucalyptus and Acacea. Among the big trees Mango, Jamun, Ahat (Pipal), Kathal and Bargad are more or less common.
- Construction of one bypass for Dimapur town would be required to avoid significant social and environmental impact of 4-laning the road.
- Ditches, submersible reaches and many water bodies exist within the study corridor. Raising the formation level of the new 4-lane road for four laning would be required in several stretches.

The major areas of concern from environmental angle appeared to be as follows, from PESS:

- Dust and sound pollution particularly at sensitive areas during construction of road
- Protections of social plantation forest within and outside the ROW
- Existence of natural water bodies very near to road
- Presence of telephone lines & posts, electric lines & posts, low and high tension posts, transformers, tube wells etc.

Infrastructure improvement associated with road projects invariably provides positive socio-economic benefits. However, the road project can produce complex negative impacts during the construction and operation stages. Since the proposed road works involves widening and improving the existing road, the overall environmental and social impacts will be minimal compared with those caused by new road construction. Impacts during both construction and operation phases are considered. In the EMP specific mitigation measures for the impacts identified are presented along with the organizations that will be responsible for implementing and monitoring the requisite measures. Environmental Management Plan associated with the following four broad categories of activities:

- Construction of road and associated structures
- Construction materials procurement storage and handling

- Construction and operation of project camps/compounds
- Operation phase

Approx. cost of implementation of EMP will be about Rs.414 lakhs for entire Bypass.

With the background of environment screening report in Feasibility stage, detailed Environmental Impact Assessment study is necessary to safeguard the environment impacts. They are broadly outlined below:

- To make an assessment which delineates the significant environmental effects of the project;
- To describe and quantify the magnitude of the effects;
- To determine the feasible mitigation measures for minimizing, eliminating, or offsetting unavoidable adverse effects; and
- To recommend the most appropriate prevention and/or mitigation measures

0.11 Social Screening and Social Assessment

Generally, about one-third of the population along the project area belong to vulnerable groups i.e. SC, ST and OBC. Widening of the existing road to 4-lane is expected to bring about positive social changes by way of reduced travel-time, increased access to markets, jobs and educational institutions, improve community facilities and health care services leading to overall development of the region in general and the project area in particular. Affected people are:

	General	ST	OBC	SC	Total
In Assam					
Family	**41**	**53**	**102**	**16**	**212**
Persons	**255**	**303**	**482**	**111**	**1151**
In Nagaland					
Family	**41**	**52**	**23**	**21**	**137**
Persons	**234**	**305**	**140**	**125**	**804**

Social Assessment

A comprehensive social screening and assessment has been carried out for the entire stretch through extensive field visits and public consultations with project-affected persons and some responsible persons from all walks of life in the project area.

Affected properties

Implementation of the project would involve acquisition of some areas of land and structures both pucca and semi-pucca/ kachha. Suitable compensation will have to be paid to the owners of these properties, as per the Govt. policies and regulations. Affected properties are:

Sl. No.	Name of Village	Pucca (P)	Semi Pucca (SP)	Kachha (K)
	In Assam			
1	Belijan 'A' / Khatkhati P.S.	0.00	251.09	965.25
2	Belijan / Khatkhati P.S.	0.00	416.00	517.50
3	Karagaon / Khatkhati P.S.	0.00	164.63	1372.26
4	Gautam Basti / Khatkhati P.S.	107.88	2074.91	3135.20
5	Naharjan / Dilai P.S.	0.00	0.00	1391.31
6	Chotolengrijan / Dilai P.S.	0.00	86.62	877.46
7	Boro Lengri / Dilai P.S.	0.00	896.70	851.33
8	Boro Lengri (ii) / Khatkhati P.S.	0.00	584.63	1640.02
9	Purana lahorijan / Khatkhati P.S.	0.00	36.00	230.86
10	Boro Lengri / Khatkhati P.S.	181.84	791.58	915.34
	TOTAL	**289.72**	**5,302.16**	**11,896.53**
	In Nagaland			
11	Kushiabil Village	477.70	124.00	419.70
12	Zani Village	0.00	75.00	110.60
13	Henivi Village	0. 00	88.40	120.90
14	Nihoto Village	0.00	0.00	308.40
15	Khuguvi Village	0.00	0.00	290.10
16	Khehokhu Village	75.00	0.00	261.60
17	Old Showba Village	0.00	0.00	192.40
18	Khelejo Village	0.00	0.00	186.00
19	Saithekema 'C' Village	1,775.50	1,933.10	2,549.40
20	Patkoi Village	255.40	682.90	1933.80
	TOTAL	**2,584.10**	**2,903.40**	**6,372.90**

Estimated cost for Rehabilitation and Resettlement Program

This has since been completed and hence not repeated.

0.12 Signages & Road Markings

Adequate provision for signages viz. overhead gantry signs, direction / information boards etc. are proposed as per IRC: 67-2001 for the entire Bypass project reach. Besides, suitable provision is proposed for road markings for centre line, shoulder and median side edge lines for the entire length. Besides, painting of median kerbs and provision of reflective posts/bollards, at the intersections and median openings, have been proposed to ensure road safety.

Client: FINAL DETAILED PROJECT REPORT
National Highways Authority of India ES - 12 *Archtech Consultants Pvt. Ltd*

11.5 Pavement

Though both flexible and rigid pavement has been discussed, it is proposed to provide Rigid pavement on the Dimapur Bypass alignment. This has been proposed after comparing Life Cycle cost for 30 years.

11.6 Junction Improvement

There are 2 major intersections along the Bypass project road, which have been recommended for improvement at grade. All the intersections are 3-legged and they do not account for any grade separation. In Nagaland part there is one major intersection.

11.7 Packages

The Bypass project stretch has been proposed to be divided into only one package.

The estimated cost of the proposed original construction for the project stretch has been estimated to be as follows:

a) With rigid pavement civil cost option **Rs. 549.10 Crores**

b) The estimated cost of the proposed new construction of the Bypass project stretch to 4-lane standard (including centage charges) works out to **Rs 696.42 Crores** with rigid pavement.