Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning of Churachandpur – Tuivai road Section(length = 162 km) on NH-102B (Manipur) on Engineering, Procurement and Construction mode in the state of Manipur. (Package No. NHIDCL/DPR/CT-IJ-TP/Manipur/ 2017)

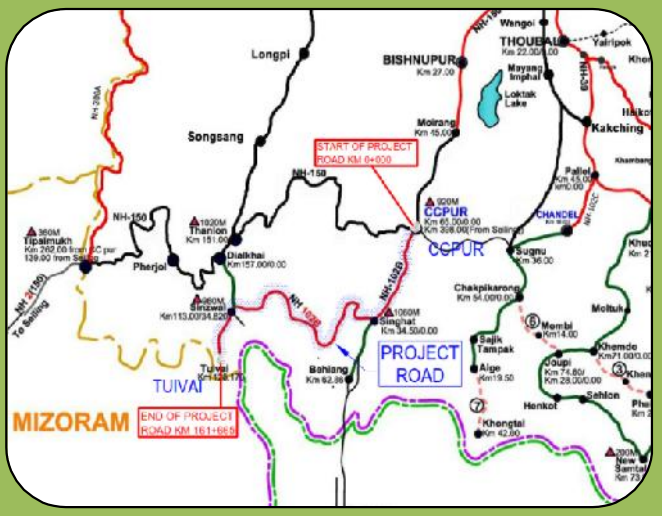
STAGE: IV

DRAFT DETAILED PROJECT REPORT
VOLUME I – MAIN REPORT
PACKAGE – IVB (130+000 KM TO 141+029 KM)

National Highways & Infrastructure Development Corporation Ltd.

PTI Building, 3rd Floor, 4, Parliament Street, New Delhi-110001







C. E. Testing Company Pvt. Ltd.

124-A, NSC Bose Road, Kolkata -92

CET/4047/NHIDCL/NH-102B/FDPR Rev: R0 Dec, 2019

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CHAPTER-1

EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND

National Highways and Infrastructure Development Corporation (NHIDCL) is a fully owned company of the Ministry of Road Transport & Highways (MoRT&H), Government of India. The company promotes, surveys, establishes, design, build, operate, maintain and upgrade National Highways and Strategic Roads including interconnecting roads in parts of the country which share international boundaries with neighboring countries. The regional connectivity so enhanced would promote cross border trade and commerce and help safeguard India's international borders. Thishydr would lead to the formation of a more integrated and economically consolidated South and South East Asia. In addition, there would be overall economic benefits for the local population and help integrate the peripheral areas with the mainstream in a more robust manner.

As a part of the above mentioned endeavor, National Highways & Infrastructure Development Corporation Limited (NHIDCL) has been entrusted with the assignment of Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning of Churachandpur – Tuivai road Section of NH-102B on Engineering, Procurement and Construction mode in the state of Manipur.

National Highways & Infrastructure Development Corporation Ltd. is the employer and executing agency for the consultancy services and the standards of output required from the appointed consultants are of international level both in terms of quality and adherence to the agreed time schedule.

National Highways & Infrastructure Development Corporation Limited (NHIDCL), MoRT&H, New Delhi has appointed C.E. Testing Company Pvt. Ltd. (CETEST) as consultant to prepare the Detailed Project Report for the above road stretches vide Letter of Acceptance No. NHIDCL/DPR/MANIPUR/C-T/2016/389 dated 26.10.2017.

The project road starts from the Junction of NH -150 at New Lamka Town in Churachandpur and ends near Manipur and Mizoram state border at Tuivai in the district of Churachandpur. The existing length of the project road comes out as 161.349 km (as per topographic survey). The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E.

The project road lies in Churachandpur district of Manipur. The project road passes through plain/mountainous Terrain. The existing road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and ends at Tuivai. **The present report deals with Package-IVA (Design Ch. 118+850 Km to Design Ch. 130+000 Km) of Churachandpur-Tuivai Road.**

PKG	Existing Ch.		Length (km)	Design Ch.		Length (km)
	Start	End		Start	End	
PKG-IA	0+000	14+210	14.210	0+000	13+747	13.747
PKG-IB	14+210	34+800	20.590	13+747	32+835	19.088
PKG-IIA	34+800	51+147	16.347	32+835	48+587	15.752
PKG-IIB	51+147	73+000	21.853	48+587	69+875	21.288
PKG-IVA	134+270	149+630	15.360	118+850	130+000	11.150
PKG-IVB	149+630	161+440	11.810	130+000	141+029	11.029

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1.2 OBJECTIVES

The main objective of the Consultancy Service is to prepare the Detailed Project Report (DPR) for up gradation of existing road to 2-lane configuration from Churachandpur - Tuivai road Section of NH-102B in the State of Manipur ensuring:

- ✓ Minimum Land acquisition
- ✓ Enhanced road safety
- ✓ Minimum adverse impact on environment

Project preparation activities mainly comprises of six stages in accordance with Terms of reference (TOR)

- ✓ **STAGE 1**: Inception Report
- ✓ **STAGE 2**: Feasibility Report
- ✓ **STAGE 3**: LA & Clearances I Report
- ✓ **STAGE 4**: Detailed Project Report (DPR)
- ✓ **STAGE 5**: Technical Schedules
- ✓ **STAGE 6**: LA & Clearances II Report

The Final Detailed Project Report covers the work carried out by the Consultants up to Stage- 4 "Detailed Project Report (DPR)".

1.3 DEFICIENCIES AND ISSUES

The following major deficiencies have been identified and addressed in terms of traffic operation, safety, road conditions and maintenance. A few other issues which contribute to operational deficiencies and safety concerns and which prevent the optimum utilization of the highway capacity to a desirable level of service, e.g. driving discipline and compliance, traffic surveillance, corridor security and management, level of regular road maintenance, maintenance and its road worthiness etc. are beyond the scope of this study.

a) Operation

- ✓ No access control
- ✓ Fast Moving Vehicles conflicts with slow moving vehicles due to bad pavement condition
- ✓ Deficient road surface conditions (roughness)
- ✓ No proper Geometry of road alignment
- ✓ Uncontrolled roadside developments and encroaching the area under ROW
- ✓ Cross-drainage structure require to be improved through reconstruction

b) Safety

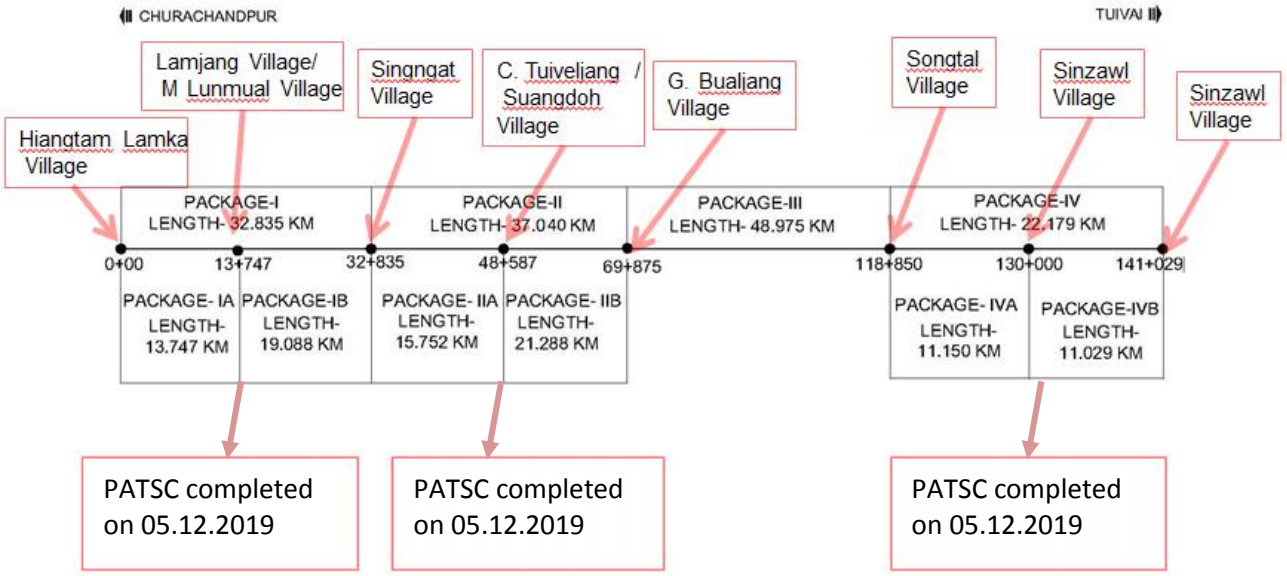
- ✓ Shoulder drop-off at places.
- ✓ Exposed roadside hazards, specially a protective part throughout the road stretch.
- ✓ Inadequate traffic signs.
- ✓ Blind Curve on the project road.

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c) Road

- ✓ Fair - Poor pavement condition and structurally inadequate
- ✓ Shoulder functionally and structurally inadequate
- ✓ Cross drainage - poor condition and inadequate
- ✓ Curve radii less than what is required for the ruling Design speed of 40 km/hr. in roads for mountainous terrain
- ✓ Deficient curves and reverse curves in roads of plain terrain without transition length for reversal of elevation.

Linear Plan of Churachandpur-Tuivai Road :-



1.4 SALIENT FEATURES

This relates to the most suitable alignment for 2-laning of road sections and for optimum upgrading of existing road based on field data and detail study involving traffic, geo-technical, topographic, pavement and road condition and socio-economic aspects. Special attention has been given for augmentation of capacity for intended level of service in design period. A few appropriate design applications have been considered for operational efficiency and road safety.

Road side religious structures, graveyards, missionaries etc. have been mostly avoided by adjusting the alignment suitably and/or by eccentric widening. All major and minor junctions/intersections have been analyzed with respect to vehicular movements and vehicular turning movements based on traffic study for providing appropriate grade / grade separated intersections for cross / turning traffic.

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED ROAD (PACKAGE-IVB)

Descriptions		Existing	Proposed
START POINT	:	Near Sinzawl Village.	Near Sinzawl Village.
END POINT	:	Near Tuivai river.	Near Tuivai River
LENGTH	:	Existing Length = 161.349 Km (As per topographic survey)	Proposed Length =141.029 Km
TERRAIN	:	Mountainous Terrain – (11.810 km)	Same as existing

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<table>
<tr><th>Descriptions</th><th></th><th>Existing</th><th>Proposed</th></tr>
<tr><td></td><td></td><td>149.630 km to 161.440 km</td><td></td></tr>
<tr><td>ALIGNMENT</td><td></td><td>Alignment consists of Sharp, Zig Zag Curves with presence of Hair Pin bends. The average speed of the corridor is 25kmph. Longitudinal gradient is found steeper than the limiting gradient at many locations in mountainous terrain.</td><td>Proposed alignment has been designed based on the design speed adopted for Plain & mountainous terrain as per standard specified in IRC SP 73-2015 and hill road manual. The vertical gradient also restricted to the recommended limiting gradient prescribed in the above said IRC codes.</td></tr>
<tr><td>DESIGN SPEED</td><td>:</td><td>Avg. speed 24 -25 kmph</td><td>Adopted Design Speed:
➢ Mountainous Terrain- 40kmph-60kmph
However, at hair pin bend locations design speed restricted to 20kmph</td></tr>
<tr><td>CROSS-SECTION</td><td>:</td><td>
<table>
<tr><th colspan="2">Chainage</th><th rowspan="2">Average Carriageway Width (m)</th></tr>
<tr><th>From (km)</th><th>To (km)</th></tr>
<tr><td>149.630</td><td>161.440</td><td>3.5</td></tr>
</table>
Earthen /Gravel Shoulder: 0.50 m –2.0 m
Total Formation width: 4.0 m to 14 m</td><td><u>For Plain terrain</u>
(1) In Built-up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(2) In Rural Area
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder = 2 x1.0m
Total Roadway Width = 12.00m
<u>For Mountainous terrain</u>
(3) In Built Up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(4) In Rural Area (Both Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side = 2 x1.0m
Total Road Width = 12.00m
(5) In Rural Area (One Side Hill & Other Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side = 1 x1.0m
Total Road Width = 11.00m
(6) In through Cutting section
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Drain = 2 x 1.0 m
Total Road Width = 10.00m</td></tr>
<tr><td>CBR</td><td>:</td><td></td><td>Design CBR adopted =10%</td></tr>
<tr><td>TRAFFIC GROWTH RATE</td><td>:</td><td></td><td>7.5%</td></tr>
<tr><td>TRAFFIC</td><td>:</td><td>Base year traffic (Yr. 2019)
Total Vehicle in numbers = 576 nos.
Total Vehicles in PCU = 678 PCU
Total CVPD = 159 nos.</td><td>Projected traffic (Yr. 2042)= 3577 PCU
(2-lane configuration recommended)</td></tr>
</table>

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Descriptions		Existing	Proposed
PAVEMENT DESIGN LIFE	:		Flexible Pavement - 20 Years
DESIGN MSA	:		Calculated = 2 MSA **Adopted = 20 MSA** (as per IRC:SP:73 guideline)
PAVEMENT THICKNESS	:	Existing Crust Thickness varies from 100-540 mm	**For New/Widening & Strengthening portion** BC = 40 mm DBM = 70 mm WMM = 250 mm GSB= 200 mm **Total = 560 mm**
BRIDGES	:	**Package - IVB** Minor Bridges (Total = 1 No.) ➢ Steel Truss bridge – 1 No.	**Package – IVB** Major Bridges (Total = 1 No.) i)Reconstruction =1 no. ➢ Steel Truss Bridge = 1 no.
CULVERTS	:	**Package – IVB** ➢RCC Slab Culvert = 5 Nos. ➢Hume Pipe Culverts = 57 Nos.	**Package - IVB** Total Culvert proposed = 69 Nos. ➢Reconstruction with Box Culvert = 46 Nos. ➢Existing culverts avoided= 16 nos. ➢New Box Culvert proposed = 23 Nos.
PROTECTION WORK	:	**Package – IVB** Breast Wall = 6 m Retaining Wall = 45 m Guard Wall = 10 m	**Package - IVB** Length of Retaining Wall =5347 m Length of Breast Wall = 3121 m Length of Toe Wall = 692 m Metal Beam Crash Barrier = 6139 m Hydro seeding = 24969 Sqm Turfing = 27006 Sqm
LONGITUDINAL DRAINS	:	Length of Earthen Drain = 11029 m (on hilly side)	**Package - IVB** Length of Covered Drain = 0 m Length of Open Drain = 8117 m Length of Chute Drain = 0 m
BUS BAY WITH PASSENGER SHELTER	:	Nil	**Package – IVB** Nil
MAJOR INTERSECTION	:	**Package – IVB** Nil.	**Package – IVB** Nil
MINOR INTERSECTION	:	Nil.	Nil.
ROW	:	4.0 m to 26.6 m	Built-up Area = 14 m Rural Area = 18 m to 24 m
LAND DETAILS	:	**Package - IVB** Available Land Within existing ROW= 7.912 Ha.	**Package - IVB** Total Land required to implement 2-lane proposal = 25.011 Ha. Land Available within PROW= 7.912 Ha. **Balance Land to be acquired = 17.099 Ha.**
TOTAL CIVIL COST (RS.)	:	-	**Package – IVB** Rs. 116.82 Cr. (Rs. 10.59 Cr/km)

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1.6 COST ESTIMATES

For arriving at the unit rate, Schedule of Rate-2018 of Manipur Public Work Department has been adopted. The analysis of rate based on "Standard Data Book", published by ministry of road transport and highways, Government of India (MoRT&H). Leads for various materials considered for the rate analysis, are given in Table below:

TABLE 1.2: LEADS FOR VARIOUS CONSTRUCTION MATERIALS (PACKAGE – IV B)

Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	length of Project Road (Km)	Total Lead (Km)
1	Sand (Fine)	Tuivai River	1	17	18
2	Filling Material	Local	-	-	10
3	Stone Metal	Tuivai River	1	17	18
4	Stone Boulder	Tuivai River	1	17	18
5	Stone Chips, Aggregate	Tuivai River	1	17	18
6	Coarse Sand	Tuivai River	1	17	18
7	Cement	Imphal	189	17	206
8	Steel	Imphal	189	17	206
9	Bitumen	Imphal	189	17	206
10	Bitumen Emulsion	Imphal	189	17	206
11	Structural Steel	Imphal	189	17	206
12	RCC Pipe	Imphal	189	17	206

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ABSTRACT OF COST ESTIMATE

Package – IV B

Length of Road (KM) : 11.029

DESCRIPTION OF WORKS		TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	% of Cost of Civil Works (% of C)
A.	**ROAD WORKS**			
1	Site Clearance and Dismantling	0.41	0.04	0.35%
2	Earth work ,Subgrade and Erosion control	21.13	1.92	18.09%
3	Sub-Base & Base	20.53	1.86	17.57%
4	Bituminous Courses	11.82	1.07	10.12%
5	Traffic signs, Road marking & other road appurtenances	3.20	0.29	2.74%
	Drainage and Protective Works			
6	Longitudinal Drains	3.73	0.34	3.19%
7	Retaining wall	20.40	1.85	17.46%
8	Breast wall	9.30	0.84	7.96%
9	Toe Wall	0.65	0.06	0.56%
B.	**BRIDGES & CULVERTS**			
10	Culvert	11.84	1.07	10.14%
11	Major Bridges	13.81	1.25	11.82%
C.	**COST OF CIVIL WORKS IN CRORES (AS PER SOR 2018)**	**116.82**	**10.59**	
D.	Maintenance for 5 years, i.e 2.5% on civil cost (C)	2.92		
E.	GST @ 12% of (C)	14.02		
F.	Contingencies @ 2.8% over Civil Cost (C)	3.27		
G.	Supervision Charges @ 3% of (C)	3.50		
H.	Agency Charges @3% of (C)	3.50		
I.	Escalation Cost @ 10% during Construction Period	11.68		
J.	**TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J**	**155.71**	**14.12**	
K.	**DEPARTMENTAL COST ***			
a.	LA Cost	9.20		
b.	R&R Cost	0.00		
c.	Utility Shifting(Electrical +PHE)	1.17		
d.	Environmental Budget +FC Clearance	11.68		
L.	**Sub Total (K)**	**22.05**		
M.	**TOTAL CAPITAL COST (K+L)=M**	**177.76**	**16.12**	
*** Cost of LA, R&R, Utility Shifting and Forest Clearance are tentative. However, concerned Departmental Cost is awaited.**				

1.7 FINANCIAL ANALYSIS

The project fails to generate the desired level of return, even with a grant of 40% on TPC.

Thus the project does not qualify to be implemented on the BOT - Toll mode. It's recommended that the project to be implemented through EPC mode.

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CHAPTER – 2
INTRODUCTION

2.1 INTRODUCTION& BACKGROUND

THE STATE

Manipur is one of the Border States in the northeastern part of the country having an international boundary of about 352km long stretch of land with Myanmar in the southeast. It is bounded by Nagaland in the north, Assam in the west and Mizoram in the south. It has a total area of 22,327 sqkm. It lies between 23.8°N to 25.7°N latitude and 93.5°E to 94.8°E longitude.

Geographically, the state of Manipur could be divided into two regions, viz. the hill and the valley. The valley lies in the central part of the state and the hills surround the valley. The average elevation of the valley is about 790m above the sea level and that of the hills is between 1500m and 1800m. The hill region comprises of ten districts viz. Senapati, Kangpokpi, Tamenglong, Noney, Churachandpur, Pherzawl, Chandel, Tengnoupal, Ukhrul, Kamjong and the valley region consists of six districts, viz. Imphal East, Imphal West, Thoubal, Jiribam, Kakching and Bishnupur. The hill districts occupy about 90 percent (20,089 sq. km.) of the total area of the state and the valley occupies only about tenth (2,238 sq. km) of the total area of the state.

THE ECONOMY

Manipur has a literacy rate of 79.21% (According to 2011 census) per cent. The main languages of the state are Meitei/Meeteilon (Manipuri), Tangkhul, Kabui Kuki, Hmar, Paite, Thadou, Bishnupriya Manipuri, English, Hindi and local dialects. There are forests of teak, pine, oak, uningthou, leihao, bamboo, and cane. Rubber, tea, coffee, and cardamom are grown in hill areas. Rice and cash crops make up the main vegetation cover in the valley. Agriculture is the main mode of living of the people. People of Manipur are also engaged in handloom sector which is the largest cottage industry in Manipur. The main vegetables and fruits are Cauliflower, Cabbage, Tomato, Pea & Litchi, cashew nuts, walnuts, orange, lemon, pineapple, papaya, peach, pear, banana and plum. The major minerals are Limestone, Asbestos, Copper, Lignite, Nickel, Chromites, and Salts etc. Small industries like Handlooms, Handicrafts, Sericulture, Food Processing, Bamboo Processing, IT, Hydro Power and Tourism are present in the state.

THE ENVIRONMENT

The climate of Manipur is largely influenced by the topography of this hilly region. Lying 790 meters above sea level, Manipur is wedged among hills on all sides. This northeastern corner of India enjoys a generally amiable climate, though the winters can be a chilly. The maximum temperature in the summer months is 32 °C (90 °F). In winter the temperature often falls below 0 °C (32 °F), bringing frost. Snow sometimes falls in hilly regions due to the Western Disturbance. The coldest month is January, and the warmest July.

The state is drenched in rains from May until mid-October. It receives an average annual rainfall of 1,467.5 millimeters (57.78 in). Rain distribution varies from 933 millimeters (36.7 in) in Imphal to 2,593 millimeters (102.1 in) in Tamenglong. The precipitation ranges from light drizzle to heavy downpour. The normal rainfall of Manipur enriches the soil and helps in agriculture and irrigation. The South Westerly Monsoon picks up moisture from the Bay of Bengal and heads toward Manipur, hits the eastern Himalaya ranges and produces a massive amount of rain. The climate is salubrious

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with approximate average annual rainfall varying from 933 millimeters (36.7 in) at Imphal to 2,593 millimeters (102.1 in) at Tamenglong. The temperature ranges from sub 0 to 36 °C (32 to 97 °F).

POVERTY

As per the estimates, Manipur saw the highest rise of 9.2 percentage points in poverty between 2004-05 and 2009-10, followed by Mizoram (5.7 percentage points), Assam (3.5 percentage points) and Meghalaya (1 percentage point).

INDIGENOUS PEOPLE

The Meitei constitute a majority of the state's population. According to 1891 census Meitei were recorded as a forest tribe. In 1901 Meitei were listed as main tribe of Manipur. They live primarily in the state's valley region.

Besides the Meitei people, the Thadous have the second highest percentage of the population. The third is the Nagas who are further sub-divided into sub-tribes: Tangkhul,Maram, Poumai Naga, Sumi, Angami, Ao, Chakhesang, Chang, Khiamniungan, Konyak, Liangmai, Lotha, Pochury, Rongmei, Zeme, and Mao.

Different tribes are speaking in different language. These language are Meitei/Meeteilon (Manipuri), Tangkhul, Kabui Kuki, Hmar, Paite, Thadou , Bishnupriya Manipuri, English, Hindi and local dialects.

HIV/AIDS & HUMAN TRAFFICKING RISKS

Two out of the six high HIV-prevalence states in India – Manipur and Nagaland – are in the Northeast and now feature what epidemiologists call a 'generalized' epidemic with a strong IDU-HIV link. This is a larger challenge for Government and NGOs fighting the epidemic in the region in particular and the world at large.

According to estimates by the National Aids Control Organization (NACO – 2006) there are 50,000 IDUs injecting drug use in the region, the majority of them in Manipur, Nagaland, Mizoram and, of late, Meghalaya. Easy availability of drugs, stress arising from socio-political unrest and frustration born of the lack of employment opportunities for the growing educated youth mass in the region are often cited as the major causes of drug use a serious social disease.

2.2 SOCIAL ASSESSMENT

OBJECTIVE

The objective of Social Assessment report is to present a socio-economic profile of the subproject area with particular reference to indigenous people, communicable diseases especially HIV/AIDS, human trafficking, poverty level, local economy like agriculture, industry, health and educational status in accordance with guidelines and recommendations of Government of India and the State Government of Manipur in association with especially National Highways & Infrastructure Development Corporation Limited (NHIDCL).

PROJECT ROAD

The project road starts from junction of NH-150 at New Lamka town in Churachandpur and ends near Manipur and Mizoram state boder at Tuivai under Churachandpur District. The existing length of the project road is 161.349 km.

The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E.

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PROJECT DESCRIPTION

The project road lies in Churachandpur district of Manipur. Major portion of the project road passes through mountainous terrain with remaining portion located in plain terrain. This Road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and ends at Tuivai.

PROJECT IMPACT AREA

The Project Impact Area (PIA) has been defined as the 2.5 km width of a band on both sides of the project road. In broad sense the PIA may be considered as Churachandpur district as a whole.

From Starting at New Lamka Town at Churachandpur (junction of NH 150) the road alignment passes through the Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and ends at Tuivai in the State of Manipur. The project road passes through about 41 nos. of villages. Though majority the area is not passing through any densely populated settlement, still the strip of land acquisition will affect road side properties.

THE PROJECT DISTRICTS

The project road passes through Churachandpur district of Manipur. Brief features of the district are summarized below:

CHURACHANDPUR DISTRICT

Churachandpur District, in the southwestern corner of Manipur, has an area of 4,570 sq. km. The district got its name "Churachandpur" from the Manipur king Churachand Maharaja. It is bounded by North latitudes $23^0$56'20.4"and $24^0$36'46.8"and East longitudes $92^0$58'12''& $93^0$52'58.8''. It is a hilly district with a very small percentage of the plain area. The district is bounded by Senapati district in the north, Bishnupur and Chandel districts in the east, Assam and Mizoram in the west and Myanmar on the south. The total population of the district as per 2011 census is 2,71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung.

VITAL STATISTICS OF CHURACHANDPUR DISTRICTS

Description	Number (Census 2011)
Actual Population	274,143
Male	138,820
Female	135,323
Population Growth	20.29%
Area Sq. Km	4,570
Density/km2	60
Proportion to Manipur Population	9.60%
Sex Ratio (Per 1000)	975
Child Sex Ratio (0-6 Age)	948
Average Literacy	82.78
Male Literacy	86.97
Female Literacy	78.5
Total Child Population (0-6 Age)	37,445
Male Population (0-6 Age)	19,227
Female Population (0-6 Age)	18,218
Literates	195,935
Male Literates	104,013

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Description	Number (Census 2011)
Female Literates	91,922
Child Proportion (0-6 Age)	13.66%
Boys Proportion (0-6 Age)	13.85%
Girls Proportion (0-6 Age)	13.46%

MAJOR INDICATORS OF THE SOCIAL PARAMETERS OF THE DISTRICT

1. Geography			
(i)Temperature	Maximum: 37^0C	Minimum: 10^0C	
(ii)Location	Latitude: $23^0$56'20.4"N-$24^0$36'46.8"N	Longitude: $92^0$58'12"E-$93^0$52'58.8"E	
(v)Rainfall	The average rainfall recorded in Churachandpur district is from 3080 mm to 597 mm.		
2. Administrative Units			
i. Sub Divisions	5 Nos.		
ii. Revenue Villages	540 Nos.		
iii. Assembly Area	6 Nos.		
3. Assembly Constituencies			
(i) 55-Tipaimukh			
(ii) 56-Thanlon			
(iii) 57-Henglep			
(iv) 58-Churachandpur			
(v) 59-Saikot			
(vi) 60-Singhat			
4. People			
i. Population as per 2011 census	Male: 1,53,421 Female: 1,17,853 Total: 2,71,274		
ii. Literacy Rate as per 2011 census	Male: 86.97% Female: 78.50% Average: 82.78%		
5. Area	4,570 Square km		
6. Forest	4,157 Square km		
7. Roads			
a) National Highway	2010-11	270 km	
b) State Highway	2010-11	58 km	
c) Major District & Rural Roads	2010-11	179.50 km	
d) Other District & Rural Roads	2010-11	20 km	
e) Rural Road/Agriculture Marketing Board Roads	2010-11	175 km	
f) Kachacha Road	2010-11	340 km	

INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)

Indigenous People Development Plan (IPDP) is an integral part of the Social, Economic and Resettlement Plan of any of the infrastructural projects taken up by the authorities when a considerable number Schedule Tribe population is affected or displaced from their natural habitat. IPDP is also required if after the completion of the project there would be substantial change in the region which might affect the traditional customary right over land of the tribal people or alter their lifestyle in such a manner that they are uprooted or not in a position to follow their tradition, culture or profess their customs or religion.

THE MITIGATION MEASURES OF HIV/AIDS & HUMAN TRAFFICKING RISKS

Awareness campaign should be conducted at regular intervals in the PIA and the road construction sites. Distribution of IEC materials, organizing audiovisual shows and street drama giving a proper idea of the menace of the disease should be undertaken by some reputed NGOs.

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Village quacks and ANMs to be trained in detecting and responding to cases of HIV/AIDS at initial level. There should facility at PHCs / referral hospital preferably within PIA to detect the infected persons early.

Counseling by NGOs to be given free of charges to the poor migrating families to create awareness against possible spread of HIV/AIDS outside the area.

THE GENDER ISSUE

Along with men in the Project areas, women will benefit from (i) easier access to markets, (ii) increased local retailing opportunities, and (iii) easier access to health care centers and education facilities as well. Women may also benefit more than men from the increased access to schools and health centers.

2.3 PROJECT ROAD BENEFIT

Project Road strategically inter connects with state capital Imphal via NH-150. The development of the road as per 2-lane with hard shoulder can boost the agricultural and industrial development of the surrounding area which can be viewed as boosting economic growth and poverty reduction, bringing substantial social and economic development in the region.

The social benefits arising due to the project will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, workplace etc which in turn increases the income of the locals, and ultimately elevating their standard of living. The possible direct and indirect positive impacts of the project are listed below.

- Road network will not only link the village communities to better national markets, but also open up wider work opportunities in distant places. People can shuttle to distant worksites and engage in construction, mining, factories, business as well as domestic works.
- The immediate benefits of road construction and improvement will come in the form of direct employment opportunities for the roadside communities and specially those who are engaged as wage labourers, petty contractors and suppliers of raw materials.
- Effective drainage system to ensure that there will be no pooling of water
- Safety measures for Highway signs, Pavement marking, Traffic signals, Truck lay byes, Bus stops and Bus bays
- Rectification of geometric deficiencies (both Horizontal & Vertical).
- Slope protection.
- Provision of crash barrier at Bridge approaches.
- Improvement of all Major and Minor Intersections.
- Facilities for public amenities such as Restrooms, Telephone booths, Toilets, shops and Trauma Centres.

Other benefits:

- It will give a major fillip to the quest for all weather connectivity.
- It will reduce travel time between towns and cities by 50% to 60%.
- It will enhance the spirit of enterprise.
- Help the locals to ply their trade.
- Provide direct employment in road construction and allied activities.

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- ❖ Lower accident and provide quick accessibility to services like hospital, market, office etc.
- ❖ Will help in growth of tourism activities immensely.

2.4 Overview of NHIDCL Organization & Activities

National Highways and Infrastructure Development Corporation is a fully owned company of the Ministry of Road Transport & Highways, Government of India. The company promotes, surveys, establishes, designs, builds, operates, maintains and upgrades National Highways and Strategic Roads including interconnecting roads in parts of the country which share international boundaries with neighboring countries. The regional connectivity so enhanced would promote cross border trade and commerce and help safeguard India's international borders. This would lead to the formation of a more integrated and economically consolidated South and South East Asia. In addition, there would be overall economic benefits for the local population and help integrate the peripheral areas with the mainstream in a more robust manner. An approximate aggregate length of 10,000 kms has been identified to begin with for development through this company. The company envisages creating customized and specialized skills in terms of addressing issues like complexities of geographical terrains and addressing extensive coordination requirements with security agencies. The company would also endeavor to undertake infrastructure projects including but not restricted to urban infrastructure and urban or city transport and to act as an agency for development of all types of Infrastructure. The company envisages working towards cross sharing of technical know-how and enhancing opportunities for business development with other nations and their agencies including the multilateral organizations and institutions.

The company also proposes to improve road connectivity and efficiency of the international trade corridor, by expanding about 500 KMs of roads in the North Bengal and Northeastern region of India to enable efficient and safe transport regionally with other South Asia Sub-regional economic Cooperation (SASEC) member countries. These projects are being funded by ADB (Asian Development Bank).

Mission of NHIDCL

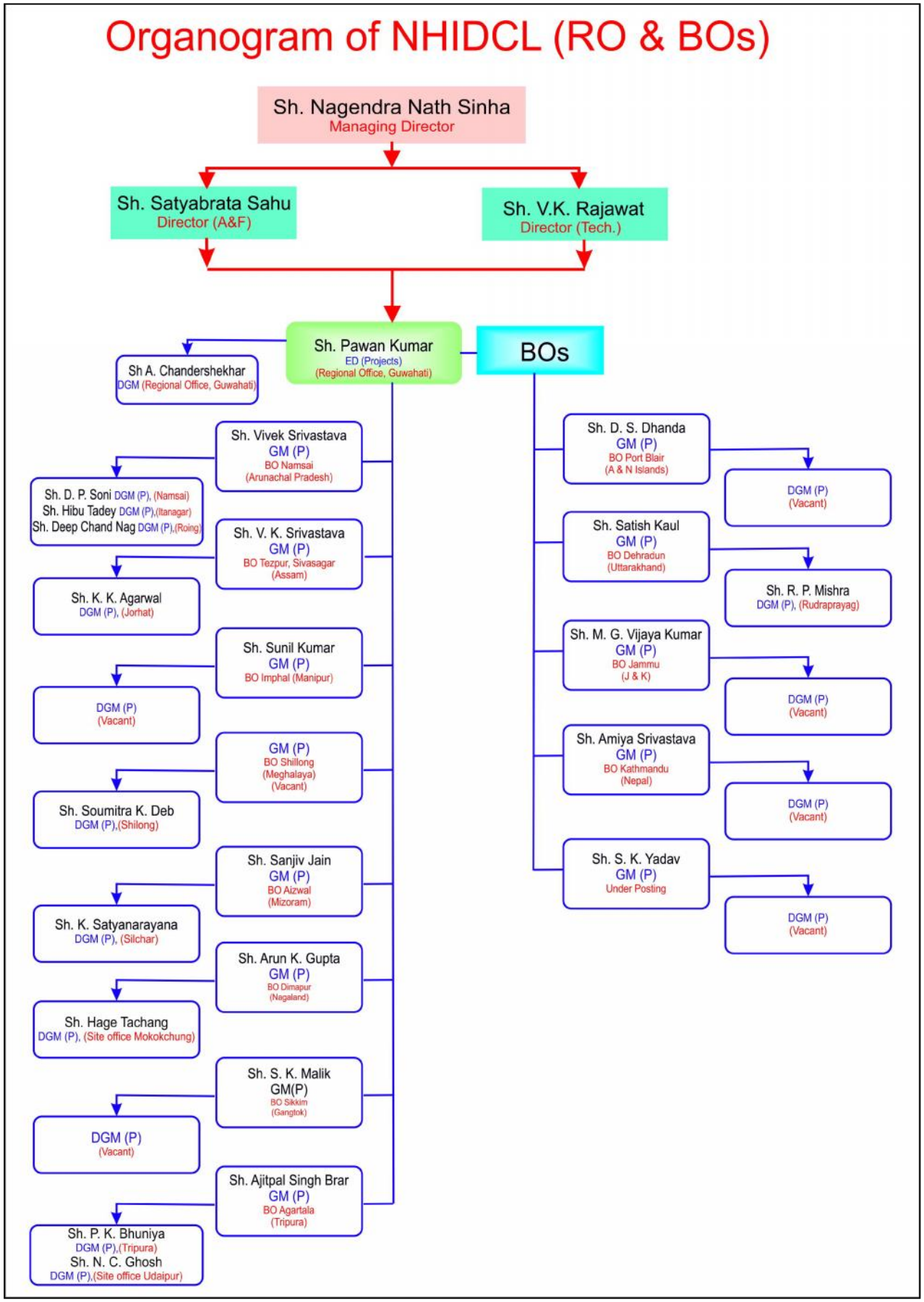
To be a professional company which works in most efficient and transparent manner and designs, develops & **delivers** infrastructure projects in a time bound basis for maximizing benefits to all stakeholders.

Vision of NHIDCL

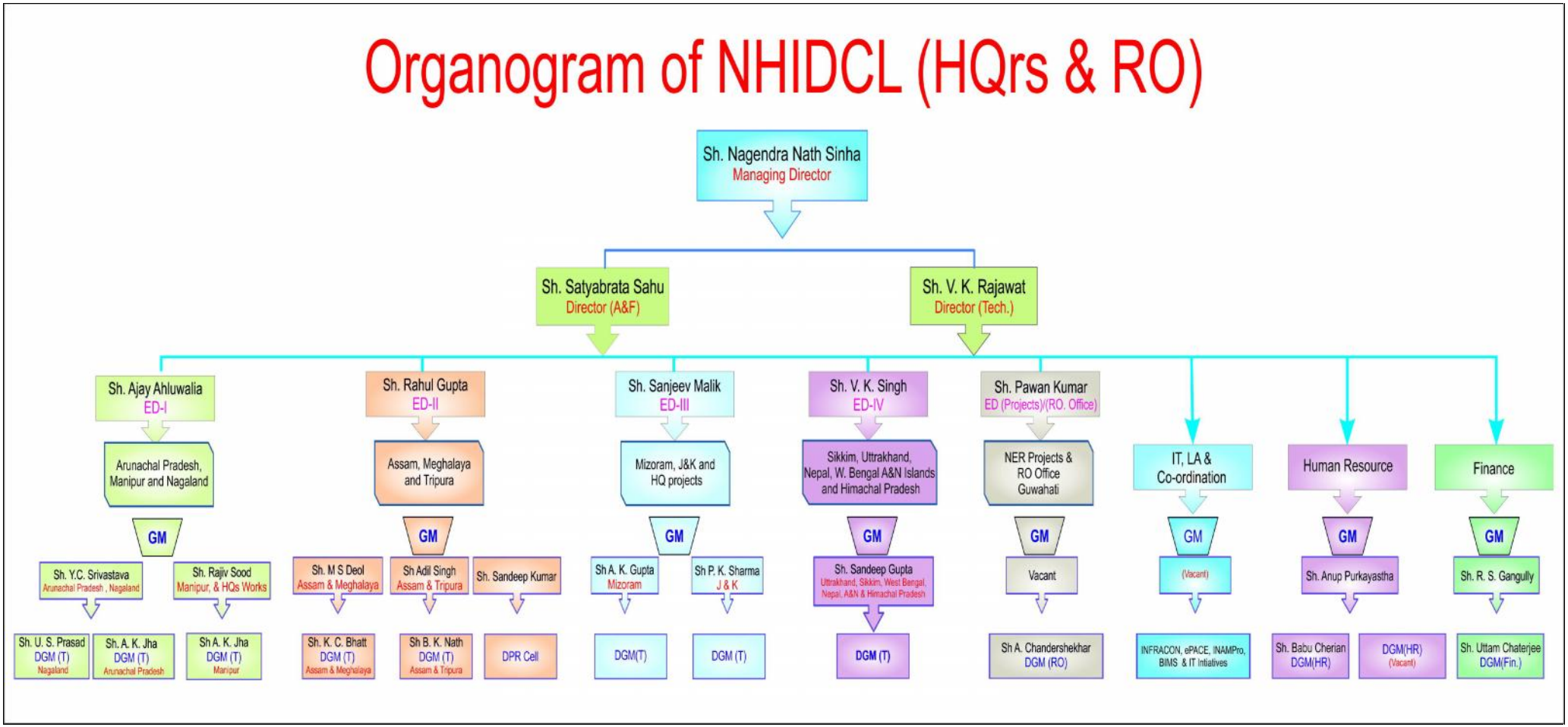
To be an instrument for creation and management of infrastructure of the highest standard in the country with focus on the North East and Border areas and contribute significantly towards nation building.

Organizational Structure of NHIDCL is given below:

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2.5 Objective

The main objective of the consultancy service is to establish the technical, economical, and financial viability of the project and prepare detailed project reports for rehabilitation and upgrading of the existing road to 2-Lane configuration.

The viability of the project shall be established taking into account the requirements with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, rehabilitation and widening of existing and/or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis.

The Detailed Project Report would inter-alia include detailed highway design, design of pavement and overlay with options for flexible or rigid pavements, design of bridges and cross drainage structures and grade separated structures, design of service roads, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social feasibility, social and environmental action plans as appropriate and documents required for tendering the project on commercial basis for international / local competitive bidding.

Preparation of detailed project should incorporate aspects of value engineering, quality audit and safety audit requirement in design and implementation.

Feasibility Report, clearly bring out through financial analysis the preferred mode of implementation on which the Civil Works for the stretches are to be taken up. Cost estimates along with feasibility report/detailed Project Report should be given.

2.6 Scope of Consultancy Services

The broad area of scope of consultancy services is highlighted below:

- As far as possible, the widening/improvement work of 2 lane proposal shall be within the existing right of way avoiding land acquisition, with the provision of bypasses wherever in urban areas and improvement to 2 lanes of the existing road is not possible. As will be required proposal for land acquisition to be taken up as per revenue records/maps for further processing of land acquisition.
- Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out as per the requirement and suggestion of NHIDCL.
- Preparation of the bid documents including required schedules preferably for EPC mode of documents. To assist the NHIDCL and its Financial Consultant and the Legal Adviser by furnishing clarifications as required for the financial appraisal and legal scrutiny of the Project Highway and Bid Documents.
- Review of all available reports and published information about the project road and the project influence area;
- Environmental and social impact assessment, including such as related to cultural properties, natural habitats, Involuntary resettlement etc.;
- Public consultation, including consultation with Communities located along the road, NGOs working in the area, other stake-holders and relevant Govt. departments at all the different stages of assignment (such as inception stage, feasibility stage, preliminary design stage and once final design are concretized).
- Detailed reconnaissance & reflection in the report;
- Identification of possible improvements in the existing alignment and bypassing congested locations with alternatives, evaluation of different alternatives comparison on techno-economic and other considerations and recommendations regarding most appropriate option;

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- Traffic studies including traffic surveys, Axle load survey and demand forecasting for next thirty years;
- Inventory and condition surveys for road;
- Inventory and condition surveys for bridges, cross-drainage structures, other structures, river bank training/protection works and drainage provisions;
- Detailed topographic surveys using mobile/aerial LiDAR or equivalent technology;
- Pavement investigations;
- Sub-grade characteristics and strength; investigation of required sub-grade and sub-soil characteristics and strength for road and embankment design all sub soil investigation;
- Identification of sources of construction materials;
- Detailed design of road, its x-sections, horizontal and vertical alignment and design of embankment of height more than 6m and also in poor soil conditions and where density consideration require, even lesser height embankment. Detailed design of structures preparation of GAD and construction drawings and cross-drainage structures and underpasses etc.
- Identification of the type and the design of intersections;
- Design of complete drainage system and disposal point for storm water.
- Value analysis / value engineering and project costing;
- Economic and financial analyses;
- Contract packaging and implementation schedule;
- Strip plan indicating the scheme for carriageway widening, location of all existing utility services (both over and underground) and the scheme for their relocation, trees to be felled, reports documents and drawings arrangement of estimates for cutting of trees and shifting of utilities from the concerned department;
- To find out financial viability of project for implementation and suggest the preferred mode on which the project is to be taken up.
- Preparation of detailed project report, cost estimate, approved for construction drawings, rate analysis, detailed bill of quantities, bid documents for execution of civil works through budgeting resources;
- Design of toll plaza and identification of their numbers and location and office cum residential complex including working drawings;
- Design of weighing stations, parking areas and rest areas;
- Any other user oriented facility en-route toll facility;
- Tie-in of on-going/sanctioned works of MORT&H/NHAI/other agencies;

Preparation of social plans for the project affected people as per policy of the lending agencies/Govt. of India R & R policy.

2.7 Stages of Submission

The project mainly comprises of 4 Stages from QAP/IR to DPR,

STAGE 1: Inception Report

STAGE 2: Feasibility Report

STAGE 3: LA & Clearances I Report

STAGE 4: Detailed Project Report (DPR)

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2.8 Structure of Report

Detailed Project Report (DPR) consists of following volumes:

Volume – I: Main Report

- Chapter -1 :Executive Summary
- Chapter -2 : Introduction
- Chapter -3 : Project Description
- Chapter -4 : Engineering Surveys, Investigation and Analysis
- Chapter -5 : Social Analysis
- Chapter -6 : Traffic Surveys & Analysis
- Chapter -7 : Indicative Design Standards
- Chapter- 8: Cost Estimates
- Chapter -9 : Environmental Screening
- Chapter -10 : Road Safety Audit
- Chapter -11 : Financial Analysis
- Chapter -12 : Conclusions & Recommendations

Volume – IA: Appendix to Main Report

- Appendix-3.1: Road Inventory Survey
- Appendix-3.2 : Pavement Condition Survey
- Appendix-3.3 : Culvert Inventory Survey
- Appendix-3.4 : Bridge Inventory Survey
- Appendix-3.5 : List of TBM & GPS Point
- Appendix-6.1 : Classified Traffic Volume Count
- Appendix-6.2 : Turning Movement Count Survey
- Appendix-6.3: Axle Load Survey
- Appendix-6.4: Origin-Destination Survey
- Appendix-6.5: Pedestrian Count Survey
- Appendix-6.6: Speed Delay Survey

Volume – II: Design Report
(Part A: Road Works
Part B: Structure Works)
Volume – III: Materials Report
Volume – IV: Environmental Assessment Report including EMP and RAP
Volume – V: Technical Specification
Volume – VI: Rate Analysis
Volume – VII: Cost Estimates
Volume – VIII: Bill of Quantities
Volume – IX: Drawing Volume
Part A: Road Works
Part B: Bridge Works
Part C: Detailed Cross-sections

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CHAPTER-3
PROJECT DESCRIPTION

3.1 EXISTING SCENARIO

3.1.1 START AND END POINT OF THE PROJECT ROAD

The name of the road as per offer and agreement is Churachandpur - Tuivai section of NH-102B starting from the junction of NH-150 (old NH-2) at New Lamka town at Churachandpur and ends near Manipur and Mizoram state border at Tuivai in the state of Manipur. The project road lies under Churachandpur district in the state of Manipur. The length of the road comes out 161.349 km (As per Topography Survey). The Project Road starts from Churachandpur and passes through major habitation Churachandpur, New Lamka, Singngat, Suangdoh and Sinzawl Village.



Origin Point at Churachandpur
(Ch. 0.000 km)



Terminating Point at Tuivai
(Ch. 161.349 km)

3.1.2 SETTLEMENT

The existing Road passes through village / localities namely Sinzawl and Tuivai. Details are given below (all marked locations are major settlement) in Table 3.1:

TABLE 3.1: DETAILS OF SETTLEMENT/HABITATIONAL AREA

Sl. No.	Chainage		Length (m)	Name of the Village/ Town
	From (km)	To (km)		
Package - IV B				
1	149.630	150.500	0.870	Sinzawl
2	161.290	161.440	0.150	Tuivai
Total Length of Habitation = 1.020 Km.				

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Habitation Area

3.1.3 LAND USE PATTERN

The project is located in the moderately high rainfall area with majority of the stretch passing through settlement area and forest area (90% stretch of the road length) in which 48% of the road length is passing through Eco-Sensitive Zone of Kailam Wildlife Sanctuary area. Remaining portion of the road stretch is passing through some settlement area. Details are given in Appendix to main report.

TABLE 3.2: DETAILS OF LAND USE

From (km)	To (km)	Terrain (Plain/Rolling/Hilly)	Land Use (Built-up/Agrt/Forest/ Industrial/Barren)
Package-IV B			
149.635	150.000	Hilly	Forest LHS=valley RHS=Hill
149.000	150.000	Hilly	Forest LHS=valley RHS=Hill
150.000	154.000	Hilly	Forest (LHS=Hilly RHS=valley)
154.000	155.000	Hilly	Forest LHS=valley RHS=Hill
155.000	161.440	Hilly	Forest (LHS=Hilly RHS=valley)

3.1.4 RIGHT OF WAY (ROW)

The existing ROW varies from 4 m to 26 m for Churachandpur-Tuivai Road. This existing ROW is not sufficient to accommodate proposed 2-lanning proposal. Therefore additional land has to be acquired

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for implementing the improvement proposal. Details of existing ROW width of the section has been given below in Table 3.3.

TABLE 3.3: DETAILS OF EROW

Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
Package – IV B			
149.630	4.0	2.7	6.7
149.700	3.7	2.4	6.1
149.800	3.1	2.5	5.6
149.900	3.5	3.3	6.8
150.000	3.3	2.2	5.5
150.100	3.9	2.1	6.1
150.200	3.5	1.9	5.4
150.300	4.6	4.0	8.6
150.400	3.2	3.1	6.3
150.500	3.7	3.0	6.7
150.600	4.4	3.3	7.7
150.700	4.2	3.1	7.3
150.800	4.9	2.5	7.5
150.900	2.8	2.3	5.1
151.000	3.8	3.2	7.1
151.100	3.6	3.6	7.2
151.200	6.2	3.6	9.9
151.300	5.9	3.0	8.9
151.400	7.1	2.5	9.7
151.500	5.2	3.6	8.8
151.600	3.9	2.5	6.4
151.700	4.0	3.5	7.5
151.800	5.0	2.9	7.9
151.900	4.5	3.5	7.9
152.000	3.7	2.8	6.5
152.100	3.3	3.1	6.4
152.200	3.3	3.0	6.3
152.300	3.5	3.1	6.6
152.400	4.4	4.0	8.5
152.500	5.1	3.3	8.4
152.600	4.5	3.2	7.7
152.700	4.6	3.3	7.9
152.800	5.3	3.1	8.4
152.900	3.2	3.0	6.2
153.000	2.9	4.5	7.3
153.100	3.2	3.5	6.8
153.200	4.4	4.0	8.4
153.300	4.3	5.0	9.2
153.400	3.7	4.3	8.0
153.500	3.3	5.1	8.4
153.600	4.3	3.6	7.9

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Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
153.700	4.0	4.9	8.9
153.800	3.6	5.4	9.0
153.900	3.3	5.1	8.4
154.000	4.4	4.4	8.8
154.100	2.6	3.4	6.0
154.200	2.8	3.5	6.3
154.300	3.2	3.7	6.9
154.400	3.9	2.9	6.8
154.500	3.4	3.2	6.5
154.600	4.8	2.5	7.3
154.700	4.2	2.7	6.9
154.800	6.3	1.7	8.0
154.900	5.5	2.7	8.1
155.000	6.5	3.3	9.9
155.100	4.1	2.2	6.3
155.200	4.0	2.8	6.7
155.300	4.4	3.8	8.2
155.400	6.2	2.3	8.5
155.500	3.9	2.6	6.6
155.600	3.2	2.9	6.1
155.700	4.1	4.0	8.1
155.800	4.7	3.8	8.5
155.900	4.7	3.4	8.1
156.000	5.0	3.6	8.6
156.100	4.6	2.7	7.4
156.200	7.6	2.6	10.2
156.300	4.5	2.7	7.2
156.400	3.8	3.1	7.0
156.500	4.0	3.1	7.1
156.600	4.6	4.0	8.6
156.700	4.6	4.1	8.8
156.800	5.2	4.4	9.6
156.900	2.4	2.1	4.5
157.000	3.9	3.5	7.4
157.100	5.0	3.4	8.5
157.200	5.1	3.1	8.2
157.300	4.1	2.8	6.9
157.400	2.9	2.1	5.0
157.500	5.5	3.0	8.4
157.600	2.8	2.5	5.2
157.700	4.7	3.4	8.1
157.800	4.2	2.7	6.9
157.900	4.9	4.6	9.4
158.000	4.3	3.5	7.8
158.100	6.1	4.3	10.4
158.200	4.8	2.5	7.3

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Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
158.300	3.6	2.9	6.5
158.400	4.8	3.1	7.8
158.500	5.2	3.1	8.3
158.600	4.2	3.4	7.6
158.700	4.9	4.0	9.0
158.800	3.2	5.5	8.7
158.900	5.0	3.9	8.8
159.000	4.1	2.6	6.7
159.100	5.7	2.7	8.5
159.200	4.1	2.6	6.8
159.300	3.5	3.4	6.9
159.400	4.4	3.5	7.9
159.500	3.6	5.2	8.7
159.600	5.1	3.6	8.7
159.700	4.3	3.0	7.4
159.800	4.0	3.9	8.0
159.900	4.3	2.6	6.9
160.000	3.2	3.5	6.7
160.100	4.6	2.4	7.0
160.200	3.8	2.7	6.5
160.300	4.5	3.6	8.1
160.400	6.8	2.9	9.7
160.500	5.5	3.1	8.6
160.600	5.8	3.9	9.7
160.700	3.7	2.7	6.4
160.800	3.4	2.0	5.3
160.900	4.1	3.0	7.2
161.000	2.9	3.4	6.3
161.100	4.2	3.1	7.3
161.200	4.3	2.8	7.1
161.300	4.5	2.4	6.9

3.1.5 EXISTING ALIGNMENT

The horizontal alignment of the existing road consists of sub-standard sharp curves including zigzag curves and hair-pin bends. Also, there is no proper transition length for most of the horizontal curves including the zigzag ones require to be providing for super elevation. These deficiencies have been corrected during fixation of the horizontal alignment for the entire project road to conform to MoRT&H standards. The deficiency in gradient is also observed in case of vertical alignment of the existing road . Location of sharp/Blind curves and hairpin bends listed in Table 3.4.

TABLE 3.4: LOCATION OF SHARP/BLIND CURVES AND HAIRPIN BENDS

Type of Curves	From (km)	To (km)
Sharp Curves/	155.300	161.000
Hair - Pin Bends	149.630	151.000

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3.1.6 EXISTING PAVEMENT

The existing road is mostly Intermediate/two Lane with earthen shoulder. The carriageway width of the existing road varies from 3.0 – 12.0 meter. Width of earthen shoulder varies from 0.50 – 2.0 meter. Hence, total formation width varies from 4.00 – 14.00 meter. Variation of road width is given below in Table 3.5:

TABLE 3.5: VARIATION OF EARTHEN ROAD WIDTH

Chainage		Average Carriageway Width (m)
From (km)	To (km)	
149.630	161.440	3.5

During topographic survey, it has been observed that restoration work was going on to improve present condition of the road. Details of restoration works are given below in Table 3.6

TABLE 3.6: DETAILS OF RESTORATION WORKS

Chainage		Length (Km)
From (km)	To (km)	
149.630	161.440	11.029

3.1.7 EXISTING JUNCTION

There are no. junction in the project stretches. Details of junctions are given below in Table 3.8:

TABLE 3.8: LIST OF MAJOR JUNCTIONS

Sl. No.	Chainage (Km)	Name of Intersection	Type of Intersection	Leads To
Package - IV B				
Nil				

3.1.8 EXISTING BRIDGES AND CULVERTS

BRIDGES:

There is 1 no. of major bridge (Steel Truss bridge) along the project stretch. Details are given in Table 3.9:

TABLE 3.9: DETAILS OF MINOR BRIDGES ALONG THE PROJECT ROAD

Sl. No.	Ext. Chainage (km)	Name of River/ Stream	Type of Bridge	Span Arrangement (Expansion joint to Expansion joint) (m)	Clear Roadway between kerbs (m)	Total outer to outer width of bridge
Package – IV B						
1	161.300	Tuivai River	Steel Truss Bridge **(Major Bridge)**	1x78.00	3.30	4.90

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Steel Truss Bridge

CULVERTS:

There are 611 nos. of existing culverts (including 345 nos. of Slab Culverts, 251 nos. of Pipe Culverts, 12 nos. of Box culverts and Type of 3 nos. of choked Culverts) on the project road. Details are given in Table 3.10.

TABLE 3.10: DETAILS OF CULVERTS ALONG THE PROJECT ROAD

Sl. No.	Survey Chainage (km)	Type of Structures (Pipe/ Slab/ Box/ Arch)	Span Arrangement (No. x Length) (M)	Carriageway Width (M)	Width of Culvert (M)
Package - IV B					
1	149.920	HP	1 X 0.9M		
2	150.040	HP	1 X 0.9M	3	2.5
3	150.233	HP	1 X1.0M	2.5	2.7
4	150.366	HP	1 X1.0M	2.7	3
5	150.621	HP	1 X1.0M	3.4	3.4
6	150.874	HP	1 X1.0M		
7	151.293	HP	1 X1.0M	3	3
8	151.373	HP	1 X 0.9M	2.5	3
9	151.429	HP	1 X1.0M	2.7	2.5
10	151.589	HP	1 X1.0M	3	2.7
11	151.812	HP	1 X 1.2M	3.4	2.5
12	152.422	HP	1 X 0.9M		
13	153.285	HP	1 X1.0M		
14	153.582	HP	1 X1.0M	3	3
15	154.075	HP	1 X 0.9M	3	2.5
16	154.413	HP	1 X 0.9M	2.5	2.7
17	154.763	HP	1 X 0.9M	2.7	3.4
18	154.802	RCC	1 X 2.6M	3.4	3.4
19	154.898	HP	1 X 1.2M	2.5	3
20	155.107	RCC	1 X 2.86M	3	3.4
21	155.270	HP	1 X 1.0M	2.5	2.7
22	155.400	HP	1 X 1.0M		
23	155.502	HP	1 X 1.0M	3	
24	155.580	HP	1 X 1.0M	2.7	3
25	155.646	HP	1 X 1.0M		
26	155.680	HP	1 X 1.0M	3.4	3.4
27	155.905	RCC	1 X 1.38M	3.4	3

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Sl. No.	Survey Chainage (km)	Type of Structures (Pipe/ Slab/ Box/ Arch)	Span Arrangement (No. x Length) (M)	Carriageway Width (M)	Width of Culvert (M)
28	156.030	HP	1 X 0.9M	3	3
29	156.199	HP	1 X 0.9M	2.5	2.7
30	156.233	HP	1 X 1.2M	2.7	3.4
31	156.328	HP	1 X 1.0M		
32	156.574	HP	1 X 0.9M	3.4	2.5
33	156.587	HP	1 X 1.2M	2.7	2.7
34	156.643	HP	1 X 0.9M	3	3
35	156.657	HP	1 X 0.9M	3.4	3
36	156.740	HP	1 X 0.9M		
37	156.835	HP	1 X 0.9M	3	3.4
38	157.111	HP	1 X 1.0M		
39	157.212	HP	1 X 1.0M	3	3
40	157.445	HP	1 X 1.0M	2.5	2.5
41	157.485	RCC	1 X 1.282M		
42	157.535	HP	1 X 1.5M	2.7	2.7
43	157.745	HP	1 X 1.0M	3.4	3
44	157.821	HP	1 X 1.0M	2.5	2.5
45	157.975	HP	1 X 1.0M	2.7	2.7
46	157.035	HP	1 X 1.0M	3	3
47	157.190	HP	1 X 1.0M	3.4	3.4
48	158.270	HP	1 X 1.0M		
49	158.395	HP	1 X 1.0M	3	3
50	158.565	HP	1 X 1.0M	3	
51	158.813	HP	1 X 1.0M		
52	159.018	HP	1 X 1.0M	2.5	3
53	159.475	HP	1 X 1.0M	2.7	2.5
54	159.660	HP	1 X 1.0M	3.4	
55	159.778	HP	1 X 1.0M	2.7	2.7
56	159.810	HP	1 X 1.0M	3	3
57	159.880	HP	1 X 1.0M	3.4	3.4
58	160.030	HP	1 X 1.0M	3	3
59	160.362	HP	1 X 1.0M	4.6	
60	160.392	RCC	1 X 4.22M	3	3
61	160.545	HP	1 X 1.0M	2.5	2.5
62	160.930	HP	1 X 1.0M	2.7	2.7

3.1.9 FOREST STRETCH

The proposed stretch of Package-IVB does not fall under protected wildlife area.

3.1.10 ROADWAY DRAINAGE

Side drains are present in the few stretches in the built up area & unlined drain is also present in few stretches in the hill side. So, most of the portion of the project road stretch is being affected by rain

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water and seepage water from hilly portion due to poor condition of existing side drains. Details of existing length of the drain are given below:

- Length of Earthen Drain = 11029 m (on hill side)

3.1.11 PHOTOGRAPH OF EXISTING ROAD

Photograph of existing road corridor is presented below.

EXISTING ROAD PHOTOGRAPH

	
Songtal Village (Ch. 134.500 km)	**Khuanggin Village (Ch. 136.500 km)**
	
Landslide (Ch. 134.873 km)	**Sinking Zone (Ch. 134.984 km)**

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HP Culvert (Ch. 148.698 km)	**Steel Truss Bridge (Ch. 161.665 km)**

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3.2 DEVELOPMENT PROPOSAL

3.2.1 GEOMETRICS DESIGN

HORIZONTAL ALIGNMENT

The horizontal alignment has been designed as per the design speed recommended for mountainous terrain (i.e. Ruling speed = 60 Kmph & Limiting speed = 40 Kmph) except for the starting 2 km stretch where design speed has been increased to 80 kmph due to presence of plain terrain. However, design speed has been reduced up to 20 kmph in case of hair pin bends as per guideline of the Road Manual. The total design length of the project road is 141.029 Km.

Details of Horizontal Alignment Report are given below in Table 3.11.

TABLE 3.11: HORIZONTAL ALIGNMENT REPORT

Package-IV (Ch. 118.850 km to Ch. 141.029 km)

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
Package- IV B													
						Straight	129994.9	130084	89.193				
						Transition	130084	130099		15			
1136	529843.6	2663039	32	19	06.92" Righ	Arc	130099	130112.2		13.203	50	5.6	20
						Transition	130112.2	130127.2		15			
						Straight	130127.2	130164.4	37.14				
						Transition	130164.4	130179.4		15			
1137	529796.8	2662969	102	10	26.59" Lef	Arc	130179.4	130200.1		20.665	20	7	20
						Transition	130200.1	130215.1		15			
						Straight	130215.1	130231.4	16.334				
						Transition	130231.4	130246.4		15			
1138	529845	2662937	15	41	49.04" Righ	Arc	130246.4	130247.8		1.438	60	6.7	30
						Transition	130247.8	130262.8		15			
						Straight	130262.8	130279.4	16.542				
						Transition	130279.4	130294.4		15			
1139	529884.7	2662893	108	50	54.04" Righ	Arc	130294.4	130317.4		22.995	20	7	20

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Transition	130317.4	130332.4		15			
						Straight	130332.4	130336	3.649				
						Transition	130336	130356		20			
1140	529838.2	2662863	42	10	41.00" Righ	Arc	130356	130365.5		9.446	40	6.9	20
						Transition	130365.5	130385.5		20			
						Straight	130385.5	130444.1	58.657				
						Transition	130444.1	130464.1		20			
1141	529713.5	2662894	39	56	35.61" Righ	Arc	130464.1	130513.8		49.714	100	7	40
						Transition	130513.8	130533.8		20			
						Straight	130533.8	130578.4	44.613				
						Transition	130578.4	130593.4		15			
1142	529638.3	2662983	71	58	40.17" Lef	Arc	130593.4	130616.1		22.688	30	5.9	20
						Transition	130616.1	130631.1		15			
						Straight	130631.1	130717.3	86.125				
						Transition	130717.3	130737.3		20			
1143	529449.3	2662916	80	4	23.79" Lef	Arc	130737.3	130857		119.754	100	7	40
						Transition	130857	130877		20			
						Straight	130877	130914.8	37.793				
						Transition	130914.8	130934.8		20			
1144	529464.8	2662769	13	34	55.50" Lef	Arc	130934.8	130938.5		3.705	100	7	40
						Transition	130938.5	130958.5		20			
						Straight	130958.5	131071.2	112.663				
						Transition	131071.2	131086.2		15			
1145	529523.1	2662602	114	27	49.11" Righ	Arc	131086.2	131131.1		44.933	30	5.9	20
						Transition	131131.1	131146.1		15			
						Straight	131146.1	131174.8	28.659				
						Transition	131174.8	131199.8		25			
1146	529423.4	2662601	31	59	16.70" Righ	Arc	131199.8	131208.3		8.498	60	7	30
						Transition	131208.3	131233.3		25			
						Straight	131233.3	131258.4	25.151				
						Transition	131258.4	131278.4		20			

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
1147	529335.5	2662648	94	10	12.81" Lef	Arc	131278.4	131324.2		45.743	40	6.9	20
						Transition	131324.2	131344.2		20			
						Straight	131344.2	131379.2	35.088				
						Transition	131379.2	131394.2		15			
1148	529279.8	2662565	22	56	58.84" Lef	Arc	131394.2	131403.3		9.033	60	6.7	30
						Transition	131403.3	131418.3		15			
						Straight	131418.3	131452.2	33.953				
						Transition	131452.2	131467.2		15			
1149	529270.9	2662495	22	44	12.09" Lef	Arc	131467.2	131472.1		4.842	50	5.6	20
						Transition	131472.1	131487.1		15			
						Straight	131487.1	131551.7	64.586				
						Transition	131551.7	131566.7		15			
1150	529292.7	2662387	112	44	36.27" Righ	Arc	131566.7	131591		24.355	20	7	20
						Transition	131591	131606		15			
						Straight	131606	131685.7	79.738				
						Transition	131685.7	131700.7		15			
1151	529146.5	2662391	105	44	23.41" Lef	Arc	131700.7	131741.1		40.365	30	5.9	20
						Transition	131741.1	131756.1		15			
						Straight	131756.1	131868.4	112.309				
						Transition	131868.4	131893.4		25			
1152	529161.4	2662195	75	52	27.98" Righ	Arc	131893.4	131934.6		41.213	50	7	30
						Transition	131934.6	131959.6		25			
						Straight	131959.6	132106	146.391				
						Transition	132106	132121		15			
1153	528963.6	2662096	114	0	21.53" Lef	Arc	132121	132145.8		24.796	20	7	20
						Transition	132145.8	132160.8		15			
						Straight	132160.8	132190.3	29.447				
						Transition	132190.3	132210.3		20			
1154	529017.1	2662032	45	6	31.10" Righ	Arc	132210.3	132221.8		11.492	40	6.9	20
						Transition	132221.8	132241.8		20			
						Straight	132241.8	132284.3	42.583				

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Transition	132284.3	132304.3		20			
1155	529019.3	2661936	50	36	42.48" Righ	Arc	132304.3	132319.7		15.334	40	6.9	20
						Transition	132319.7	132339.7		20			
						Straight	132339.7	132371.9	32.177				
						Transition	132371.9	132386.9		15			
1156	528958.5	2661880	14	35	23.72" Righ	Arc	132386.9	132403.7		16.83	125	5.7	40
						Transition	132403.7	132418.7		15			
						Straight	132418.7	132535.3	116.604				
						Transition	132535.3	132550.3		15			
1157	528815.2	2661809	23	30	52.71" Righ	Arc	132550.3	132559.9		9.624	60	6.7	30
						Transition	132559.9	132574.9		15			
						Straight	132574.9	132599.2	24.309				
						Transition	132599.2	132624.2		25			
1158	528728.5	2661795	87	44	53.80" Lef	Arc	132624.2	132660.5		36.26	40	7	30
						Transition	132660.5	132685.5		25			
						Straight	132685.5	132696	10.488				
						Transition	132696	132711		15			
1159	528719.3	2661720	26	35	12.44" Righ	Arc	132711	132723.8		12.842	60	6.7	30
						Transition	132723.8	132738.8		15			
						Straight	132738.8	132841.9	103.044				
						Transition	132841.9	132861.9		20			
1160	528653.9	2661585	21	40	21.58" Righ	Arc	132861.9	132872.1		10.261	80	6.8	30
						Transition	132872.1	132892.1		20			
						Straight	132892.1	133061	168.881				
						Transition	133061	133076		15			
1161	528496.9	2661441	9	12	03.66" Righ	Arc	133076	133085.1		9.088	150	4.7	40
						Transition	133085.1	133100.1		15			
						Straight	133100.1	133172.9	72.812				
						Transition	133172.9	133192.9		20			

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
1162	528350.9	2661336	79	39	34.00" Lef	Arc	133192.9	133311.9		119.032	100	7	40
						Transition	133311.9	133331.9		20			
						Straight	133331.9	133393.6	61.658				
						Transition	133393.6	133418.6		25			
1163	528414.6	2661138	96	39	08.84" Righ	Arc	133418.6	133477.9		59.345	50	7	30
						Transition	133477.9	133502.9		25			
						Straight	133502.9	133674.3	171.336				
						Transition	133674.3	133699.3		25			
1164	528135	2661035	97	12	25.42" Lef	Arc	133699.3	133776.1		76.795	60	7	30
						Transition	133776.1	133801.1		25			
						Straight	133801.1	133863.3	62.189				
						Transition	133863.3	133878.3		15			
1165	528187.1	2660891	28	13	36.61" Lef	Arc	133878.3	133892.8		14.559	60	6.7	30
						Transition	133892.8	133907.8		15			
						Straight	133907.8	133968.7	60.877				
						Transition	133968.7	133983.7		15			
1166	528272.3	2660809	135	41	58.70" Righ	Arc	133983.7	134016.1		32.368	20	7	20
						Transition	134016.1	134031.1		15			
						Straight	134031.1	134112.3	81.219				
						Transition	134112.3	134132.3		20			
1167	528125.6	2660782	26	29	00.02" Lef	Arc	134132.3	134158.5		26.222	100	7	40
						Transition	134158.5	134178.5		20			
						Straight	134178.5	134249.4	70.952				
						Transition	134249.4	134274.4		25			
1168	528013.1	2660709	41	5	59.37" Lef	Arc	134274.4	134285.3		10.866	50	7	30
						Transition	134285.3	134310.3		25			
						Straight	134310.3	134342.8	32.523				
						Transition	134342.8	134367.8		25			
1169	527979.9	2660621	42	38	06.75" Righ	Arc	134367.8	134380		12.206	50	7	30
						Transition	134380	134405		25			
						Straight	134405	134415.8	10.748				

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Transition	134415.8	134440.8		25			
1170	527905.6	2660567	53	29	40.28" Lef	Arc	134440.8	134490.5		49.692	80	7	40
						Transition	134490.5	134515.5		25			
						Straight	134515.5	134548.6	33.139				
						Transition	134548.6	134563.6		15			
1171	527886.5	2660453	44	57	21.01" Righ	Arc	134563.6	134595.7		32.078	60	6.7	30
						Transition	134595.7	134610.7		15			
						Straight	134610.7	134622.5	11.776				
						Transition	134622.5	134637.5		15			
1172	527838.4	2660408	29	11	32.02" Lef	Arc	134637.5	134653		15.57	60	6.7	30
						Transition	134653	134668		15			
						Straight	134668	134683.8	15.71				
						Transition	134683.8	134698.8		15			
1173	527801.6	2660331	70	3	47.09" Righ	Arc	134698.8	134757.1		58.37	60	6.7	30
						Transition	134757.1	134772.1		15			
						Straight	134772.1	134943.5	171.403				
						Transition	134943.5	134958.5		15			
1174	527557.1	2660327	107	23	26.93" Lef	Arc	134958.5	134981		22.486	20	7	20
						Transition	134981	134996		15			
						Straight	134996	135068.7	72.718				
						Transition	135068.7	135088.7		20			
1175	527582.4	2660195	69	37	22.28" Righ	Arc	135088.7	135117.3		28.606	40	6.9	20
						Transition	135117.3	135137.3		20			
						Straight	135137.3	135549.2	411.821				
						Transition	135549.2	135564.2		15			
1176	527193.1	2659907	66	42	46.22" Righ	Arc	135564.2	135607.4		43.218	50	5.6	20
						Transition	135607.4	135622.4		15			
						Straight	135622.4	135647	24.657				
						Transition	135647	135662		15			
1177	527081.8	2659960	89	3	45.98" Lef	Arc	135662	135740.3		78.266	60	6.7	30
						Transition	135740.3	135755.3		15			

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Straight	135755.3	135854.7	99.376				
						Transition	135854.7	135869.7		15			
1178	526985.2	2659809	46	47	30.26" Lef	Arc	135869.7	135879.2		9.5	30	5.9	20
						Transition	135879.2	135894.2		15			
						Straight	135894.2	135895.5	1.356				
						Transition	135895.5	135910.5		15			
1179	526991.4	2659766	57	15	04.87" Righ	Arc	135910.5	135925.5		14.977	30	5.9	20
						Transition	135925.5	135940.5		15			
						Straight	135940.5	135982.9	42.35				
						Transition	135982.9	135997.9		15			
1180	526934.8	2659691	80	52	53.81" Lef	Arc	135997.9	136025.2		27.35	30	5.9	20
						Transition	136025.2	136040.2		15			
						Straight	136040.2	136056.4	16.171				
						Transition	136056.4	136071.4		15			
1181	526978.8	2659617	109	52	09.91" Righ	Arc	136071.4	136113.9		42.527	30	5.9	20
						Transition	136113.9	136128.9		15			
						Straight	136128.9	136280.9	152.034				
						Transition	136280.9	136305.9		25			
1182	526745.2	2659511	126	51	24.23" Lef	Arc	136305.9	136369.5		63.563	40	7	30
						Transition	136369.5	136394.5		25			
						Straight	136394.5	136457	62.531				
						Transition	136457	136482		25			
1183	526866	2659405	61	2	10.65" Righ	Arc	136482	136499.6		17.611	40	7	30
						Transition	136499.6	136524.6		25			
						Straight	136524.6	136544.9	20.297				
						Transition	136544.9	136569.9		25			
1184	526861.6	2659323	31	12	54.28" Righ	Arc	136569.9	136577.6		7.688	60	7	30
						Transition	136577.6	136602.6		25			
						Straight	136602.6	136667.3	64.635				
						Transition	136667.3	136692.3		25			
1185	526781.5	2659219	59	50	09.40"	Arc	136692.3	136719.5		27.217	50	7	30

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
					Righ								
						Transition	136719.5	136744.5		25			
						Straight	136744.5	136801.2	56.708				
						Transition	136801.2	136836.2		35			
1186	526618.1	2659217	92	35	07.08" Lef	Arc	136836.2	136898.1		61.955	60	7	40
						Transition	136898.1	136933.1		35			
						Straight	136933.1	137005.4	72.258				
						Transition	137005.4	137020.4		15			
1187	526595.3	2659062	6	42	03.67" Righ	Arc	137020.4	137022.9		2.543	150	4.7	40
						Transition	137022.9	137037.9		15			
						Straight	137037.9	137120.1	82.173				
						Transition	137120.1	137135.1		15			
1188	526574.2	2658937	16	13	26.36" Lef	Arc	137135.1	137162.6		27.474	150	4.7	40
						Transition	137162.6	137177.6		15			
						Straight	137177.6	137242	64.36				
						Transition	137242	137267		25			
1189	526570.8	2658794	154	2	24.22" Righ	Arc	137267	137309.2		42.213	25	7	20
						Transition	137309.2	137334.2		25			
						Straight	137334.2	137427.5	93.348				
						Transition	137427.5	137452.5		25			
1190	526456.8	2658933	55	27	04.40" Lef	Arc	137452.5	137475.9		23.39	50	7	30
						Transition	137475.9	137500.9		25			
						Straight	137500.9	137629.3	128.343				
						Transition	137629.3	137644.3		15			
1191	526262.1	2658939	121	27	48.58" Lef	Arc	137644.3	137671.6		27.399	20	7	20
						Transition	137671.6	137686.6		15			
						Straight	137686.6	137699.9	13.289				
						Transition	137699.9	137714.9		15			
1192	526287.4	2658864	96	7	33.78" Righ	Arc	137714.9	137750.3		35.331	30	5.9	20
						Transition	137750.3	137765.3		15			
						Straight	137765.3	137808.5	43.252				

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Transition	137808.5	137823.5		15			
1193	526187.3	2658808	101	52	22.48" Lef	Arc	137823.5	137861.9		38.341	30	5.9	20
						Transition	137861.9	137876.9		15			
						Straight	137876.9	137932.5	55.621				
						Transition	137932.5	137947.5		15			
1194	526254.2	2658682	128	37	11.62" Righ	Arc	137947.5	137999.8		52.345	30	5.9	20
						Transition	137999.8	138014.8		15			
						Straight	138014.8	138112.1	97.235				
						Transition	138112.1	138137.1		25			
1195	526058	2658677	80	51	56.35" Lef	Arc	138137.1	138182.6		45.569	50	7	30
						Transition	138182.6	138207.6		25			
						Straight	138207.6	138225.7	18.036				
						Transition	138225.7	138250.7		25			
1196	526026.7	2658586	23	37	22.29" Righ	Arc	138250.7	138258.7		7.984	80	7	40
						Transition	138258.7	138283.7		25			
						Straight	138283.7	138370	86.309				
						Transition	138370	138385		15			
1197	525939.8	2658451	120	18	41.69" Lef	Arc	138385	138433		47.995	30	5.9	20
						Transition	138433	138448		15			
						Straight	138448	138468.5	20.57				
						Transition	138468.5	138483.5		15			
1198	526025.5	2658428	87	21	02.37" Righ	Arc	138483.5	138499		15.491	20	7	20
						Transition	138499	138514		15			
						Straight	138514	138540.4	26.425				
						Transition	138540.4	138555.4		15			
1199	526030.2	2658357	81	5	18.32" Lef	Arc	138555.4	138568.7		13.305	20	7	20
						Transition	138568.7	138583.7		15			
						Straight	138583.7	138602.3	18.593				
						Transition	138602.3	138617.3		15			
1200	526097.1	2658329	127	4	49.76" Righ	Arc	138617.3	138646.7		29.359	20	7	20
						Transition	138646.7	138661.7		15			

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Straight	138661.7	138711.2	49.501				
						Transition	138711.2	138736.2		25			
1201	526018.3	2658255	34	6	28.53" Righ	Arc	138736.2	138741		4.765	50	7	30
						Transition	138741	138766		25			
						Straight	138766	138786	20.009				
						Transition	138786	138811		25			
1202	525942.1	2658247	39	25	18.42" Righ	Arc	138811	138820.4		9.402	50	7	30
						Transition	138820.4	138845.4		25			
						Straight	138845.4	138867.9	22.502				
						Transition	138867.9	138882.9		15			
1203	525870.3	2658282	111	10	19.93" Lef	Arc	138882.9	138906.7		23.806	20	7	20
						Transition	138906.7	138921.7		15			
						Straight	138921.7	138993.5	71.795				
						Transition	138993.5	139018.5		25			
1204	525834.2	2658160	36	10	13.58" Righ	Arc	139018.5	139025		6.565	50	7	30
						Transition	139025	139050		25			
						Straight	139050	139132.4	82.327				
						Transition	139132.4	139157.4		25			
1205	525730.9	2658057	52	14	45.39" Lef	Arc	139157.4	139178		20.593	50	7	30
						Transition	139178	139203		25			
						Straight	139203	139279.7	76.687				
						Transition	139279.7	139299.7		20			
1206	525737.7	2657917	21	38	06.81" Lef	Arc	139299.7	139317.4		17.761	100	7	40
						Transition	139317.4	139337.4		20			
						Straight	139337.4	139375.2	37.786				
						Transition	139375.2	139390.2		15			
1207	525771.9	2657835	55	3	15.41" Righ	Arc	139390.2	139404		13.826	30	5.9	20
						Transition	139404	139419		15			
						Straight	139419	139429.7	10.705				
						Transition	139429.7	139444.7		15			
1208	525750.7	2657790	14	4	27.35" Lef	Arc	139444.7	139449.4		4.651	80	5	30

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
						Transition	139449.4	139464.4		15			
						Straight	139464.4	139510.3	45.89				
						Transition	139510.3	139550.3		40			
1209	525730.5	2657672	86	54	46.35" Lef	Arc	139550.3	139586.1		35.846	50	7	40
						Transition	139586.1	139626.1		40			
						Straight	139626.1	139794	167.867				
						Transition	139794	139809		15			
1210	525959.2	2657580	31	43	59.94" Righ	Arc	139809	139821.7		12.693	50	5.6	20
						Transition	139821.7	139836.7		15			
						Straight	139836.7	139874.6	37.939				
						Transition	139874.6	139899.6		25			
1211	526017.5	2657518	39	49	44.11" Lef	Arc	139899.6	139902.4		2.806	40	7	30
						Transition	139902.4	139927.4		25			
						Straight	139927.4	139942.2	14.747				
						Transition	139942.2	139972.2		30			
1212	526090.9	2657493	85	47	06.29" Righ	Arc	139972.2	139987.1		14.917	30	7	30
						Transition	139987.1	140017.1		30			
						Straight	140017.1	140125.2	108.108				
						Transition	140125.2	140140.2		15			
1213	526080.1	2657331	41	45	06.05" Righ	Arc	140140.2	140147.1		6.861	30	5.9	20
						Transition	140147.1	140162.1		15			
						Straight	140162.1	140180.3	18.211				
						Transition	140180.3	140195.3		15			
1214	526041.8	2657290	46	11	59.76" Lef	Arc	140195.3	140204.5		9.19	30	5.9	20
						Transition	140204.5	140219.5		15			
						Straight	140219.5	140238.5	19.085				
						Transition	140238.5	140263.5		25			
1215	526034.8	2657224	34	33	48.51" Righ	Arc	140263.5	140268.7		5.162	50	7	30
						Transition	140268.7	140293.7		25			
						Straight	140293.7	140346.5	52.846				
						Transition	140346.5	140371.5		25			

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HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	SUPERELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)					
1216	525975.3	2657136	19	37	58.96" Lef	Arc	140371.5	140374		2.413	80	7	40
						Transition	140374	140399		25			
						Straight	140399	140563	164.062				
1217	525914.8	2656938	11	31	40.34" Righ	Arc	140563	140597.2		34.204	170	Normal Camber	30
						Straight	140597.2	140615.7	18.508				
1218	525892.9	2656897	7	14	42.88" Lef	Arc	140615.7	140637.2		21.497	170	Normal Camber	30
						Straight	140637.2	140756.1	118.915				
						Transition	140756.1	140771.1		15			
1219	525827.6	2656744	101	4	06.24" Righ	Arc	140771.1	140809.1		37.919	30	5.9	20
						Transition	140809.1	140824.1		15			
						Straight	140824.1	140928.8	104.72				
						Transition	140928.8	140943.8		15			
1220	525663	2656833	80	41	24.36" Lef	Arc	140943.8	140999.2		55.415	50	5.6	20
						Transition	140999.2	141014.2		15			
						Straight	141014.2	141028.7	14.526				

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3.2.2 PROPOSED CROSS SECTION DETAILS

Cross-section of the improved facility should be adequate to cater to the traffic expected over the design period and offer safe and convenient traffic operation at speeds consistent with the terrain conditions and functional classification of this road.

The cross-sectional parameters (land /shoulder width etc.) shall be as per standards specified in IRC SP: 73-2015. Following typical cross-sections have been envisaged for the subject road. Chainage wise cross-section details are given in Table 3.12 and Table 3.13.

TABLE 3.12: PROPOSED CROSS-SECTION DETAILS

TCS Type	Description	Length (m)
TCS-1	Two Lane carriageway with hard shoulder in built up area with both side foothpath cum RCC covered drain (existing pavement)	N/A
TCS-2	Two Lane carriageway with hard shoulder and one side toe wall & one side retaining wall (existing pavement)	N/A
TCS-3	Two Lane carriageway with hard shoulder and one side toe wall (existing pavement)	N/A
TCS-4	Two Lane carriageway with hard shoulder in rural area (existing pavement)	N/A
TCS-4A	Two Lane carriageway with hard shoulder in rural area (realignment stretch)	N/A
TCS-5	Two Lane carriageway with hard shoulder and one side toe wall & one side trapezoidal drain (existing pavement)	600
TCS-5A	Two Lane carriageway with hard shoulder and one side toe wall & one side trapezoidal drain (realignment stretch)	N/A
TCS-6	Two Lane carriageway with hard shoulder and both side trapezoidal drain (existing pavement)	N/A
TCS-6A	Two Lane carriageway with hard shoulder and both side trapezoidal drain (realignment stretch)	N/A
TCS-7	Two Lane carriageway with hard shoulder and one side trapezoidal drain (existing pavement)	2209
TCS-7A	Two Lane carriageway with hard shoulder and one side trapezoidal drain (realignment stretch)	N/A
TCS-8	Two Lane carriageway with hard shoulder and one side breast wall (existing pavement)	2150
TCS-8A	Two Lane carriageway with hard shoulder and one side breast wall (realignment stretch)	N/A
TCS-9	Two Lane carriageway with hard shoulder and one side breast wall & one side drain (existing pavement)	500
TCS-9A	Two Lane carriageway with hard shoulder and one side breast wall & one side drain (realignment stretch)	N/A
TCS-10	Two Lane carriageway with hard shoulder and one side retaining wall (existing pavement)	N/A
TCS-10A	Two Lane carriageway with hard shoulder and one side retaining wall (realignment stretch)	N/A
TCS-11	Two Lane carriageway with hard shoulder and one side retaining wall & one side drain (existing pavement)	5070
TCS-11A	Two Lane carriageway with hard shoulder and one side retaining wall & one side drain (realignment stretch)	N/A
TCS-12	Two Lane carriageway with hard shoulder and one side retaining wall & one breast wall (existing pavement)	400
TCS-12A	Two Lane carriageway with hard shoulder and one side retaining wall & one breast wall (realignment stretch)	N/A
TCS-13	Two Lane carriageway with hard shoulder and both side retaining wall (existing pavement)	N/A
TCS-13A	Two Lane carriageway with hard shoulder and both side retaining wall (realignment stretch)	N/A
TCS-14	Two Lane carriageway with hard shoulder and one side toe wall & one side breast wall (existing pavement)	100
TCS-15	Two Lane carriageway with hard shoulder and both side breast wall (existing pavement)	N/A
TCS-15A	Two Lane carriageway with hard shoulder and both side breast wall (realignment stretch)	N/A

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TCS Type	Description	Length (m)
TCS-16	Two Lane carriageway with hard shoulder and both side composite RE wall (existing pavement)	N/A
TCS-16A	Two Lane carriageway with hard shoulder and both side composite RE wall (realignment stretch)	N/A
TCS-17	Two Lane carriageway with hard shoulder and one side drain & one side composite RE wall (existing pavement)	N/A
TCS-17A	Two Lane carriageway with hard shoulder and one side drain & one side composite RE wall (realignment stretch)	N/A

TABLE 3.13: CHAINAGEWISE CROSS-SECTION DETAILS

Chainage		Length (m)	TCS Type
From (m)	To (m)		
Package - IV B			
130000	130220	220	TCS-11
130220	130270	50	TCS-8
130270	130370	100	TCS-11
130370	130470	100	TCS-14
130470	130870	400	TCS-8
130870	130920	50	TCS-11
130920	130970	50	TCS-9
130970	131620	650	TCS-11
131620	131770	150	TCS-7
131770	131970	200	TCS-11
131970	132220	250	TCS-8
132220	132570	350	TCS-11
132570	132720	150	TCS-9
132720	133020	300	TCS-11
133020	133120	100	TCS-7
133120	133170	50	TCS-11
133170	133220	50	TCS-5
133220	133320	100	TCS-7
133320	133520	200	TCS-11
133520	133620	100	TCS-8
133620	133920	300	TCS-11
133920	134070	150	TCS-7
134070	134320	250	TCS-5
134320	134420	100	TCS-7
134420	134470	50	TCS-11
134470	134570	100	TCS-8
134570	135220	650	TCS-11
135220	135320	100	TCS-8
135320	135370	50	TCS-11
135370	135470	100	TCS-9
135470	135570	100	TCS-11
135570	135770	200	TCS-8
135770	135870	100	TCS-11
135870	135970	100	TCS-5
135970	136020	50	TCS-8

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Chainage		Length (m)	TCS Type
From (m)	To (m)		
136020	136320	300	TCS-12
136320	136520	200	TCS-7
136520	136770	250	TCS-11
136770	136820	50	TCS-8
136820	136870	50	TCS-11
136870	136970	100	TCS-7
136970	137620	650	TCS-11
137620	137920	300	TCS-7
137920	137970	50	TCS-5
137970	138470	500	TCS-8
138470	138570	100	TCS-7
138570	138670	100	TCS-8
138670	138720	50	TCS-7
138720	138770	50	TCS-11
138770	138820	50	TCS-7
138820	138870	50	TCS-11
138870	138970	100	TCS-7
138970	139170	200	TCS-9
139170	139470	300	TCS-7
139470	139720	250	TCS-11
139720	139820	100	TCS-12
139820	140020	200	TCS-8
140020	140170	150	TCS-5
140170	140220	50	TCS-8
140220	140620	400	TCS-11
140620	141029	409	TCS-7
Total Length = 11.029 Km			

3.2.3 ADOPTED PAVEMENT THICKNESS

New 2-lane road will be developed by upgrading existing road after necessary geometric improvement. Considering Design traffic of 20 msa and Design CBR of 10% following pavement thickness has been adopted over existing and New/Widening portion.

TABLE 3.14: PAVEMENT THICKNESS

Design CBR (%)	Design Traffic (MSA)	GSB (mm)	WMM (mm)	DBM (mm)	BC (mm)	Total Thickness (mm)	Sub-grade in New /widening portion (CBR-10%)
10%	20	200	250	70	40	560	500

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Pavement Thickness as per IRC:37-2018

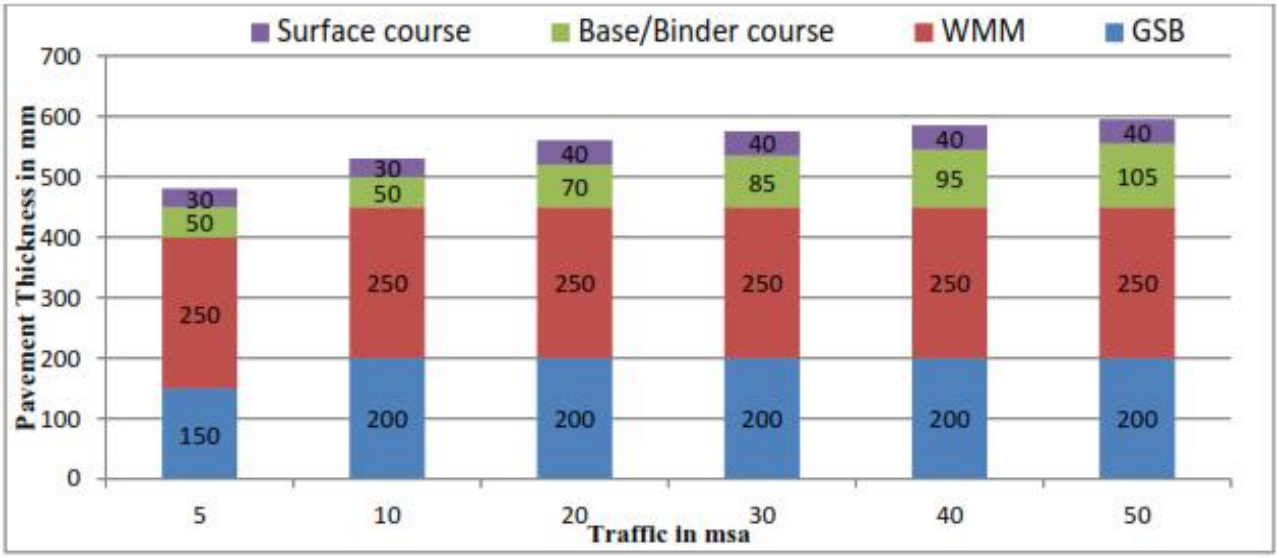


Figure 12.6 Catalogue for pavement with bituminous surface course with granular base and sub-base - Effective CBR 10% (Plate-6)

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3.2.4 MUCK DISPOSAL

The muck from hill cutting and construction activities will be safely disposed at suitable locations. Principle adopted for selecting muck dumping areas was to avoid sensitive areas like dense vegetation, natural water courses and areas prone to landslides. During the selection of the dumping sites preference was given on the following aspects.

- The muck does not fall/flow into stream/river.
- Dumping sites should be at least 30 m (horizontal) away from the High Flood Level of the River/ stream.
- The sites are free from active landslides or creeps.
- The sites should not fall within pristine forest nor are these habitats of threatened species of flora and fauna.
- The sites are located close to its source in order to avoid long distance haulage.

Requirement of total muck disposal area has been given below in Table 3.15:

TABLE 3.15: DETAILS OF MUCK DISPOSAL AREA

Package	Quantity of Muck/Debris generated in Cum	Quantity of Muck with 30% swell factor in Cum	Total Quantity of Muck/Debris including swell factor in Cum	Estimated Quantity of Muck/Debris proposed to be utilized for Filling in cum	Estimated quantity of muck/debris proposed to be dumped in cum.	Estimated quantity of muck/debris dumped in Valley Side within our Proposed ROW in Cum	Estimated quantity of muck/debris dumped in other location in Cum	Avg. Dumping Height in M.	Avg. Dumping Area (Sq m.)	Avg. Dumping Area (Ha.)
IV-B	752090.64	225627.19	977717.83	79351.89	898365.94	50000.00	848365.94	20	42418.30	4.24

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3.2.5 PROPOSED ROW

Proposed ROW varies from 20.00 m to 24.00 for rural area and 14.00 m for built-up area of the project stretch.

Package – IV B

- Total Land required to implement 2-lane proposal = 24.011 Ha.
- Land Available within PROW= 7.912 Ha.
- **Balance Land to be acquired = 17.099 Ha.**

3.2.6 BRIDGES AND CULVERTS

BRIDGES

4 Nos. major bridges and 16 nos. minor bridges have been proposed along the project road. Improvement proposal of all the major and minor bridges are given below in Table 3.16:

TABLE 3.16: DETAILS OF BRIDGES

Sl No.	Survey Chainage (km)	Design Chainage (km)	Existing Details		Remarks for Proposal	Proposal	
			Type of Structures	Span Arrangement		Bridge Type	Span Arrangement (No. x Span in m)
Package- IV B							
1	162.269	140.880	Steel Truss Bridge	1x78.00	RECONSTRUCTION	SLAB+TRUSS+SLAB	1X10+1 x 90+1X10m

CULVERTS

There are 611 nos. of existing culverts (including 345 nos. of Slab Culverts, 251 nos. of Pipe Culverts, 12 nos. of Box culverts and Type of 3 nos. of choked Culverts) on the project road. However, due to geometric improvement 394 nos. existing culverts are reconstructed with box and remaining 217 nos. culverts are avoided and 274 nos. new RCC Box Culverts are proposed.
Improvement Proposals are given below in Table 3.17a & 3.17b:

TABLE 3.17a: DETAILS OF RECONSTRUCTION CULVERTS

Sl. No.	Survey Chainage (Km)	Design Chainage (KM)	Existing Details		Proposal		Remarks for Proposal
			Type of Structures	Span Arrangement	Culvert Type	Size Span x Height (M X M)	
Package -IV B							
1	149.920	130.282	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
2	150.040	130.36	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
3	150.621	130.905	HP	1 X1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
4	150.874	131.112	HP	1 X1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
5	151.293	131.503	HP	1 X1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
6	151.429	131.639	HP	1 X1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
7	151.589	131.779	HP	1 X1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
8	151.812	132.002	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0	Reconstruction

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Sl. No.	Survey Chainage (Km)	Design Chainage (KM)	Existing Details		Proposal		Remarks for Proposal
			Type of Structures	Span Arrangement	Culvert Type	Size Span x Height (M X M)	
9	152.422	132.562	HP	1 X 0.9M	BOX CULVERT	2.0 X 3.0	Reconstruction
10	153.285	133.335	HP	1 X1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
11	153.582	133.625	HP	1 X1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
12	154.075	134.081	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
13	154.413	134.414	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
14	154.763	134.751	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
15	154.898	134.883	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0	Reconstruction
16	155.107	135.072	RCC	1 X 2.86M	BOX CULVERT	2.0 X 2.0	Reconstruction
17	155.270	135.233	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
18	155.400	135.333	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
19	155.646	135.56	HP	1 X 1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
20	155.680	135.59	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
21	155.905	135.805	RCC	1 X 1.38M	BOX CULVERT	2.0 X 2.0	Reconstruction
22	156.030	135.927	HP	1 X 0.9M	BOX CULVERT	2.0 X 3.0	Reconstruction
23	156.199	136.084	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
24	156.233	136.14	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0	Reconstruction
25	156.328	136.216	HP	1 X 1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
26	156.574	136.42	HP	1 X 0.9M	BOX CULVERT	2.0 X 3.0	Reconstruction
27	156.587	136.432	HP	1 X 1.2M	BOX CULVERT	2.0 X 3.0	Reconstruction
28	156.643	136.483	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
29	156.657	136.498	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
30	156.740	136.572	HP	1 X 0.9M	BOX CULVERT	2.0 X 3.0	Reconstruction
31	156.835	136.662	HP	1 X 0.9M	BOX CULVERT	2.0 X 2.0	Reconstruction
32	157.111	136.924	HP	1 X 1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
33	157.445	137.25	HP	1 X 1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
34	157.485	137.282	RCC	1 X 1.282M	BOX CULVERT	2.0 X 2.0	Reconstruction
35	157.535	137.325	HP	1 X 1.5M	BOX CULVERT	2.0 X 2.0	Reconstruction
36	157.190	137.91	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
37	158.270	137.975	HP	1 X 1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
38	158.813	138.485	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
39	159.018	138.662	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
40	159.778	139.392	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
41	159.810	139.421	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
42	159.880	139.486	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
43	160.030	139.63	HP	1 X 1.0M	BOX CULVERT	2.0 X 3.0	Reconstruction
44	160.392	139.977	RCC	1 X 4.22M	BOX CULVERT	2.0 X 2.0	Reconstruction
45	160.545	140.12	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction
46	160.930	140.502	HP	1 X 1.0M	BOX CULVERT	2.0 X 2.0	Reconstruction

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TABLE 3.17b: DETAILS OF NEW CULVERTS

Sl. No.	Survey Chainage (Km)	Design Chainage (KM)	Existing Details		Proposal	
			Type of Structures	Span Arrangement	Culvert Type	Size Span x Height (M X M)
Package- IV B						
1	-	130.093	-	-	BOX CULVERT	2.0 X 2.0
2	-	130.308	-	-	BOX CULVERT	2.0 X 2.0
3	-	130.778	-	-	BOX CULVERT	2.0 X 2.0
4	-	131.212	-	-	BOX CULVERT	2.0 X 2.0
5	-	132.248	-	-	BOX CULVERT	2.0 X 2.0
6	-	132.420	-	-	BOX CULVERT	2.0 X 3.0
7	-	132.786	-	-	BOX CULVERT	2.0 X 2.0
8	-	132.984	-	-	BOX CULVERT	2.0 X 2.0
9	-	133.167	-	-	BOX CULVERT	2.0 X 2.0
10	-	133.681	-	-	BOX CULVERT	2.0 X 2.0
11	-	133.788	-	-	BOX CULVERT	2.0 X 2.0
12	-	134.461	-	-	BOX CULVERT	2.0 X 2.0
13	-	134.652	-	-	BOX CULVERT	2.0 X 2.0
14	-	134.932	-	-	BOX CULVERT	2.0 X 2.0
15	-	135.190	-	-	BOX CULVERT	2.0 X 2.0
16	-	136.724	-	-	BOX CULVERT	2.0 X 2.0
17	-	137.158	-	-	BOX CULVERT	2.0 X 2.0
18	-	137.378	-	-	BOX CULVERT	2.0 X 2.0
19	-	138.711	-	-	BOX CULVERT	2.0 X 2.0
20	-	138.854	-	-	BOX CULVERT	2.0 X 2.0
21	-	139.673	-	-	BOX CULVERT	2.0 X 3.0
22	-	139.747	-	-	BOX CULVERT	2.0 X 3.0
23	-	140.300	-	-	BOX CULVERT	2.0 X 2.0

3.2.7 JUNCTION IMPROVEMENT

The existing project road has a number of junctions mainly with village roads. Junctions have been classified into "Major" and "Minor" junctions according to functional importance and future prospects. There are 6 nos. minor junctions in the project road.

TABLE 3.18: LIST OF MAJOR JUNCTIONS

Sl. No.	Chainage (Km)	Name of Junction	Type of Junction	Leads To
Package – IV B				
Nil				

Minor Junctions:

- Package – IV B: Nil

3.2.8 SERVICE ROADS

There is no Service Road proposed along the project stretch.

3.2.9 FOOTPATH AND COVERED DRAINS

Footpath cum RCC cover drain has been proposed in congested built up area for safe movement of

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pedestrian, Trapezoidal stone masonry open drain has been considered in scattered built-up area on both side of footpath for proper drainage purpose. Details are given below.

TABLE 3.20: DETAILS OF FOOTPATH CUM RCC COVER DRAIN

Chainage (Km)		Total length	Length of CD	Net Length (m)	Side	TCS No.
From	To					
Package – IV B						
NIL						

RR Masonry Trapezoidal open drain has been considered in hill side. The detail list of drain is given below.

TABLE 3.21: DETAILS OF RR MASONRY TRAPEZOIDAL OPEN DRAIN

Chainage		Total Length	Length of CD	Net Length (m)	Side	TCS No.
From (M)	To (M)					
Package-IV B						
130000	130220	220	2.6	217	Single	TCS-11
130270	130370	100	7.8	92	Single	TCS-11
130870	130920	50	2.6	47	Single	TCS-11
130920	130970	50		50	Single	TCS-9
130970	131620	650	7.9	642	Single	TCS-11
131620	131770	150	2.6	147	Single	TCS-7
131770	131970	200	2.6	197	Single	TCS-11
132220	132570	350	8	342	Single	TCS-11
132570	132720	150		150	Single	TCS-9
132720	133020	300	5.2	295	Single	TCS-11
133020	133120	100		100	Single	TCS-7
133120	133170	50	2.6	47	Single	TCS-11
133170	133220	50		50	Single	TCS-5
133220	133320	100		100	Single	TCS-7
133320	133520	200	2.7	197	Single	TCS-11
133620	133920	300	7.8	292	Single	TCS-11
133920	134070	150		150	Single	TCS-7
134070	134320	250	2.6	247	Single	TCS-5
134320	134420	100	2.6	97	Single	TCS-7
134420	134470	50	2.6	47	Single	TCS-11
134570	135220	650	15.6	634	Single	TCS-11
135320	135370	50	2.6	47	Single	TCS-11
135370	135470	100		100	Single	TCS-9
135470	135570	100	2.7	97	Single	TCS-11
135770	135870	100	2.6	97	Single	TCS-11
135870	135970	100	2.7	97	Single	TCS-5
136320	136520	200	10.6	189	Single	TCS-7
136520	136770	250	7.9	242	Single	TCS-11
136820	136870	50		50	Single	TCS-11
136870	136970	100	2.7	97	Single	TCS-7
136970	137620	650	13.1	637	Single	TCS-11

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Chainage		Total Length	Length of CD	Net Length (m)	Side	TCS No.
From (M)	To (M)					
137620	137920	300	2.6	297	Single	TCS-7
137920	137970	50		50	Single	TCS-5
138470	138570	100	2.6	97	Single	TCS-7
138670	138720	50	2.6	47	Single	TCS-7
138720	138770	50		50	Single	TCS-11
138770	138820	50		50	Single	TCS-7
138820	138870	50	2.6	47	Single	TCS-11
138870	138970	100		100	Single	TCS-7
138970	139170	200		200	Single	TCS-9
139170	139470	300	5.2	295	Single	TCS-7
139470	139720	250	8	242	Single	TCS-11
140020	140170	150	2.6	147	Single	TCS-5
140220	140620	400	5.2	395	Single	TCS-11
140620	141029	409	110	299	Single	TCS-7
Length of trapezoidal drain in Package- IV B= 8117 m						

TABLE 3.21: DETAILS OF RR MASONRY TRAPEZOIDAL DRAIN FOR CATCH PIT

Chainage		Side	CD Length	Length (m)	Net Length (m)
From (M)	To (M)				
Package- IV B					
Nil					

3.2.10 ROAD MARKINGS/SIGNAGE/ROAD FURNITURE

Retro-reflective signage as per IRC standard mounted on post or overhead gantry, required for safety and traffic control will be provided at suitable locations. Thermoplastic road markings, road studs, delineators, crash barriers etc. will be provided at required locations to ensure adequate safety of the road users. Details are given in Volume-VII: Cost Estimate.

3.2.11 BUS BAY & PASSENGER SHELTER

42 nos. of Bus Bays with passenger shelter are provided at 21 habitation areas along the project road. Details of proposed Bus bay location are given below in Table-3.22:

TABLE 3.22: LIST OF BUSBAYS WITH PASSENGER SHELTER

Sl. No.	Design Chainage (km)	Name of the habitation	Side
Package – IV B			
Nil			

3.2.12 PROTECTION WORK

For proper protection of proposed road on hill and valley side Breast Wall and retaining wall have been proposed from road safety point of view. Details of Breast Wall, Retaining Wall, Toe wall & Metal Beam Crash Barrier are given in Table 3.23, Table 3.24, Table 3.25 and Table 3.26 respectively.

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TABLE 3.23: DETAILS OF BREAST WALL

Chainage		Total length	Length of CD	Net Length (m)	Side	TCS No.
From (M)	To (M)					
Package-IV B						
130220	130270	50		50	Single	TCS-8
130370	130470	100		100	Single	TCS-14
130470	130870	400	2.6	397	Single	TCS-8
130920	130970	50		50	Single	TCS-9
131970	132220	250	2.6	247	Single	TCS-8
132570	132720	150		150	Single	TCS-9
133520	133620	100		100	Single	TCS-8
134470	134570	100		100	Single	TCS-8
135220	135320	100	2.6	97	Single	TCS-8
135370	135470	100		100	Single	TCS-9
135570	135770	200	2.6	197	Single	TCS-8
135970	136020	50		50	Single	TCS-8
136020	136320	300	7.9	292	Single	TCS-12
136770	136820	50		50	Single	TCS-8
137970	138470	500	2.7	497	Single	TCS-8
138570	138670	100	2.6	97	Single	TCS-8
138970	139170	200		200	Single	TCS-9
139720	139820	100	2.7	97	Single	TCS-12
139820	140020	200	2.6	197	Single	TCS-8
140170	140220	50		50	Single	TCS-8
Length of breast wall in package- IV B=				**3121m**		

TABLE 3.24: DETAILS OF RETAINING WALL

Chainage		Side	Avg. Height	CD Length	Length	Net Length	TCS
From (M)	To (M)						
Package-IV B							
130000	130220	single	2.5	2.6	220	217	TCS-11
130970	131620	single	2	7.9	650	642	TCS-11
131770	131970	single	1.5	2.6	200	197	TCS-11
132220	132570	single	2.5	8	350	342	TCS-11
132720	133020	single	4	5.2	300	295	TCS-11
133320	133520	single	2	2.7	200	197	TCS-11
133620	133920	single	2.5	7.8	300	292	TCS-11
134420	134470	single	2	2.6	50	47	TCS-11
134570	135220	single	3	15.6	650	634	TCS-11
135770	135870	single	2	2.6	100	97	TCS-11
136020	136320	single	2	7.9	300	292	TCS-12
136520	136770	single	2	7.9	250	242	TCS-11
136820	136870	single	2		50	50	TCS-11
136970	137620	single	2	13.1	650	637	TCS-11
138720	138770	single	2.5		50	50	TCS-11
138820	138870	single	2.5	2.6	50	47	TCS-11
139470	139720	single	4	8	250	242	TCS-11

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Chainage		Side	Avg. Height	CD Length	Length	Net Length	TCS
From (M)	To (M)						
139720	139820	single	4	2.7	100	97	TCS-12
130270	130370	single	6	7.8	100	92	TCS-11
130870	130920	single	6	2.6	50	47	TCS-11
133120	133170	single	6	2.6	50	47	TCS-11
135320	135370	single	6	2.6	50	47	TCS-11
135470	135570	single	6	2.7	100	97	TCS-11
140220	140620	single	5	5.2	400	395	TCS-11
Length of retaining wall in package- = IV B =						**5347m**	

TABLE 3.25: DETAILS OF TOE WALL

Chainage (M)		Total length	Length of CD	Net Length (m)	Side	TCS No.
From (M)	To (M)					
Package-IV B						
130370	130470	100		100	Single	TCS-14
133170	133220	50		50	Single	TCS-5
134070	134320	250	2.6	247	Single	TCS-5
135870	135970	100	2.7	97	Single	TCS-5
137920	137970	50		50	Single	TCS-5
140020	140170	150	2.6	147	Single	TCS-5
Length of toe wall in Package IV B=				**692m**		

TABLE 3.26: DETAILS OF METAL BEAM CRASH BARRIER

Chainage		Length	Length of CD	Net Length (m)	TCS No.	Side
From (m)	To (m)					
Package - IV B						
130000	130220	220	2.6	217	TCS-11	Single
130270	130370	100	7.8	92	TCS-11	Single
130370	130470	100		100	TCS-14	Single
130870	130920	50	2.6	47	TCS-11	Single
130970	131620	650	7.9	642	TCS-11	Single
131770	131970	200	2.6	197	TCS-11	Single
132220	132570	350	8	342	TCS-11	Single
132720	133020	300	5.2	295	TCS-11	Single
133120	133170	50	2.6	47	TCS-11	Single
133170	133220	50		50	TCS-5	Single
133320	133520	200	2.7	197	TCS-11	Single
133620	133920	300	7.8	292	TCS-11	Single
134070	134320	250	2.6	247	TCS-5	Single
134420	134470	50	2.6	47	TCS-11	Single
134570	135220	650	15.6	634	TCS-11	Single
135320	135370	50	2.6	47	TCS-11	Single
135470	135570	100	2.7	97	TCS-11	Single
135770	135870	100	2.6	97	TCS-11	Single
135870	135970	100	2.7	97	TCS-5	Single
136020	136320	300	7.9	292	TCS-12	Single
136520	136770	250	7.9	242	TCS-11	Single

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Chainage		Length	Length of CD	Net Length (m)	TCS No.	Side
From (m)	To (m)					
136820	136870	50		50	TCS-11	Single
136970	137620	650	13.1	637	TCS-11	Single
137920	137970	50		50	TCS-5	Single
138720	138770	50		50	TCS-11	Single
138820	138870	50	2.6	47	TCS-11	Single
139470	139720	250	8	242	TCS-11	Single
139720	139820	100	2.7	97	TCS-12	Single
140020	140170	150	2.6	147	TCS-5	Single
140220	140620	400	5.2	395	TCS-11	Single
Total length of Metal beam crash barrier= 6039m **For Bridge Approaches = 100 m** **(Taking 50 m each Approach)** **Total length of crash barrier = 6139 m**						

TABLE 3.26: DETAILS OF COMPOSITE RE WALL

Chainage		Length (m)	TCS Type	Side
From (m)	To (m)			
Package-IV B				
Nil				

HYDRO SEEDING OR VEGETATION

Hydro seeding or roadside vegetation will be provided through hill cutting portion for better stability and prevention of soil erosion. Details are given below.

Packages	Hydro seeding (sqm.)	Turfing (sqm.)
PKG-IV B	24969	27006

3.2.13 FOREST PROPOSAL

Project road passes through unclassified forest. Forest Clearance proposal will be separately uploaded for that. Total Forest Land required is stated below:

Package – IV B: 15.562 Ha.

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CHAPTER - 4
ENGINEERING SURVEYS, INVESTIGATION AND ANALYSIS

4.1 INTRODUCTION

Different types of field studies, engineering surveys and investigations are required to gather data and information for preparation of the report for the project road stretches. The aim of the investigations is to develop an adequate supportive database for selecting and preparing the most appropriate and economic proposal to meet the functional and structural efficiency of the road as well as safety requirements.

The following are the necessary engineering survey and investigations need to be carried out at site to assess the existing characteristics of the road:

(a) Reconnaissance Survey
(b) Road Inventory
(c) Pavement Condition Survey
(d) Inventory and Condition Survey of Existing Structures
(e) Topographical Survey
(f) Traffic Survey
(g) Benkelman Beam Deflection Test
(h) Sub-grade Investigation
(i) Quarry Material Survey
(j) Sub-Soil Exploration

4.2 ENGINEERING SURVEYS AND INVESTIGATIONS

4.2.1 RECONNAISSANCE SURVEY

The consultants made an in-depth study of the available maps of the project area and other relevant information collected. A detailed reconnaissance survey was conducted for the entire stretch of the project road and detail features such as land use, habitation, water routes, river, intersecting roads, utilities such as electrical lines (HT/LT), etc has been noted. The detailed ground reconnaissance of project influence area was utilized for planning and programming the detailed surveys and investigations.

4.2.2 ROAD INVENTORY

Detailed inventory of the project road stretches have been prepared through visual inspection with sample measurements to assess the existing status. Features like existing kilometerage, terrain, land use, width of pavement and shoulders, height of embankment, geometric deficiencies, important road junctions, railway level crossings, utilities, other roadside features etc. were recorded. The inventory is essentially included to collect physical information on the road and its environment for enabling preliminary assessment of the project. The existing road is mostly single lane with earthen shoulder with small stretch having two lane road. The details of these inventories are provided in Appendix: 4.1 of Main Report. Brief summary of the Carriageway & shoulder details are in Table 4.1.

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TABLE 4.1: BRIEF SUMMARY OF CARRIAGEWAY AND SHOULDER DETAILS

From (km)	To (km)	Carriageway Width (m)	Shoulder width (m)
Package - IV B			
149.630	150.000	3.5	0.6
150.000	150.500	3.5	0.4
150.500	151.000	3.5	0.4
151.000	151.500	3.5	0.4
151.500	152.000	3.5	0.2
152.000	152.500	3	0.4
152.500	153.000	3	0.4
153.000	153.500	3	0.2
153.500	154.000	3	0.2
154.000	154.500	3	0.4
154.500	155.000	3	0.4
155.000	155.500	2.8	0.4
155.500	156.000	3	0.2
156.000	156.500	2.8	0.2
156.500	157.000	3	0.4
157.000	157.500	2.8	0.4
157.500	158.000	2.8	0.2
158.000	158.500	2.8	0.2
158.500	159.000	2.8	0.4
159.000	159.500	2.8	0.4
159.500	160.000	2.8	0.4
160.000	160.500	2.5	0.2
160.500	161.000	2.5	0.2
161.000	161.500	2.5	0.2
161.500	161.665	2.5	0.2

4.2.3 PAVEMENT CONDITION SURVEY

Pavement condition survey has been carried out as per the standard format. The existing pavement surface is of bituminous type and surface condition along the road varies from fair to poor. Some portion of the stretches, the existing pavement is partially damaged with cracks, potholes, raveling, rutting and considerable amount of patching. Few stretches have been observed where bituminous layer is fully exposed. Detailed field study including pavement condition, shoulder condition, embankment condition, drainage condition etc. were noted by visual means supplemented by sample measurements. The following measurements were involved:

- Cracking (as a percentage of paved carriageway area)
- Raveling (as a percentage of paved carriageway area)
- Pothole (as a percentage of paved carriageway area)
- Rut depth, mm
- Edge drop, mm

Shoulder and embankment conditions were determined visually and its extent will be noted. The details of the Pavement Conditions are provided in Appendix: 4.2 to the Main Report. Brief summary of existing pavement surface condition are in Table 4.2.

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TABLE 4.2: BRIEF SUMMARY OF PAVEMENT CONDITION DETAILS

Good to Fair Condition	Poor Condition
From km 149.630 to km 161.440	Nil

4.2.4 INVENTORY AND CONDITION SURVEY OF EXISTING STRUCTURES

Inventory and condition survey of the existing bridges and culverts were carried out to identify their number, type, condition and hydrological aspects. Mainly visual inspection and dimensional measurements were carried out during this survey. Data were collected in the standard format. The exercise enabled to collect the visible as-built information to the extent possible and condition to assess the individual requirements of the existing structures enroute, like widening, repair and reconstruction. The details of culvert inventories and condition surveys are provided in Appendix: 4.3 and bridges in Appendix: 4.4 of Main Report. Brief summary of existing structures are in Table 4.3.

Table 4.3: Brief summary of Structure Details

Bridges (Total 1 nos.)	
Type	**No.**
Steel Truss Bridges	1 no. (Major bridge)
Culverts (Total 69 nos.)	
Type	**No.**
RCC Slab Culverts	46 nos.
HP Culverts	23 nos.

4.2.5 TOPOGRAPHIC SURVEY

The specific objective of the topographical survey is to delineate accurately the complete existing natural and man-made features, so as to study and develop the existing road, creating an accurate Digital Terrain Model, which is also a fundamental requirement to design the highway through latest software. The detailed topographical survey for the existing road as well as realignment stretches were completed with fixing BM pillars according to the procedure outlined in the TOR. A list of TBM and GPS pillars established along the project road is given in Appendix: 4.5 of Main Report. Summary of BM, TBM and GPS pillar list are in Table 4.4.

TABLE 4.4: SUMMARY OF PILLARS DETAILS

❖ **BM Pillar List**

BM No.	Easting (m)	Northing (m)	R.L. (m)
BM151/1	529684.32	2662928.684	743.419
BM151/2	529493.015	2662955.398	729.753
BM152/1	529403.678	2662606.034	710.446
BM152/2	529281.294	2662544.26	717.555
BM152/3	529175.919	2662409.081	721.414
BM153/1	528956.75	2662125.908	714.431
BM153/2	528912.051	2661863.014	706.041
BM153/3	528716.699	2661821.846	708.699
BM154/1	528476.748	2661410.439	729.245
BM154/2	528374.991	2661286.35	737.281
BM154/3	528256.571	2661073.394	736.675
BM155/1	528047.18	2660727.348	754.391
BM155/2	527918.613	2660584.345	763.091

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BM No.	Easting (m)	Northing (m)	R.L. (m)
BM156/1	527274.41	2659981.728	734.703
BM157/1	526981.176	2659810.522	714.869
BM157/2	526976.067	2659623.984	703.105
BM157/1	526981.176	2659810.522	714.869
BM157/2	526976.067	2659623.984	703.105
BM-158/1	526590.408	2659187.95	661.729
BM-158/2	526570.314	2658947.859	646.038
BM-159/1	526194.471	2658829.442	608.746
BM-159/2	526078.34	2658690.78	589.752
BM-161/1	526005.194	2657184.446	453.316

❖ **TBM Pillar List**

TBM No.	Easting (m)	Northing (m)	R.L. (m)	Remarks
TBM-C23	529896.806	2662870.731	755.73	On the top of parapet
TBM-C24	529902.111	2662866.591	755.795	On the top of parapet
TBM-C21	529472.843	2662805.902	719.486	On the top of parapet
TBM-C22	529466.788	2662802.718	719.305	On the top of parapet
TBM-C25	529523.722	2662587.648	707.214	On the top of parapet
TBM-C26	529520.294	2662594.953	707.247	On the top of parapet
TBM-C27	527948.945	2660597.054	763.614	On the top of parapet
TBM-C28	527944.121	2660601.56	763.51	On the top of parapet
TBM-C29	527737.725	2660324.361	758.008	On the top of parapet
TBM-C30	527737.53	2660331.357	757.741	On the top of parapet
TBM-C31	527580.345	2660226.029	748.754	On the top of parapet
TBM-C32	527575.144	2660223.08	748.796	On the top of parapet
TBM-B21	527481.23	2660108.392	743.598	On the top of parapet
TBM-B22	527478.284	2660114.965	743.514	On the top of parapet
TBM-B19	527409.648	2660037.587	738.768	On the top of parapet
TBM-B20	527405.647	2660043.305	738.638	On the top of parapet
TBM-B18	527222.116	2659913.085	730.119	On the top of parapet
TBM-B17	527186.636	2659904.294	728.233	On the top of parapet
TBM-B15	526986.732	2659756.939	710.768	On the top of parapet
TBM-B16	526992.362	2659754.267	710.907	On the top of parapet
TBM-C35	526948.754	2659600.65	703.183	On the top of parapet
TBM-C36	526945.78	2659606.78	703.103	On the top of parapet
TBM-C33	526861.493	2659406.06	684.933	On the top of parapet
TBM-C34	526863.477	2659413.791	685.336	On the top of parapet
TBM-C37	526615.878	2659163.301	659.991	On the top of parapet
TBM-C38	526608.293	2659160.186	659.571	On the top of parapet
TBM-C39	526532.579	2658812.327	637.376	On the top of parapet
TBM-C40	526535.676	2658819.195	637.275	On the top of parapet
TBM-B31	526288.028	2658877.737	616.316	On the top of parapet
TBM-B32	526281.008	2658881.54	616.173	On the top of parapet
TBM-B27	526249.695	2658673.436	596.777	On the top of parapet
TBM-B28	526245.178	2658678.955	596.585	On the top of parapet
TBM-B25	526028.33	2658582.07	580.711	On the top of parapet
TBM-B26	526022.173	2658584.96	580.576	On the top of parapet

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TBM No.	Easting (m)	Northing (m)	R.L. (m)	Remarks
TBM-B23	526029.913	2658439.703	564.92	On the top of parapet
TBM-B24	526036.76	2658441.695	565.047	On the top of parapet
TBM-B29	525774.357	2657842.815	505.795	On the top of parapet
TBM-B30	525762.579	2657814.814	504.499	On the top of parapet
TBM-C43	526091.451	2657501.253	475.43	On the top of parapet
TBM-C44	526087.682	2657495.439	475.342	On the top of parapet
TBM-C41	525929.994	2657015.484	440.235	On the top of parapet
TBM-C42	525936.761	2657013.725	440.297	On the top of parapet
TBM-V1	525765.605	2656755.561	426.521	On the top of rcc bridge
TBM-V2	525719.842	2656780.063	426.524	On the top of rcc bridge

- **GPS Pillar List**

GPS No.	Easting (m)	Northing (m)	Elevation (m)
GPS-151	529857.37	2662870.671	751.745
GPS-152	529493.708	2662677.302	709.141
GPS-153	529160.322	2662216.482	723.925
GPS-154	528669.755	2661631.367	714.862
GPS-155	528284.63	2660805.527	744.987
GPS-155A	528220.713	2660785.299	745.96
GPS-156	527636.852	2660328.15	752.907
GPS-157	527109.505	2659958.702	721.969
GPS-158	526857.322	2659362.376	682.3
GPS-159	526254.295	2658959.392	619.968
GPS-160	526063.547	2658333.547	553.744
GPS-161	525877.37	2657598.427	476.943
GPS-162	525790.335	2656737.39	425.596
GPS-162A	525655.763	2656825.009	426.08

The survey has been done involving the following sequential steps:

1. Establishing Bench Marks
2. Traversing and Leveling
3. Cross-section Surveying/Detailing

Following features were recorded during detailing, in general:

- ✓ Carriageway crown, carriageway edges and two intermediate carriageway points
- ✓ Roadway edges (shoulder break-points)
- ✓ Embankment toe-line
- ✓ Borrow pit / pond / ditch / toe drain profile, where present
- ✓ All break-points of natural ground
- ✓ Positions of individual entities such as trees, utility lines and poles, wells and tube wells, other pillars like ROW etc.
- ✓ Property lines and structures (with description)
- ✓ Salient points on bridges and culverts (e.g. abutment, headwall, inverts level, etc.)

The data for each survey point were recorded in terms of Northing, Easting, and Elevation. To ensure standardization of works of different survey teams and to facilitate further CAD works, a rational coding system was developed and used.

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The survey data collected in the field was downloaded in text file format and converted to graphic files using suitable software.

4.2.6 TRAFFIC SURVEY

Following traffic surveys were conducted at site to estimate the present and future traffic of the project road.

- Classified traffic volume count survey
- Axle Loading Characteristics Survey
- Intersection Volume Count Survey
- Origin - Destination Survey
- Pedestrian count Survey
- Speed & Delay Survey

The details of the Traffic Survey Locations and Analysis are provided in Chapter - 7 of the Main Report.

4.2.7 SUB-GRADE INVESTIGATION

Trial pits of size 1m x 1m were dug at the pavement shoulder interface at 0.5 km interval, extending through the pavement layers down to the sub-grade level to assess the following:

a) Visual classification of soil
b) Field density
c) Field moisture content
d) Atterberg Limits
e) Existing pavement composition
f) Available CBR

After the completion of field tests and collection of samples, the pits were backfilled with the excavated materials and compacted suitably so as not to discomfort the smooth movement of traffic of the existing road.

Analysis of Results

The results of field and laboratory investigations have been compiled in the form of tables and figures and summarized in Annexure - II of Volume III - Material Report. The factual results and the corresponding interpretations will be instrumental to assess the actual scenario of the existing road construction and will form a basis for the design of pavement structure. Summary of laboratory test result is given in Table 4.6

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TABLE 4.6: SUMMARY OF LABORATORY TEST RESULT

2 Laning with paved shoulder of Churachandrapur-Tuivai Road Sec on NH-102B in Manipur												LABORATORY TEST RESULTS										
SL NO	LOCATION / CHAINAGE (KM)	Sample No.	SIEVE ANALYSIS (% PASSING BY WEIGHT)						ATTERBERG LIMIT			I.S. CLASSI-FICATION	Differential Free swell Index %	Laboratory Compaction (Heavy)		SOAKED CBR AT 3 ENERGY LEVELS						SOAKED CBR AT 97 % OF MDD
																Test 1		Test 2		Test 3		
			20 mm	10 mm	4.75 mm	2.00 mm	425 m	75 m	LL (%)	PL (%)	PI (%)			MDD (gm/cc)	OMC (%)	DD (gm/cc)	Soaked CBR %	DD (gm/cc)	Soaked CBR %	DD (gm/cc)	Soaked CBR %	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
301	150.000	TP-301	100	82	68	58	50	46	36	20	16	SC	4.00	1.893	10.25	1.609	9.063	1.828	13.94	1.884	15.34	14.15
302	150.500	TP-302	100	93	80	76	60	40	35	22	13	SC	5.00	2.142	13.17	1.833	6.367	1.976	10.35	2.112	20.52	17.95
303	151.000	TP-303	100	91	70	56	49	43	45	22	23	SC	5.50	1.985	14.40	1.656	8.512	1.875	11.70	1.999	22.49	16.09
304	151.500	TP-304	100	81	55	41	34	30	41	24	17	SC	2.33	2.050	11.75	1.780	12.541	1.942	17.17	2.061	26.26	20.73
305	152.000	TP-305	100	100	90	86	82	66	42	26	16	MI	8.51	1.830	14.85	1.592	4.564	1.756	6.84	1.845	13.36	8.26
306	152.500	TP-306	100	93	89	85	78	64	43	22	21	CI	7.50	1.820	14.60	1.577	4.710	1.696	6.45	1.827	9.87	8.26
307	153.000	TP-307	100	95	87	80	75	59	43	25	18	CI	9.09	1.905	15.20	1.583	4.723	1.767	5.82	1.927	10.53	8.20
308	153.500	TP-308	100	100	87	75	61	54	39	24	16	CI	5.00	1.930	14.90	1.639	3.328	1.767	5.41	1.907	10.72	9.38
309	154.000	TP-309	100	100	88	75	60	52	41	24	17	CI	7.50	1.915	14.65	1.626	2.356	1.754	4.17	1.893	11.65	9.76
310	154.500	TP-310	100	100	90	85	81	71	37	21	16	CI	2.27	1.825	15.10	1.519	4.735	1.765	7.70	1.850	15.26	8.19
311	155.000	TP-311	98	89	76	64	52	47	33	19	14	SC	9.00	2.062	12.25	1.753	9.779	1.990	15.04	2.052	16.55	15.29
312	155.500	TP-312	100	85	70	60	51	42	32	19	13	SC	8.00	1.990	12.75	1.707	10.420	1.851	12.93	2.025	21.93	17.02
313	156.000	TP-313	100	82	66	57	48	39	30	18	12	SC	4.55	1.995	12.40	1.694	13.080	1.885	15.59	2.007	23.74	18.94
314	156.500	TP-314	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
315	157.000	TP-315	100	83	60	43	30	23	Non Plastic			SM	0.00	2.160	9.90	1.839	17.774	2.058	29.01	2.198	57.42	36.53
316	157.500	TP-316	87	65	39	28	21	16	Non Plastic			GM	0.00	Modified proctor and CBR Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade								
317	158.000	TP-317	84	78	67	55	44	37	37	22	15	SC	2.00	2.010	12.95	1.746	20.508	1.904	28.10	2.020	42.97	30.80
318	158.500	TP-318	85	77	73	67	49	32	33	18	15	SC	3.50	1.913	11.02	1.606	9.520	1.769	12.62	1.882	21.44	19.40
319	159.000	TP-319	90	81	77	72	50	30	31	20	11	SC	2.50	2.096	11.42	1.764	11.780	1.919	16.19	2.134	31.13	24.11
320	159.500	TP-320	75	72	62	51	41	35	36	22	14	SC	2.33	2.094	9.00	1.780	23.137	2.022	35.60	2.084	39.15	36.13
321	160.000	TP-321	79	60	41	30	21	16	Non Plastic			GM	0.00	2.094	9.00	1.780	23.137	2.022	35.60	2.084	39.15	8.23
322	160.500	TP-322	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
323	161.000	TP-323	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
324	161.500	TP-324	85	69	59	51	41	27	Non Plastic			SM	0.00	Modified proctor and CBR Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade								
325	162.000	TP-325	78	65	49	42	37	32	Non Plastic			GM	0.00	Modified proctor and CBR Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade								

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Composition of Existing Pavement

Existing crust thickness varies from 100mm to 540mm. The layer composition of the existing pavement noted from each excavated pit is given Annexure - I of Volume – III: Material Report.

4.2.8 QUARRY MATERIAL

The material investigation for road construction material required to be carried out to identify the potential sources of construction materials and to assess their general availability, engineering properties and quantities. This is one of the most important factors for stable, economic and successful implementation of the road program within the stipulated time. The material investigation is quite representative, but more exhaustive search may surely be explored by the contractors at the time of construction. For improvement work as well as for new construction the list of materials includes the following:

- Granular materials for sub-base works
- Crushed stone aggregates for base , bituminous surfacing and cement concrete works
- Sand for bituminous and cement concrete works, sub-base, filter materials and filling materials etc.
- Borrow earth/moorum materials for embankment, sub-grade and filling.

OBJECTIVE

The following are the basic objective to make material investigation:

- Source locations indicating places, kilometerage, availability and the status whether in operation or new source.
- Access to source, indicating the direction and nature of the access road i.e. left/ right of project road, approximate lead distance from the gravity center and type of access road.
- Ownership of land/ quarries, either government or private.
- Test results, indicating the quality of materials with respect to their suitability in construction.
- Probable use indicating the likely use of materials at various stages of construction work i.e. fill material, sub-grade, sub-base, base, bituminous surfacing and cross drainage structures.

The potential sources of construction materials were selected from consideration of the availability and suitability of the materials, easy access to the source and minimum hauling distance from the source in order to make the construction economical and feasible as far as possible. Details are given below:

Leads for Various Materials (Package – IV B)

Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	length of Project Road (Km)	Total Lead (Km)
1	Sand (Fine)	Tuivai River	1	17	18
2	Filling Material	Local	-	-	10
3	Stone Metal	Tuivai River	1	17	18
4	Stone Boulder	Tuivai River	1	17	18
5	Stone Chips, Aggregate	Tuivai River	1	17	18
6	Coarse Sand	Tuivai River	1	17	18
7	Cement	Imphal	189	17	206
8	Steel	Imphal	189	17	206
9	Bitumen	Imphal	189	17	206

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Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	length of Project Road (Km)	Total Lead (Km)
10	Bitumen Emulsion	Imphal	189	17	206
11	Structural Steel	Imphal	189	17	206
12	RCC Pipe	Imphal	189	17	206

4.2.9 BORROW AREA REQUIREMENT:

Package – IV B:

Quantity of Earthwork in Cutting = 757587 cum (Ref. Quantity Calculation for Road Works of Volume-II: Cost Estimation)
Total ordinary Rock Cutting volume = 151517 cum
So, total quantity of Earthwork in soil = (757587–151517) cum = 606070 cum

Amount of Earthwork can be used for filling of embankment from Roadway cutting material (considering 60% quantity of Earthwork in soil) = 363642 cum

Now, requirement of total Earthwork quantity in Filling is 79402 cum., which can be compensated from the suitable roadway cut material.

Therefore, no Borrow area soil is required for embankment construction in Package – IV B of the project road.

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4.2.10 MUCK DISPOSAL

The muck from hill cutting and construction activities will be safely disposed at suitable locations. Principle adopted for selecting muck dumping areas was to avoid sensitive areas like dense vegetation, natural water courses and areas prone to landslides. During the selection of the dumping sites preference was given on the following aspects.

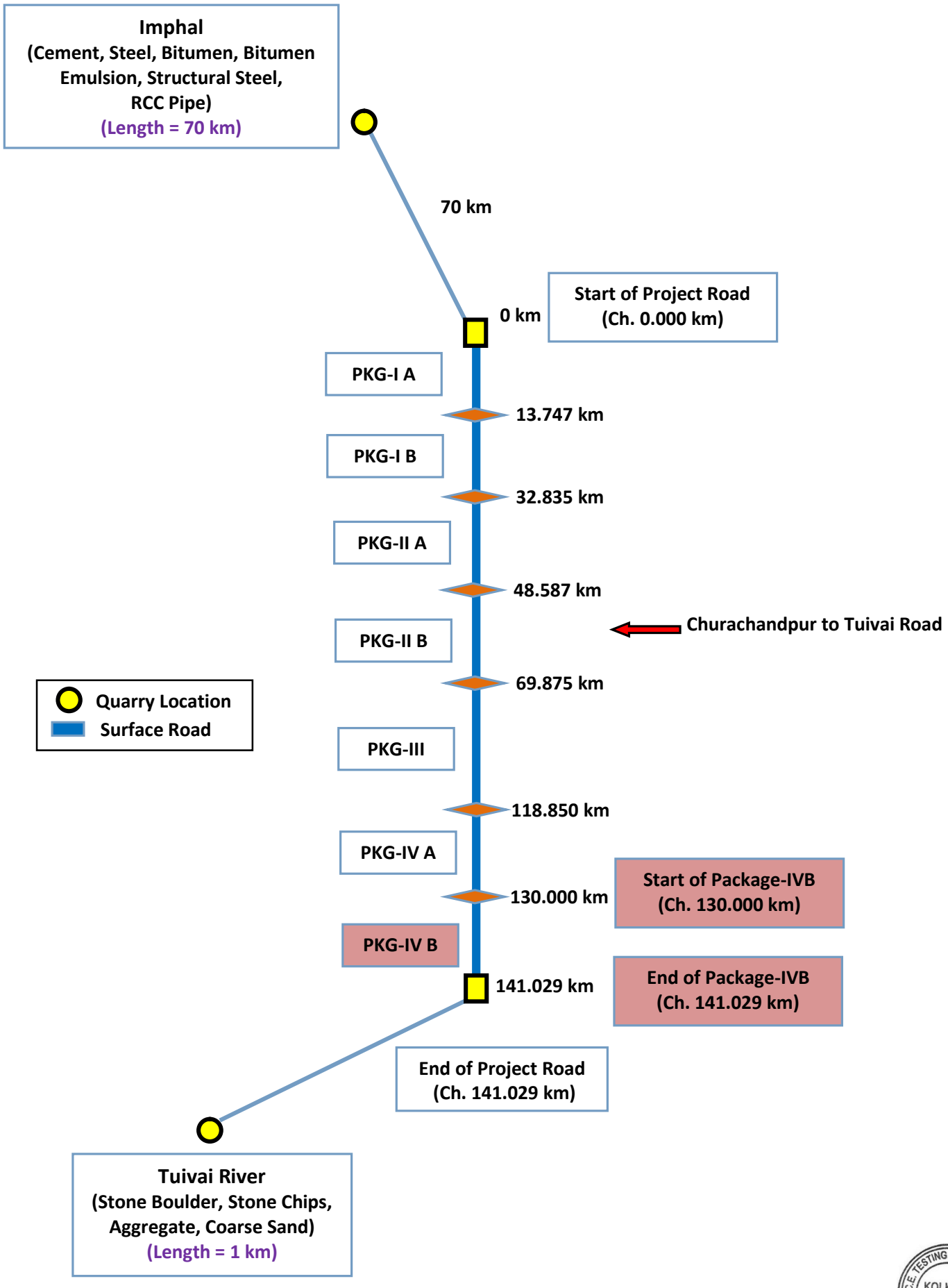
- The muck does not fall/ flow into stream/river.
- Dumping sites should be at least 30 m (horizontal) away from the High Flood Level of the River/ stream.
- The sites are free from active landslides or creeps.
- The sites should not fall within pristine forest nor are these habitats of threatened species of flora and fauna.
- The sites are located close to its source in order to avoid long distance haulage.

Details of Muck Disposal area has given below:

Package	Quantity of Muck/Debris generated in Cum	Quantity of Muck with 30% swell factor in Cum	Total Quantity of Muck/Debris including swell factor in Cum	Estimated Quantity of Muck/Debris proposed to be utilized for Filling in cum	Estimated quantity of muck/debris proposed to be dumped in cum.	Estimated quantity of muck/debris dumped in Valley Side within our Proposed ROW in Cum	Estimated quantity of muck/debris dumped in other location in Cum	Avg. Dumping Height in M.	Avg. Dumping Area (Sq m.)	Avg. Dumping Area (Ha.)
IV-B	752090.64	225627.19	977717.83	79351.89	898365.94	50000.00	848365.94	20	42418.30	4.24

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Lead Chart for Material



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4.2.11 PHOTOGRAPHS

Photographs of field activities are given below:



Road Inventory at Ch. Km 68+500



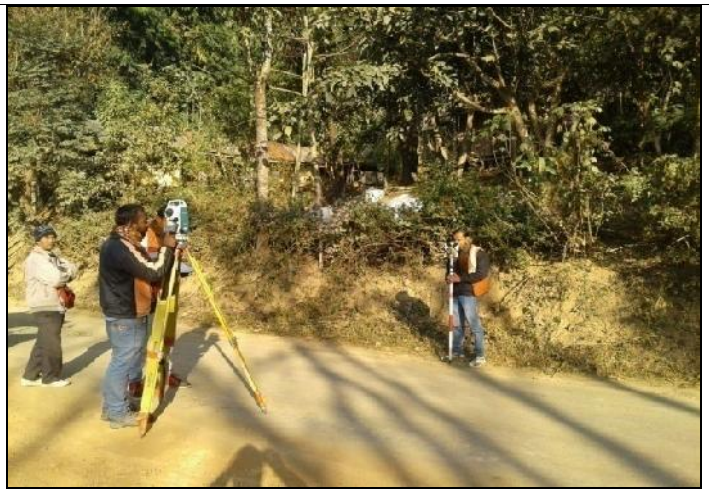
Pavement Condition Survey at Ch. Km 40+500



Culvert Inventory at Ch. Km 26+400



Bridge Inventory at Ch. Km 48+304



Topographic Survey at km 5+300



Trial Pit at km 14+100

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TMC Survey



CTVC Survey



Axle Load survey



OD Survey



Pedestrian Survey



BBD Survey

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CHAPTER-5
SOCIAL ANALYSIS

5.1 INTRODUCTION AND BACKGROUND

5.1.1. The Project

Manipur is one of the Border States in the north-eastern part of the country having an international boundary of about 352 kms. long stretch of land with Myanmar in the southeast. It is bounded by Nagaland in the north, Assam in the west and Mizoram in the south. It has a total area of 22327 sq. kms. It lies between 23.80 N to 25.70 N latitude and 93.50 E to 94.80 E longitude.

Geographically, the State of Manipur could be divided into two regions, viz. the hill and the valley. The valley lies in the central part of the State and the hills surround the valley. The average elevation of the valley is about 790 m above the sea level and that of the hills is between 1500 m and 1800m. Manipur earlier had 9 districts - Imphal West, Imphal East, Bishnupur, Thoubal, Ukhrul, Senapati, Tamenglong, Churachandpur and Chandel and the newly formed districts are Kangpokpi, Tengnoupal, Pherzawl, Noney, Kamjong, Jiribam and Kakching. The hill districts occupy about 90 percent (20089 sq km) of the total area of the State and the valley occupies only about tenth (2238 sq km) of the total area of the State. Imphal is the capital city of Manipur.

In the need of development of the newly created state the Government of India under the vehicle of National Highway Authority of India had initiated in constructing/upgrading the road conditions in the state. The district of Churachandpur in the state of Manipur, does not have any railway connectivity so there was an urgent requirement of the development of the roadways.

Realizing the above fact National Highways & Infrastructure Development Corporation Limited (NHIDCL) has taken up one prestigious road network improvement projects namely developing a road from Churachandpur to Tuivai (Mizoram Border). The upgraded road will connect Manipur (Churachandpur Town) and Mizoram at Tuivai. The Design road length is 141.029 km. The road starts Chrachandpur main town and end at Tuivai. The project road has distributed in four packages. The 4th (IVB) Package starts from chainage 130.000 km to 141.029 km. Project road passes through mountainous terrain with some stretches having steep terrain.

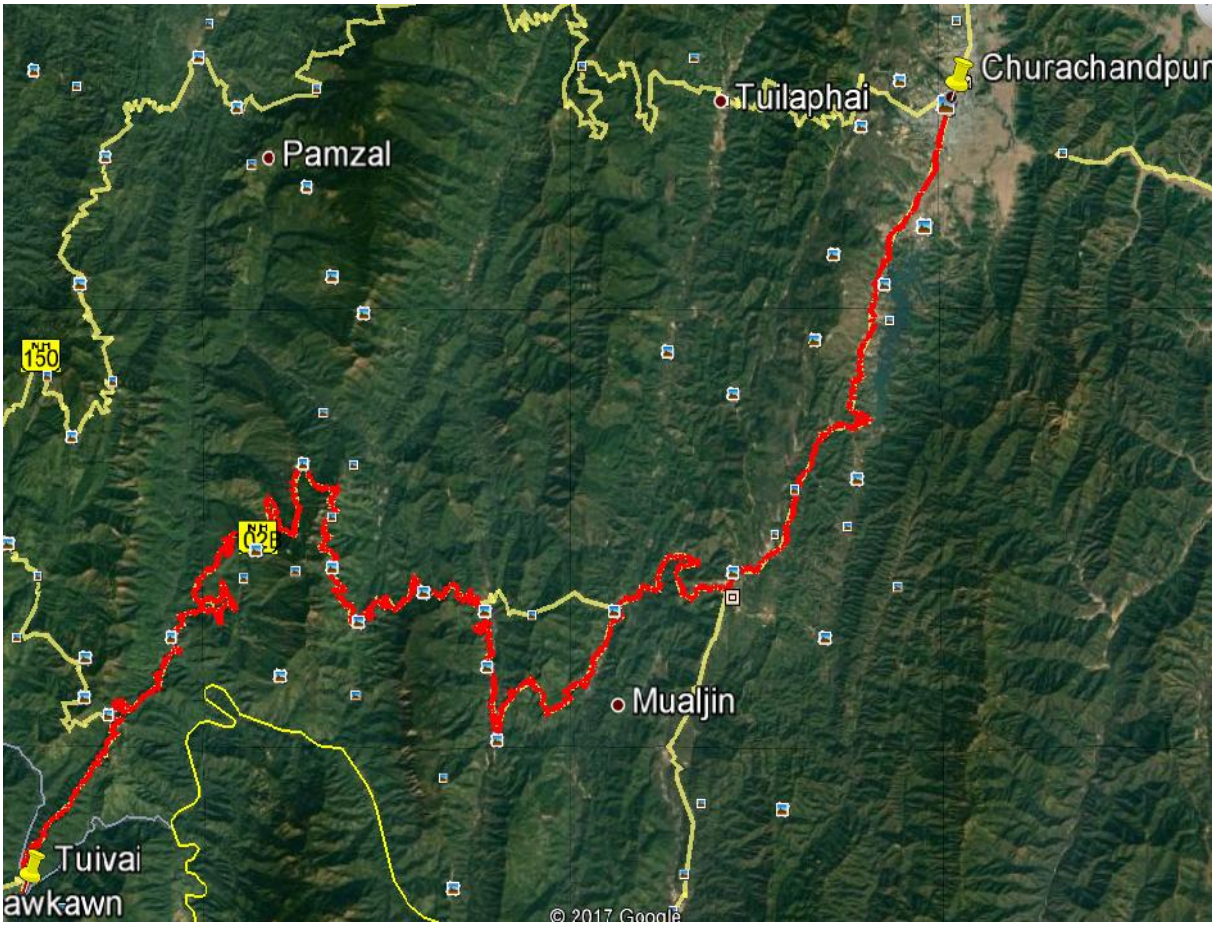
Provision of a high class access controlled facility for high mobility in the form of NH/SH may be useful in bypassing the city by external traffic, if it is not connected to the core by proper road network. It will not be helpful in decongesting the core area. Realizing this need NH has proposed 30 National Highways in its master plan. The National Highways not only provide connectivity between the cities but also serve as a connecting link between proposed townships and the cities. They also help in serving the traffic expected to be generated by the exploring activities in the outer municipalities. The NH with its service roads connected to the cities by National Highway network is expected to direct the development of Project Influence Area and will be a position to cater the travel demand patterns generated by these developments.

The National Highway Infrastructural Development Corporation Limited (NHIDCL) Manipur Wing planned to develop the major arterial roads to facilitate smooth traffic flow on existing major

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arterials and State Highways.

Figure 5.1: Depicting Map of the Project Road



Source: Google

Adequate attention has been given during the feasibility phases of the project preparation to minimize the adverse impacts on land acquisition and resettlement impacts. However, technical and engineering constraints were one of the major concerns during exploration of various alternative alignments. With the available options, best engineering solution have been adopted to avoid large scale land acquisition and involuntary resettlement impacts.

This Resettlement Plan (RP) is prepared to mitigate all unavoidable negative impacts caused due to the project, resettle the displaced persons and restore their livelihoods. This Full Resettlement Plan has been prepared on the basis of census survey findings and consultation with various stakeholders. The plan complies with National Highway policy for involuntary resettlement and rehabilitation.

5.1.2. Scope of Land Acquisition and Resettlement Impacts

From Drain Edge to Drain Edge in Built up area is varying from 6 m to 16 m & in hilly area from hill toe to valley edge is varying from 4 m to 8 m. However, the existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area and hence land is required to be acquired to adhere to the codal provision.

As discussed the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of two lane with paved shoulder new Bypasses / Realignment are

suggested. According to the Land Acquisition Plan (LAP) for Package-IVB prepared as a part of Project Report, 17.1 ha of Total land will be acquired for the project. A project census survey was carried out to identify the persons who would be displaced by the project and to make an inventory of their assets that would be lost to the project, which would be the basis of calculation of compensation.

As per requirement of the Resettlement Action Plan for Package- IVB a 100% census survey of the likely affected Displaced Persons (DP) have been conducted again in December 2019 of affected land and non-land assets of the project has been taken up. The impacts can be broadly classified as (i) impacts on private land, (ii) impacts on private structures including (Encroachers and Squatters), (iii) impacts on livelihoods due to loss of private properties and (iv) loss of common property resources. The census survey reveals that altogether in no private structures will be affected due to the project work. As per the socio economic survey, no household, no DPs will be affected in the project. The details of project impacts as revealed in the study have been depicted in the following section and the summary of the project impacts are presented in the ***(Table 1.1)***.

Table: 1.1: Brief Summary of the Resettlement Impact of Package-IVB.

Sl.	Impacts	Number
1	Total land acquisition requirements (in ha)	17.1
2	Total no. of private Residential structures	0
3	Total no. of private Commercial structures	0
4	Total number of Residential cum Commercial structures	0
5	Total number of other private structure	0
6	Total No. of Affected Families by affected structure	0
7	Total Number of Vulnerable households affected of Affected structure	0
8	Total number of displaced persons (DPs)	0
9	Total number of CPRs affected (Community and Religious)	0

Source: Census Survey on December, 2019

5.1.3. Stakeholders Consultation and Participation

Focus Group Consultations with various stakeholders were carried out during various phases of project preparation. Key person and focus group consultations at section of the society were arranged at the stage of project preparation to ensure peoples' participation in the planning phase of this project and to treat public consultation and participation as a continuous two-way process. Aiming at promotion of public understanding and fruitful solutions of developmental problems such as local needs and problem and prospects of resettlement, various sections of DPs and other stakeholders were consulted through focus group discussions and individual interviews.

To keep more transparency in planning and for further active involvement of DPs and other stakeholders, the project information will be disseminated through disclosure of resettlement planning documents. This report with the Entitlement Matrix after accepted by the EA and National Highway would be available for disclosure on both EA's and National Highway's website.

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5.1.4. Legal and Policy Framework

The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the Government of Manipur, Government of India, Safeguard Policies and guidelines of National Highway's guidelines. Prior to the preparation of the Resettlement Plan, a detailed analysis of the proposed national and state policies was undertaken and an entitlement matrix has been prepared for the entire program. The section below provides details of the various national and state level legislations studied and their applicability within this framework. This RP is prepared based on the review and analysis of all applicable legal and policy frameworks of the country and National Highway policy requirements.

The objectives of the Resettlement Framework as per the policies are as follows: -

- To minimize displacement and to identify non-displacing or least-displacing alternatives.
- To plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special needs of Tribal and vulnerable sections.
- To provide better standard of living to DPs; and
- To facilitate harmonious relationship between the Requiring Body and DPs through mutual cooperation.
- The involuntary resettlement would be avoided wherever possible or minimized as much as possible by exploring project and design alternatives.
- The Project or all sub-projects under the program will be screened to identify past, present, and future involuntary resettlement impacts and risks.
- The scope of resettlement planning will be determined through a survey and/or census of displaced persons, including a gender analysis, specifically related to resettlement impacts and risks.
- Meaningful consultations with affected persons, host communities, and PIU will be carried out and all displaced persons will be informed of their entitlements and resettlement options participation in planning, implementation, and monitoring and reporting of resettlement programs will be ensured.
- Particular attention will be paid to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land, and ensure their participation in consultations.
- An effective grievance redress mechanism will be established to receive and facilitate resolution of the displaced persons' concerns. The social and cultural institutions of displaced persons and their host population will be supported through proper planning. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be preceded by a social preparation phase.
- The livelihoods of all displaced persons will be improved or at least restored through (i) land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement value for land when the loss of land does not undermine

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livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where possible.

- Physically and economically displaced persons will be provided with needed assistance, including (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities; (ii) Transportation support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.
- The standards of living of the displaced poor and other vulnerable groups, including women, will be improved to at least national minimum standards. In rural areas legal and affordable access to land and resources will be provided, and in urban areas appropriate income sources and legal and affordable access to adequate housing will be provided to the displaced poor.
- If land acquisition is through negotiated settlement, procedures will be developed in a transparent, consistent, and equitable manner to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status. If, however, the negotiated settlement fails, the normal procedure of land acquisition will be followed.
- Displaced persons without titles to land or any recognizable legal rights to land will be ensured that they are eligible for resettlement assistance and compensation for loss of non-land assets.
- A resettlement plan will be prepared elaborating on displaced persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.
- The draft resettlement plan, including documentation of the consultation process will be disclosed in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. The final resettlement plan and its updates will also be disclosed to displaced persons and other stakeholders.
- Involuntary resettlement will be conceived and executed as part of a development project or program. Full costs of resettlement will be included in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.
- All compensation will be paid and other resettlement entitlements will be provided before physical or economic displacement. The resettlement plan will be implemented under close supervision throughout project implementation.

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- Resettlement outcomes, their impacts on the standards of living of displaced persons will be monitored; it will be accessed whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Monitoring reports will be disclosed to DPs.
- Land acquisition for the project would be done as per National Highway Act, 1956 and the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. To meet the replacement cost of land payment of compensation in revised rate.
- The uneconomic residual land remaining after land acquisition will be acquired as per the provisions of Land Acquisition Act. The owner of such land/property will have the right to seek acquisition of his entire contiguous holding/ property provided the residual land is less than the average land holding of the district.
- People moving in the project area after the cut-off date will not be entitled to any assistance. In case of land acquisition, the date of publication of preliminary notification for acquisition under RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 will be treated as the cut-off date.
- All common property resources (CPR) lost due to the project will be replaced or compensated by the project.

The project will recognize three types of displaced persons like (i) persons with formal traditional rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and (iii)persons who lost the land they occupy in its entirety or in part who have neither formal traditional rights nor recognized or recognizable claims to such land but occupying the land for than three years. The involuntary resettlement requirements apply to all three types of displaced persons.

5.1.5. Entitlements, Assistance and Benefits

The project will have three types of displaced persons i.e., (i) persons with formal legal/traditional rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no forma/traditional legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land. The involuntary resettlement requirements apply to all three types of displaced persons.

Compensation eligibility is limited by a cut-off date as set for this project on the day of the beginning of the census survey which is December 2019. DPs who settle in the affected areas after the cut-off date will not be eligible for compensation. They, however, will be given sufficient advance notice, requested to vacate premises and dismantle affected structures prior to project implementation. Their dismantled structures materials will not be confiscated and they will not pay any fine or suffer any sanction.

Compensation for the lost assets to all displaced persons will be paid on the basis of replacement

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cost. Resettlement assistance for lost income and livelihoods will be provided to both title holders. Special resettlement and rehabilitation measures will be made available to the "Vulnerable Group" comprises of DPs living below poverty line (BPL), SC, ST, women headed households, the elderly and the disabled. The detail of the assistance and entitlements has been discussed in the following chapters.

5.1.6. Relocation of Housing and Settlements

The EA will provide adequate and appropriate replacement land and structures or cash compensation at full replacement cost for lost land and structures, adequate compensation for partially damaged structures, and relocation assistance, according to the Entitlement Matrix. The EA will compensate to the title holders for the loss of assets other than land, such as dwellings, and also for other improvements to the land, at full replacement cost.

5.1.7. Income Restoration and Rehabilitation

Due to loss of land and structures, many households shall lose their livelihoods or shall get economically displaced. The DPs losing their livelihoods includes titleholders land, agricultural labourers, agricultural tenants, and sharecroppers, DPs having commercial structures and employees of the affected structures. In the case of economically displaced persons, regardless of whether or not they are physically displaced, the EA will promptly compensate for the loss of income or livelihood sources at full replacement cost. The EA will also provide assistance such as credit facilities, training, and employment opportunities so that they can improve, or at least restore, their income-earning capacity, production levels, and standards of living to pre-displacement levels.

5.1.8. Resettlement Budget

The resettlement cost estimate for this project includes eligible compensation, resettlement assistance and support cost for RP implementation. The support cost, which includes staffing requirement, monitoring and reporting in project implementation and other administrative expenses are part of the overall project cost. The unit cost for land and other assets in this budget has been derived through field survey, consultation with affected families, relevant local authorities and reference from old practices. Contingency provisions have also been made to take into account variations from this estimate. The total R&R budget for the Package-IVB of proposed project RP works out to Rs. 63.30 Lacs as per Minimum Guidance Value.

5.1.9. Institutional Arrangements

For implementation of RP there will be a set of institutions involve at various levels and stages of the project. The Executing Agency (EA) for the Project is NHIDCL. They have already set up a Project Implementing Unit (PIU) headed by a Project Director (PD) with Technical Manager and Deputy Managers (DGM) assisted by other staffs. This office will be functional for the whole Project duration. The EA, headed by PD will have overall responsibility for implementation of the project and will also be responsible for the overall coordination among NHAI, Government of Manipur and PIU. For resettlement activities, PIU will do the overall coordination, planning, implementation, and financing. Project Implementation Unit (PIU) will be established at project level for the implementation of sub-

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projects.

5.1.10. Implementation Schedule

Implementation of RP mainly consists of compensation to be paid for affected structures and rehabilitation and resettlement activities. A composite implementation schedule for R&R activities in the project including various sub tasks and time line matching with civil work schedule is prepared and presented in the following chapters. The cut-off date will be notified formally for titleholder as the date of LA notification. However, the sequence had change or delay had occurred due to circumstances beyond the control of the Project and accordingly the time can be adjusted for the implementation of the plan. The present implementation schedule may be structured through package wise. The entire stretch can be divided in to various contract packages and the completion of resettlement implementation for each contract package shall be the pre-condition to start of the civil work at that particular contract package.

5.1.11. Monitoring and Reporting

Monitoring and reporting are critical activities in involuntary resettlement management in order to ameliorate problems faced by the DPs and develop solutions immediately. Monitoring is a periodic assessment of planned activities providing midway inputs. It facilitates change and gives necessary feedback of activities and the directions on which they are going. In other words, monitoring apparatus is crucial mechanism for measuring project performance and fulfilment of the project objectives.

PIU responsible for supervision and implementation of the RP will prepare monthly progress reports on resettlement activities and submit to EA. The Resettlement Expert under CSC would be responsible for monitoring of the RP implementation will submit a quarterly review report to determine whether resettlement goals have been achieved, more importantly whether livelihoods and living standards have been restored/ enhanced and suggest suitable recommendations for improvement. All the resettlement monitoring reports will be disclosed to DPs as per procedure followed for disclosure of resettlement documents by the EA. An External Monitor to be engaged to review and monitor the implementation process and time frame of the resettlement and rehabilitation of the DPs. The External Monitor may submit a biannual report on the progress of the implementation of the Resettlement action plan to NHIDCL.

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5.2 PROJECT DESCRIPTION

5.2.1. General

National Highway Infrastructure Development Company Limited has decided to prepare a Project Report for NH-102B with a minimum of 2-Lane with paved shoulder configuration starting from Churachandpur Tow and ending at Tuivai (Mizoram Border) in the District of Churanchandpur, Manipur, on Engineering, Procurement & Construction (EPC) basis or SBD mode as will emerge out on preparation of Project Report.

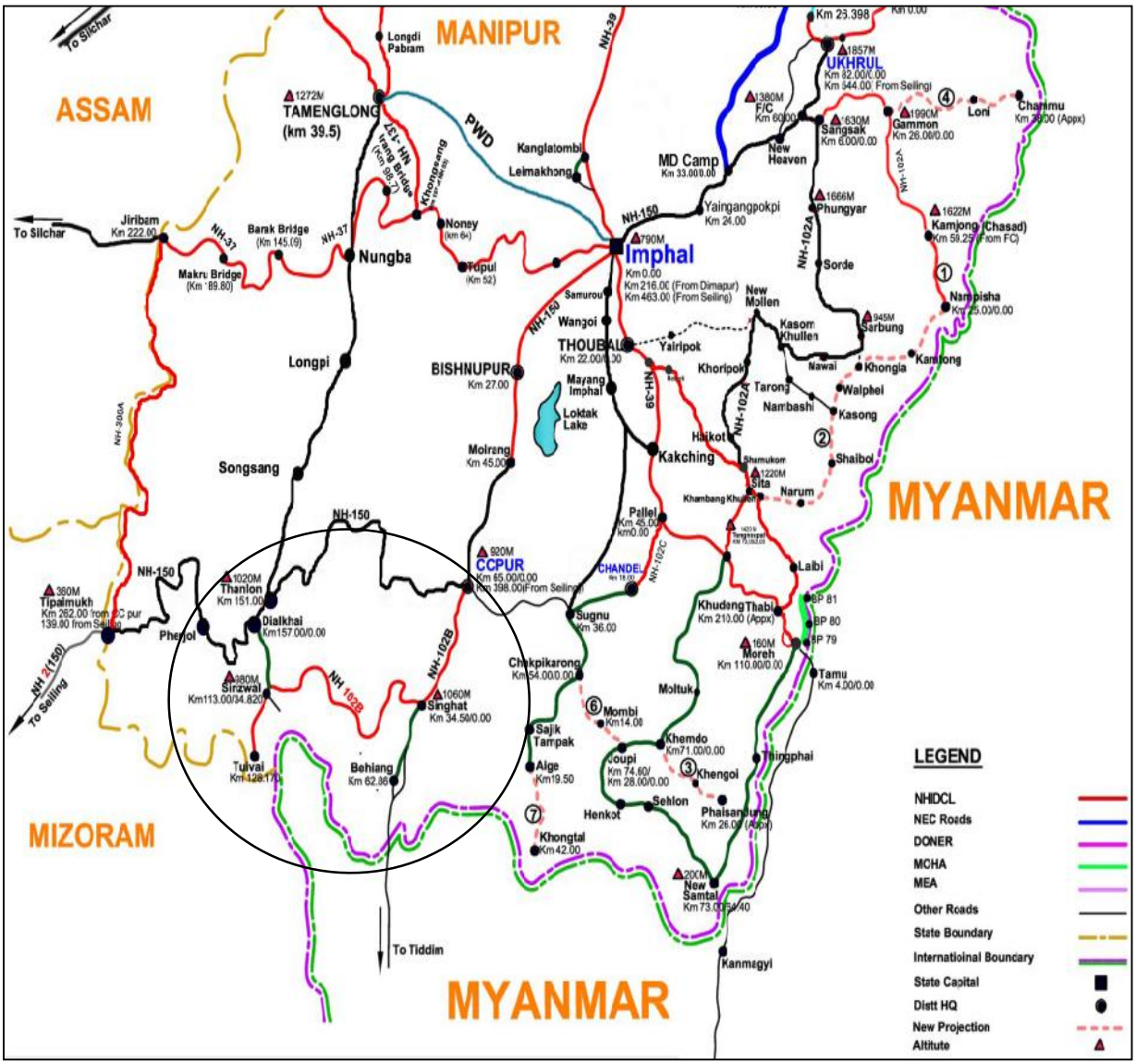
5.2.2. The Project Road and its Location

The project road starts from Churachandpur Town (Junction of NH-102B and old NH-2) and ends at Tuvai in the district of Churanchandpur. As per design the total length of the project road comes out as 130.562 km. The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E. Most part of the District is in through mountainous / hilly terrain and very small portion. The topography is mostly rural in nature. This Road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and Tuivai. The 4th (IVB) package starts from Chainage 130.000 to 141.029 km and it lie on Churachandpur district only.

From Drain Edge to Drain Edge in Built up area is varying from 6 m to 16 m & in hilly area from hill toe to valley edge is varying from 4 m to 8 m. However, the existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area and hence land is required to be acquired to adhere to the codal provision.

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Figure 5.2: Location Map



5.2.3. Profile of the Project Area

The project road section passes through Churachandpur districts of Manipur State. The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E.

5.2.4. The Profile of the District of Churachandpur

In 1972, Manipur state was divided into five districts namely Central, West, East, North and South districts. The Central district comprised the whole of the Imphal Valley and Jiribam Sub-Division. In the 1980s it was further divided into the three valley districts of Imphal, Bishenupur and Thoubal. The East, West, North and South districts later became the hill districts of Ukhrul, Tamenglong, Senapati and Churachandpur district respectively. A fifth hill district, Chandel, was carved out from the erstwhile East and South districts. These five are the homes to twenty-nine (29) recognized Scheduled Tribes of Manipur. Among the hill districts, the fastest growing district headquarters and

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hill-town is that of Churachandpur. All the communities of Manipur live happily in small but noticeable sizes amongst the more populous tribal folk belonging to Chin, Kuki, Mizo, Naga and Zomiethnic groups -a mosaic of tribes, well laid out and glowing with life.

Churachandpur District, in the southwestern corner of Manipur, has an area of 4,570 sq. km. The district got its name "Churachandpur" from the Manipur king Churachand Maharaja. It is bounded by North latitudes 23056'20.4"and 24036'46.8"and East longitudes 92058'12''& 93052'58.8''. It is a hilly district with a very small percentage of the plain area. The district is bounded by Senapati district in the north, Bishnupur and Chandel districts in the east, Assam and Mizoram in the west and Myanmar on the south. The total population of the district as per 2011census is 2,71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung.

Table 2.1: Churachandpur District

1. Geography		
(i) Temperature	Maximum: 37^0 C	Mininum: 10^0 C
(ii) Location	Latitude: $23^0$56'20.4"N-$24^0$36'46.8"N	Longitude: $92^0$58'12"E-$93^0$52'58.8"E
(iii) Rainfall	Average rainfall recorded in Churachandpur district is from 3080mm to 597mm.	
2. Administrative Units		
Sub Divisions	Revenue Villages	Assembly Area
5 Nos.	540 Nos.	6 Nos.
5. Area	4,570 Square kms	
6. Forest	4,157 Square kms	
7. Roads		
a) National Highway	2010-11	270 km
b) State Highway	2010-11	58 km
c) Major District & Rural Roads	2010-11	179.50 km
d) Other District & Rural Roads	2010-11	20 km
e) Rural Road/Agriculture Marketing Board Roads	2010-11	175 km
f) Kachacha Road	2010-11	340 km
7. Census		
Description	2011	2001
Actual Population	274,143	227,905
Male	138,820	117,232
Female	135,323	110,673
Population Growth	20.29%	29.36%
Area Sq. Km	4,570	4,570
Density/km2	60	50

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Proportion to Manipur Population	9.60%	9.94%
Sex Ratio (Per 1000)	975	944
Child Sex Ratio (0-6 Age)	948	968
Average Literacy	82.78	70.60
Male Literacy	86.97	77.70
Female Literacy	78.50	63.10
Total Child Population (0-6 Age)	37,445	30,879
Male Population (0-6 Age)	19,227	15,690
Female Population (0-6 Age)	18,218	15,189
Literates	195,935	139,080
Male Literates	104,013	78,871
Female Literates	91,922	60,209
Child Proportion (0-6 Age)	13.66%	13.55%
Boys Proportion (0-6 Age)	13.85%	13.38%
Girls Proportion (0-6 Age)	13.46%	13.72%

Source: Website of Manipur State

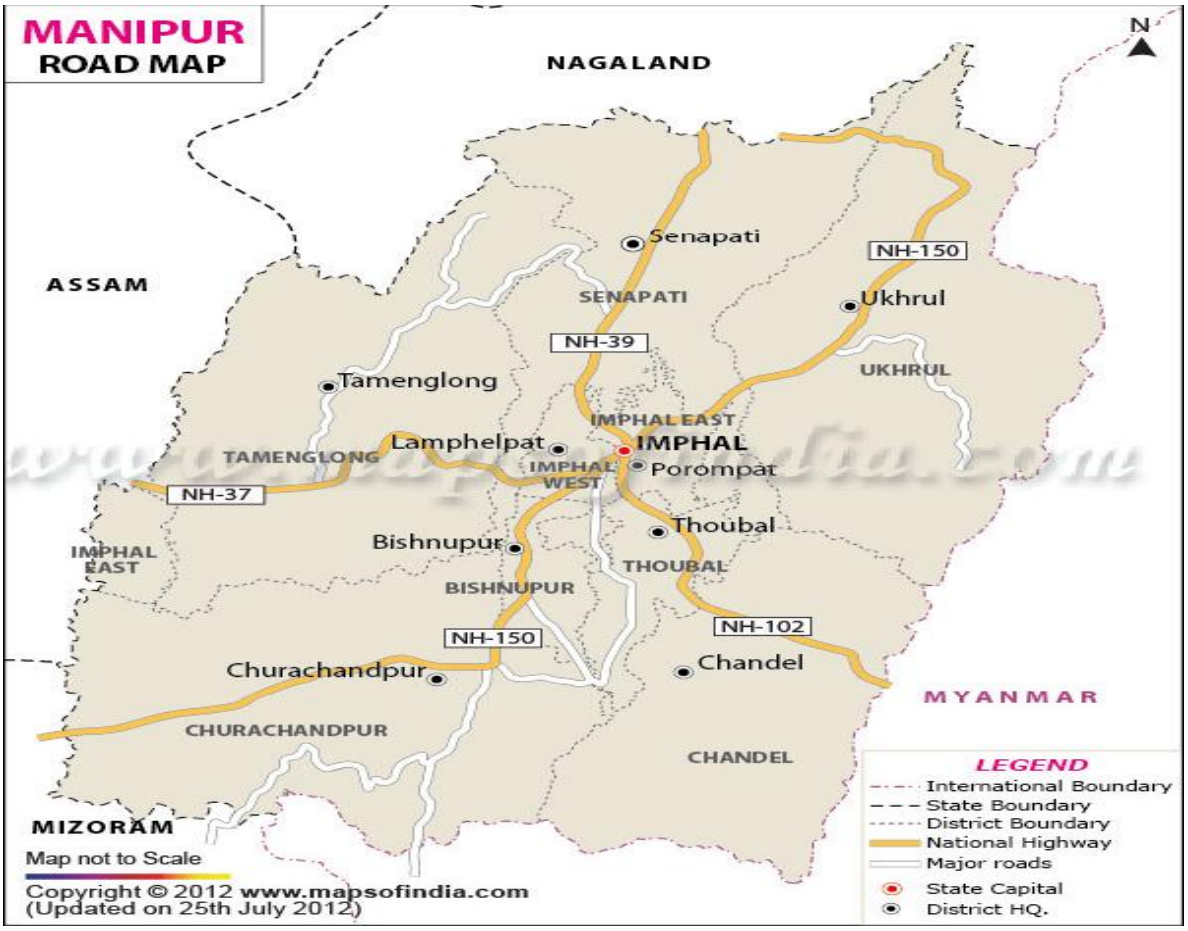
5.2.5. The Profile of the State of Manipur

Manipur is a state in north eastern India, with the city of Imphal as its capital. It covers an area of 22,347 square kilometres. The state is bounded in the north by Nagaland, in the south by Mizoram, Assam lies in the west and nation of Myanmar is bordering in the east. Manipur has a recorded history of kingship since 33 A.D. with the coronation of Pakhangba followed by a series of kings ruling over the kingdom of Manipur. The independence and sovereignty of Manipur remained uninterrupted until the Burmese invaded and occupied it for seven years in the first quarter of the 19th century (1819-25). In 1891 British Govt. brought it under its rule, and later on it was merged in the Indian Union as part "C" State on 15 October, 1949. This was replaced by a Territorial Council of 30 elected and 2 nominated members. In 1963, a Legislative Assembly of 30 elected and 3 nominated members was established under the Union Territories Act, 1962. Manipur attained full-fledged statehood on 21 January, 1972. With this, a Legislative Assembly consisting of 60 elected members was established.[11]

[11] Wikipedia

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Figure 5.3: State Road Map



Physiographically, Manipur is characterised in two distinct physical regions – an outlying area of rugged hills and narrow valleys, and the inner area of flat plain, associated with residual mounds and undulating plains. These two regions are also conspicuous with respective distinct various flora and fauna. The Loktak lake is an important feature of the central plain. The hills cover about 9/10th of the total area of the State. Manipur Valley is about 790 metres above the sea level. The hill ranges are higher on the north and gradually diminish in height as they reach the southern part of Manipur. The valley itself slopes down towards the south. The highest peak is Mt. Iso of 2,994 m altitude near Mao.

Manipur state has four major river basins: the Barak River Basin (Barak Valley) in the west, the Manipur River Basin in central Manipur, the Yu River Basin in the east, and a portion of the Lanye River Basin in the north. The total water resources of Barak and Manipur river basins are about 1.8487 Mham. The Barak River, the largest of Manipur, originates in the Manipur Hills and is joined by a number of tributaries, all originating from surrounding hills. Rivers in the valley area are in mature stage and deposit their sediments in Loktak. The rivers in the hills cause land erosion and in rainy season turn into turbulent form.

According to 2011 census Manipur has a total population of 2,721,756 and ranked 22nd among Indian states. Its density of population is 115 persons per square kilometre. Population communities of Manipur comprise Meitei, Pangal, Naga, Kuki and Mizo. The Meitei, who live primarily in the state's valley region, form the primary ethnic group (60% of the total population). They occupy about 10% of the total land area. The Muslims (the Meitei-Pangal) also live in the valley. The Kuki, Naga,

Mizo and several other smaller tribal communities make up about 40% of the population but occupy the remaining 90% of the total area of Manipur.

5.2.6. Impact and Benefits

The road project is associated with some adverse impacts as well as some benefits. The major impacts of the road project include loss of agricultural land due to acquisition of land all along the project corridor and in Realignment. But it should be kept in mind that the project road strategically interconnects two major states namely Manipur and Mizoram. Boost in agricultural and industrial development can be viewed as boosting economic growth and poverty reduction which will bring substantial social and economic development in the region. The social benefits arising due to the project will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, workplace etc. which in turn increases the income of the locals, and ultimately elevating their standard of living. The possible direct and indirect positive impacts of the project are listed below.

- Road network will not only link the village communities to better national markets, but also open up wider work opportunities in distant places. People can shuttle to distant worksites and engage in construction, mining, factories, business as well as domestic works.
- The immediate benefits of road construction and improvement will come in the form of direct employment opportunities for the roadside communities and specially those who are engaged as wage labourers, petty contractors and suppliers of raw materials.
- Effective drainage system to ensure that there will be no pooling of water
- Safety measures for Highway signs, Pavement marking, Traffic signals, Truck lay byes, Bus stops and Bus bays
- Rectification of geometric deficiencies (both Horizontal & Vertical).
- Provision of Pedestrian passes.
- Provision of ROBs to fly over the traffic and minimize the traffic congestion, if required.
- Provision of ROBs over railway crossings, if required.
- Slope protection.
- Provision of crash barrier at Bridge approaches.
- Improvement of all Major and Minor Intersections.
- Facilities for public amenities such as Restrooms, Telephone booths, Toilets, shops and Trauma Centres.

Other benefits: -

- It will give a major fillip to the quest for all weather connectivity.
- It will reduce travel time between towns and cities by 50% to 60%.
- It will enhance the spirit of enterprise.
- Help the locals to ply their trade.

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- Provide direct employment in road construction and allied activities.
- Lower accident and provide quick accessibility to services like hospital, market, office etc.
- Will help in growth of tourism activities immensely.

5.2.7. Project Feature

The name of the road as per offer and agreement is Churachandpur (Junction of NH-102B and old NH-2) is to be upgraded under this study. The upgraded road will connect old NH-2 at New Lamka town in Churachandpur. The Project Road passes through) Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and Tuivai in the State of Manipur. The project road lies in Churachandpur of Manipur. The length of the road is 161.665 km (as per preliminary survey).

The project road has significant importance as the road joints two National Highways (NH-2) and connects to important nearby towns Churachandpur, New Lamka, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and Tuivai.

From Drain Edge to Drain Edge in Built up area is varying from 6 m to 16 m & in hilly area from hill toe to valley edge is varying from 4 m to 8 m. However, the existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area. Fresh land will have to be acquired, to make up the shortfall, both along the proposed NH and along all the Bypasses / Realignment.

5.2.8. Minimizing Resettlement

As per the NH's guidelines, adequate attention has been given during the feasibility and detailed project design phases of the project preparation to minimize the adverse impacts on land acquisition and resettlement impacts. However, technical and engineering constraints were one of the major concerns during exploration of various alternative alignments. With the available options, best engineering solution have been adopted to avoid large scale land acquisition and resettlement impacts. Following are the general criteria adopted for the selection of the alignment:

- It should serve as uninterrupted traffic for proposed Tourist centres.
- It should provide linkage to other roads in the region.
- It should take in to account the future traffic growth and management.
- It should be coordinated with local and national development plans.
- It should minimize environment impact along the corridor.
- It should take in to consideration the opinions of local people in selection of
- Alignment.

The specific measures adopted for minimizing the resettlement impacts for the sub

Project is as follows:

- Exploration of several alternate alignments in consultation with engineering team, concerned

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government departments and local community

- ❖ Avoiding major settlements and urban areas to minimize the large scale physical displacement.
- ❖ Avoiding productive agricultural land to minimize the adverse economic displacement;
- ❖ Diverting the alignment towards the available unused government land to minimize impact on private property.

5.2.9. Scope and Objective of Resettlement Plan (RP)

The aim of this Resettlement Plan (RP) is to mitigate all such unavoidable negative impacts caused due to the project and resettle the displaced persons and restore their livelihoods. This Full Resettlement Plan has been prepared on the basis of project census survey findings and consultation with various stakeholders. The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the Government of Manipur, Government of India, Safeguard Policies and guidelines of National Highway's guidelines. The issues identified and addressed in this document are as follows:

- ❖ Type and extent of loss of land/ non-land assets, loss of livelihood, loss of common property resources and social infrastructure.
- ❖ Impacts on indigenous people, vulnerable groups like poor, women and other disadvantaged sections of society.
- ❖ Public consultation and people's participation in the project.
- ❖ Proposed legal and administrative framework and formulation of resettlement policy for the project.
- ❖ Preparation of entitlement matrix, formulation of relocation strategy and restoration of businesses/income.
- ❖ R&R cost estimate including provision for fund and Institutional framework for the implementation of the plan, including grievance redress mechanism and monitoring & reporting.

5.2.10. Primary Responsibility for Land Acquisition & Resettlement

The NHIDCL Department, Manipur is the nodal agency for implementation of the proposed project. Therefore, the prime responsibility for land acquisition lies with the NHIDCL, Manipur. However, such land acquisition is normally done through the State Level District Administration and the compensation amount is deposited with the District Administration by the acquiring body for disbursement. Similarly, the resettlement of the affected population will be implemented by the NHIDCL, Manipur like it is being done in other projects. The NHIDCL do conduct RAP implementation through PIU. An independent External Monitor would be engaged to review and monitor the implementation process and time frame of the resettlement and rehabilitation of the DPs. The Monitor may submit a biannual report on the progress of the implementation of the Resettlement action plan to EA.

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5.3 METHODOLOGY FOR IMPACT ASSESSMENT

This Chapter presents an analysis of the project impacts based on census survey data. The purpose of the analysis is to (a) develop profiles of DPs and communities affected by the project. (b) Identify the nature and types of losses. The following sections briefly describe the methods used to ascertain various types of impacts.

5.3.1. The Census Survey

The census survey was carried out in the month of December 2019 by a team of trained enumerators. The objectives of the census survey were to generate an inventory of social impacts on the people affected by the project, their structures affected, social profile of the project affected people, their poverty, their views about the project and also their views on various options of rehabilitation and resettlement. A questionnaire was used to collect detailed information on affected households/business for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the DPs. A structured census questionnaire was used to collect detailed information on affected households/ properties for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the DPs. The census survey includes the following: -

- ❖ Inventory of the affected assets
- ❖ Categorization and measurements of potential loss
- ❖ Physical measurements of the affected assets/structures
- ❖ Identification of trees and crops
- ❖ Household characteristics, including social, economic and demographic profile
- ❖ Identification of titleholders
- ❖ Assessment of potential economic impact

The present census survey has covered 100% structures affected within the proposed ROW including private and customary owners. The additional information about the private land holders land is being collected from village Council. The results of census survey presented in the report will also be updated further after completion of landholders' data collection.

5.3.2. Land Acquisition Planning

The alignment was finalized as per the detailed engineering design. Initially, the numbers of affected villages were identified as per the alignment. All the village maps were collected from the local revenue offices. The village maps were digitized by the consultant. Following the digitization of village maps, the engineering design of the alignment was superimposed in the digitized cadastral map in order to identify the number of land parcels and their demarcation including the quantification. The superimposition of alignment on the village map provided all the plot numbers. A Land Acquisition Plan (LAP) has been prepared accordingly.

5.3.3. Inventory of Assets

The alignment was finalized as per the detailed engineering design. Initially, the numbers of affected

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villages were identified as per the alignment. All the village maps and documents were collected from the local village council offices. The village maps were digitized by the consultant. Following the digitization of village maps, the engineering design of the alignment was superimposed in the digitized cadastral map in order to identify the number of land parcels and their demarcation including the quantification. The superimposition of alignment on the village map provided all the plot that are to be affected.

5.3.4. Survey of Affected Structures

Different types of structures will be affected by the road improvements. In order to assess market/ replacement value for the affected structures, the survey considered the types of construction, material used for roof, walls and floor; levels/ stories of structures, and land area of each structure.

5.3.5. Public Consultation

To ensure peoples' participation in the planning phase and aiming at promotion of public understanding and fruitful solutions of developmental problems such as local needs of road users and problem and prospects of resettlement, various sections of affected persons and other stakeholders were consulted through focus group discussions, individual interviews and formal and informal consultations. The vulnerable sections of DPs and women were also included in this consultation process.

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5.4 SOCIO ECONOMIC PROFILE OF THE PROJECT AREA

To understand the socio-economic profile of project area, the socio-economic information of DPs was collected through the Socio Economic Survey (SES) and Census survey. No Displaced Household (DH) (Private Structure owner, Tenent & Employee in commercial Structures) occupying private structures would be affected as per proposed ROW.

5.4.1. Social Categories of the DPs

No DPs in Package-IVB.

5.4.2. Religious Categories of the Displaced Households

No DPs in Package-IVB.

5.4.3. Number of Displaced Persons (DPs)

No DPs in Package-IVB.

5.4.4. Vulnerable Households being affected in the project

No DPs in Package-IVB.

5.4.5. Annual Income Level of the Affected Households

No DPs in Package-IVB.

5.4.6. Occupation by DPs

No DPs in Package-IVB.

5.4.7. Educational Status of DPs

No DPs in Package-IVB.

5.4.8. Impact on Indigenous People

No DPs in Package-IVB.

5.4.9. Gender Impact and Mitigation Measures

No DPs in Package-IVB.

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5.5 DEFINITIONS

The Definition of various terms used in this Policy Document are as follows:

(a) "Administrator for Resettlement and Rehabilitation" means an officer not below the rank of District Collector of the State Government appointed by it for the purpose of resettlement and rehabilitation of the Project Affected Families of the Project concerned provided that if the appropriate Government in respect of the project is the Central Government, such appointment shall be made in consultation with the Central Govt.

(b) "affected zone", in relation to a project, means declaration of this Policy by the appropriate Government area of villages or locality under a project for which the land is being acquired under Land Acquisition Resettlement and Rehabilitation, 2013 or any other Act in force or an area that comes under submergence due to impounding of water in the reservoir of the project.

(c) "agricultural family" means a family whose primary mode of livelihood is agriculture and includes family of owners as well as sub-tenants of agricultural land, agricultural labourers, occupiers of forest lands and of collectors of minor forest produce.

(d) "agricultural labourer" means a person normally resident in the affected zone for a period of not less than three years immediately before the declaration of the affected zone who does not hold any land in the affected zone but who earns his livelihood principally by manual labour on agricultural land therein immediately before such declaration and who has been deprived of his livelihood.

(e) "Agricultural land" includes lands used or capable of being used for the purpose of-

agriculture or horticulture;

Dairy farming, poultry farming, pisciculture, breeding or livestock and nursery growing medical herbs.

raising of crops, grass or garden produce; and

Land used by an agriculturist for the grazing of cattle, but does not include land used for the cutting of wood only.

(f) "Appropriate Government" means, -

(i) In relation to acquisition of land for the purposes of the NHIDCL, the Central Government;

(ii) in relation to a project which is executed by Central Government agency(NHIDCL)/Central Government undertaking or by any other agency on the orders/directions of Central Government, the Central Government, otherwise the State Government and in relation to acquisition of land for other purposes, the State Government.

(g) 'BPL Family': The Below Poverty Line Families shall be those as defined by the Planning Commission of India from time to time.

(h) "Commissioner for Resettlement and Rehabilitation", in relation to a project, means the Commissioner for Resettlement and Rehabilitation appointed by the State Government not below the rank of Commissioner/Secretary of that Government.

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(i) "Displaced family" means any tenure holder, tenant, Government lessee or owner of other property, who on account of acquisition of his land including plot in the abadi or other property in the affected zone for the purpose of the project, has been displaced from such land or other property.

(j) "Family" means Project Affected Family consisting of such persons, his or her spouse, minor sons, unmarried daughters, minor brothers or unmarried sisters, father, mother and other members residing with him and dependent on him for their livelihood.

(k) "Holding" means the total land held by a person as an occupant or tenant or as both;

(l) "Marginal farmer" means a cultivator with an unirrigated land holding up to one acres or irrigated land holding up to half acres.

(m) "non-agricultural laborer" means a person who is not an agricultural laborer but is normally residing in the affected zone for a period of not less than three years immediately before the declaration of the affected zone and who does not hold any land under the affected zone but who earns his livelihood principally by manual labour or as a rural artisan immediately before such declaration and who has been deprived of earning his livelihood principally by manual labour or as such artisan in the affected zone.

(n) "Notification" means a notification published in the Official Gazette;

(o) "Occupiers" mean members of Scheduled Tribe community in possession of forest land prior to 25th October, 1980;

(p) "Project" means a project displacing 500 families or more enmasse in plain areas and 250 families or more enmasse in hilly areas, DDP blocks, areas mentioned in Schedule V and Schedule VI of the Constitution of India as a result of acquisition of land for any project.

(q) "displaced family" means a family/person whose place of residence or other properties or source of livelihood are substantially affected by the process of acquisition of land for the project and who has been residing continuously for a period of not less than three years preceding the date of declaration of the affected zone or practicing any trade, occupation or vocation continuously for a period of not less than three years in the affected zone, preceding the date of declaration of the affected zone.

(r) "Resettlement zone", in relation to a project, means the declaration of any area under our National Policy by the appropriate Government acquired or proposed to be acquired for resettlement and rehabilitation of Project Affected Families as a resettlement zone.

(s) "Requiring Body" shall mean any company, a body corporate, an institution, or any other organization for whom land is to be acquired by the appropriate Government, and includes the appropriate Government if the acquisition of land is for such Government either for its own use or for subsequent allotment of such land in public interest to a body corporate, institution, or any other organization or to any company under lease, license or through any other system of transfer of land to such company, as the case may be.

(t) "Small farmer" means a cultivator with an unirrigated land holding up to two acres or with an irrigated land holding up to one acres.

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5.6 SCOPE OF LAND ACQUISITION AND RESETTLEMENT FOR PACKAGE-IVB

5.6.1. Scope of Land Acquisition

As discussed earlier also the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of road as the applicable code for road construction. According to the Land Acquisition Plan (LAP) prepared as a part of Project Report (Package-IVB), 17.1 ha of Total land will be acquired for the sub-project. The area is excluding the area that already lies with PIU in terms of proposed roads falling in the alignment. A project census survey was carried out to identify the persons who would be displaced by the project and to make an inventory of their assets that would be lost to the project, which would be the basis of calculation of compensation. The major findings of the land acquisition estimates and census of 100% affected structures are discussed in the following sections which will be further updated after completion of landholder's data collection.

5.6.2. Uses of Affected Structure

No structure affected in Package-IVB.

5.6.3. Type of Construction of Affected Structure

No structure affected in Package-IVB.

5.6.4. Age of Structures Being Affected

No structure affected in Package-IVB.

5.6.5. Type of Commercial Structures Affected

No structure affected in Package-IVB.

5.6.6. Type of Mixed Structures Affected

No structure affected in Package-IVB.

5.6.7. Type of Other Structures Affected

No structure affected in Package-IVB.

5.6.8. Status of Ownership

No structure affected in Package-IVB.

5.6.9. Scale of Impact on Structure

No structure affected in Package-IVB.

5.6.10. Loss of Livelihoods

No structure affected in Package-IVB.

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5.6.11. Loss of Community Property Resources (CPRs)

No structure affected in Package-IVB.

5.6.12. Summary Project Impacts

As per findings of the (Package-IVB) 100% census of affected land and non-land assets, the project impacts can be broadly classified as (i) impacts on private land, (ii) impacts on private structures (iii) impacts on livelihoods due to loss of private properties and (iv) loss of common property resources. From the analysis of impacts, it is noted that altogether no structures are affected in Package-IVB. Summary project impacts are presented in the (***Table 6.11***).

Table 6.11: Summary Project Impacts

Sl.	Impacts	Number
1	Total land acquisition requirements (in ha)	17.1
2	Total no. of private Residential structures	0
3	Total no. of private Commercial structures	0
4	Total number of Residential cum Commercial structures	0
5	Total number of other private structure	0
6	Total No. of Affected Families by affected structure	0
7	Total Number of Vulnerable households affected of Affected structure	0
8	Total number of displaced persons (DPs)	0
9	Total number of CPRs affected Community and Religious)	0

Source: Census Survey on December, 2019

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5.7 REHABILITATION AND RESETTLEMENT PLAN

The procedure mentioned in this chapter shall be followed for declaration of the affected area, carrying out survey and census of affected persons, assessment of government land available and land to be arranged for rehabilitation and resettlement, declaration of the resettlement area or areas, preparation of the draft rehabilitation and resettlement scheme or plan and its final publication.

Where the appropriate Government is of the opinion that there is likely to be involuntary displacement of four hundred or more families enmasse in plain areas, or two hundred or more families enmasse in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution due to acquisition of land for any project or due to any other reason, it shall, declare, by notification in the Official Gazette, area of villages or localities as an affected area.

Every declaration made in our policy shall be published in at least three daily newspapers, two of which shall be in the local vernacular having circulation in villages or areas which are likely to be affected, and also by affixing a copy of the notification on the notice board of the concerned gram panchayats or municipalities and other prominent place or places in the affected area and the resettlement area, and/or by any other method as may be prescribed in this regard by the appropriate Government.

Once the declaration is made, the Administrator for Rehabilitation and Resettlement shall undertake a baseline survey and census for identification of the persons and families likely to be affected.

Every such survey shall contain the following village-wise information of the affected families: -

- Members of the family who are permanently residing engaged in any trade, business, occupation or vocation in the affected area.
- families who are likely to lose, or have lost, their house, agricultural land, employment or are alienated wholly or substantially from the main source of their trade, business, occupation or vocation.
- Agricultural labourers and non-agricultural labourers.
- Families belonging to the Scheduled Caste or Scheduled Tribe categories.
- Vulnerable persons such as the disabled, destitute, orphans, widows, unmarried girls, abandoned women, or persons above sixty years of age; who are not provided or cannot immediately be provided with alternative livelihood, and who are not otherwise covered as part of a family.
- families that are landless (not having homestead land, agricultural land, or either homestead or agricultural land) and below poverty line, but residing continuously for a period of not less than three years in the affected area preceding the date of declaration of the affected area.
- Scheduled Tribes families who are or were having possession of forest lands in the affected area prior to the LA Notice Publication date.
- Every survey undertaken under shall be completed within a period of ninety days from the

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date of declaration.

On completion of the above surveyor on expiry of a period of ninety days, whichever is earlier, the Administrator for Rehabilitation and Resettlement shall, by notification, and also in such other manner so as to reach all persons likely to be affected, publish a draft of the details of the findings of the survey conducted by him and invite objections and suggestions from all persons likely to be affected thereby. This draft shall be made known locally by wide publicity in the affected area.

On the expiry of thirty days from the date of publication of the draft of the details of survey and after considering the objections and suggestions received by him in "this behalf, the Administrator for Rehabilitation and Resettlement shall submit his recommendations thereon along with the details of the survey to the appropriate Government.

Within forty-five days from the date of receipt of the details of the survey and recommendations of the Administrator for Rehabilitation and Resettlement, the appropriate Government shall publish the final details of survey in the Official Gazette. The appropriate Government shall, by notification, declare any area (or areas) as a resettlement area (or areas) for rehabilitation and resettlement of the affected families.

The Administrator for Rehabilitation and Resettlement shall ensure that the affected families may be settled, wherever possible, in a group or groups in such resettlement areas. However, it has to be ensured that the affected families may be resettled with the host community on the basis of equality and mutual understanding, consistent with the desire of each group to preserve its own identity and culture.

The Administrator for Resettlement and rehabilitation shall draw up a list of lands that may be available for rehabilitation and resettlement of the affected families.

The lands drawn up shall consist of: -

- Land available or acquired for the project and earmarked for this purpose
- Government wastelands arid any other land vesting in the Government available for allotment to the affected families.
- Lands that may be available for purchase or acquisition for" the purposes of rehabilitation and resettlement scheme or plan.
- A combination of one or more of the above.

However, the Administrator for Rehabilitation and Resettlement should ensure that such acquisition of land does not lead to another set of physically displaced families. The Administrator for Rehabilitation and Resettlement, on behalf of the appropriate Government, may either purchase land from any person through consent award and may enter into an agreement for this purpose, or approach the state Government concerned for acquisition of land for the purposes of rehabilitation and resettlement scheme or plan.

After completion of baseline survey and census of the affected families and assessment of the requirement of land for resettlement, the Administrator for Rehabilitation and Resettlement shall prepare a draft scheme or plan for the rehabilitation and resettlement of the affected families after consultation with the representatives of the affected families including women and the

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representative of the requiring body.

The draft rehabilitation and resettlement scheme or plan shall contain the following particulars, namely: -

(a) The extent of land to be acquired for the project and the name(s) of the affected village(s);

(b) A village-wise list of the affected persons, family-wise, and the extent and nature of land and immovable property owned or held in their possession in the affected area, and the extent and nature of such land and immovable property which they are likely to lose or have lost, indicating the survey numbers thereof;

(c) A list of agricultural laborers in such area and the names of such persons whose livelihood depends on agricultural activities;

(d) A list of persons who have lost or are likely to lose their employment or livelihood or who have been or likely to be alienated wholly or substantially from their main sources of trade business, occupation or vocation consequent to the acquisition of land for the project or involuntary displacement due to any other cause;

(e) A list of non-agricultural laborers, including artisans;

(f) A list of affected landless families, including those, without homestead land and below poverty line families;

(g) A list of vulnerable affected persons.

(h) A list of occupiers, if any;

(i) A list of public utilities and government buildings which are affected or likely to be affected;

(j) Details of public and community properties, assets and infrastructure;

(k) A list of benefits and packages which are to be provided to the affected families;

(l) Details of the extent of land available in the resettlement area for resettling and for allotment of land to the affected families.

(m) Details of the amenities and infrastructural facilities which are to be provided for resettlement.

(n) The time schedule for shifting and resettling the displaced persons in the resettlement area or areas.

(o) Such other particulars as the Administrator for Rehabilitation and Resettlement may consider necessary.

The draft scheme or plan may be made known locally by wide publicity in the affected area and the resettlement area (or areas) in such manner as may be prescribed by the appropriate Government.

The draft rehabilitation and resettlement scheme or plan shall also be discussed in gram sabhas in rural areas and in public hearings in urban and rural areas where gram sabhas don't exist.

The consultation with the gram sabha or the panchayats at the appropriate level in. the Scheduled Areas under' Schedule V of the Constitution shall be in accordance with the provisions of the

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Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996 (40 of 1996).

In cases of involuntary displacement of two hundred or more Scheduled Tribes families from the Scheduled Areas, the concerned Tribes Advisory Councils may also be consulted.

While preparing a draft scheme or plan, the Administrator for Rehabilitation and Resettlement shall ensure that the entire estimated cost of the rehabilitation and resettlement scheme or plan forms an integral part of the cost of the project for which the land is being acquired. The entire expenditure on rehabilitation and resettlement benefits and the expenditure for rehabilitation and resettlement of the affected families are to be borne by the requiring body for which the land is being acquired. The Administrator for Rehabilitation and Resettlement shall ensure that the entire estimated cost of rehabilitation and resettlement benefits and other expenditure for rehabilitation and resettlement of the affected families is communicated to the requiring body for incorporation in the project cost.

The Administrator for Rehabilitation and Resettlement shall submit the draft scheme or plan for rehabilitation and resettlement to the appropriate Government for its approval. In case of a project involving land acquisition on behalf of a requiring body, it shall be the responsibility of the appropriate Government to obtain the consent of the requiring body, to ensure that the necessary approvals as required under this policy have been obtained, and to make sure that the requiring body has agreed to bear the entire cost of rehabilitation and resettlement benefits and other, expenditure for rehabilitation and resettlement of the affected families as communicated by the Administrator for Rehabilitation and Resettlement, before approving it. After approving the rehabilitation and resettlement scheme or plan, the appropriate Government shall publish the same in the Official Documents. On final notification of the rehabilitation and resettlement scheme or plan, it shall come into force.

It shall be the responsibility of the requiring body to provide sufficient funds to the Administrator for Rehabilitation and Resettlement for proper implementation of the rehabilitation and resettlement scheme or plan. As soon as the rehabilitation and resettlement scheme or plan is finalized, the requiring body shall deposit one-third cost of the rehabilitation and resettlement scheme or plan with the Administrator for Rehabilitation and Resettlement. The administrator for Rehabilitation and Resettlement shall keep proper books of accounts and records of the funds placed at his disposal and submit periodic returns to the appropriate Government in this behalf.

In case of a project involving land acquisition on behalf of a requiring body, an exercise for fast-track updating of land records shall be undertaken on currently with the land acquisition proceedings. Persons who have acquired any right prior to the date of issue of the notification under sub-section (1) of section 24 of the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 (or such notification under any other Act of the Union or a State for the time being in force under which land acquisition is being undertaken) as per the updated' records shall also have right to proportionate compensation along with the original landowners referred to in the notification.

(a) The compensation award shall be declared well in time before displacement of the affected families. Full payment of compensation as well as adequate progress in resettlement shall be ensured in advance of the actual displacement of the affected families.

(b) The compensation award shall take into account the market value of the property being

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acquired, including the location-wise minimum price per unit area fixed (or to be fixed) by the State Government.

(c) Conversion to the intended category of use of the land being acquired (for example, from agricultural to non-agricultural) shall be taken into account in advance of the acquisition, and the compensation award shall be determined as per the intended land use category.

(d) The applicable conversion charges for the change in the land use category shall be paid by the requiring body, and no reduction shall be made in the compensation award on this account.

In case of a project involving land acquisition on behalf of a requiring body, and if the requiring body is a company authorized to issue shares and debentures, the affected families who are entitled to get compensation for the land or other property acquired, shall be given the option to take up to twenty percent of the compensation amount due to them in the form of shares or debentures or both of the requiring body, as per the guidelines to be notified by the Central Government: Provided that the appropriate Government, at its discretion, may raise this proportion up to fifty percent of the compensation amount.

Land compulsorily acquired for a project cannot be transferred to any other purpose except for a public purpose, and after obtaining the prior approval of the appropriate Government.

If land compulsorily acquired for a project or part thereof, remains unutilized for the project for a period of five years from the date of taking over the possession by the requiring body, the same shall revert to the possession and ownership of the appropriate Government without payment of any compensation or remuneration to the requiring body. Whenever any land acquired for a public purpose is transferred to an individual or organization (whether in private sector, public sector or joint sector) for a consideration, eighty percent of any net unearned income so accruing to the transferor, shall be shared amongst the persons from whom the lands were acquired or their heirs, in proportion to the value at which the lands were acquired. The fund shall be kept in a separate account which shall be administered in such manner as may be prescribed.

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5.8 REHABILITATION AND RESETTLEMENT BENEFITS FOR THE AFFECTED FAMILIES

The rehabilitation and resettlement benefits shall be extended to all the affected families who are eligible as affected families on the date of publication of the declaration under as stated above, and any division of assets in the family after the said date may not be taken into account.

Any affected family owning house and whose house has been acquired or lost, may be allotted free of cost house site to the extent of actual loss of area of the acquired house but not more than two hundred and fifty square meter of land in rural areas, or one hundred and fifty square meter of land in urban areas, as the case may be, for each nuclear family Provided that, in urban areas, a house of up to one hundred square meter' carpet area may be provided in lieu thereof. Such a house, if necessary, may be offered in a multi-storied building complex

Each affected below poverty line family which is without homestead land and which has been residing in the affected area continuously for a period of not less than three years preceding the date of declaration of the affected area and which has been involuntarily displaced from such area, shall be entitled to a house of minimum one hundred square meter carpet area in rural areas, or fifty square meter carpet area in urban areas (which may be offered, where applicable, in a multi-storied building complex), as the case may be, in their settlement area:

Provided that any such affected family which opts not to take the house offered, shall get a suitable one-time financial assistance for use construction, and the amount shall not be less than what is given under any programme of house construction by the Government of India.

Each affected family owning agricultural land in the affected area and whose entire land has been acquired or lost, may be allotted in the name of the khatedar(s) or holder of Village Council Pass in the affected family, agricultural land or cultivable wasteland to the extent of actual land loss by the khatedar(s) in the affected family subject to a maximum of one acres of irrigated land or two acres of irrigated land or cultivable wasteland, if Government land is available in the resettlement area. This benefit shall also be available to the affected families who have, as a consequence of the acquisition" or loss of land, been reduced to the status of marginal farmers.

In the case of irrigation or hydel projects, the affected families shall be given preference in allotment of land-for-land in the command area of the project, to the extent possible. Such lands may be consolidated, and plots of suitable sizes allotted to the affected families who could be settled their in-groups. In case a family cannot be given land in the command area of the project or the family opts not to take land there, such a family may be given monetary compensation on replacement cost basis for their lands lost, for purchase of suitable land elsewhere.

In the case of irrigation or hydel projects, the State Governments may formulate suitable schemes for providing land to the affected families in the command areas of the projects by way of pooling of the lands that may be available or, otherwise, could be made available in recommended areas of such projects.

(a) In the case of irrigation or hydel projects, fishing rights in the reservoirs shall be given to the affected families, if such rights were enjoyed by them in the affected area; (b) In other cases also,

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unless there are special reasons, fishing rights shall be given preferentially to the affected families.

In case of a project involving land acquisition on behalf of a requiring body, the stamp duty and other fees payable for registration of the land or house allotted to the affected families shall be borne by the requiring body.

The land or house allotted to the affected families under this policy shall be free from all encumbrances.

The land or house allotted to the affected families under this policy may be in the joint names of wife and husband of the affected family.

In case of allotment of wasteland or degraded land in lieu of the acquired land, each khatedar in the affected family shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than fifteen thousand rupees per acres for land development.

In case of allotment of agricultural land in lieu of the acquired land, each khatedar in the affected family shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than ten thousand rupees, for agricultural production.

Each affected family that is displaced and has cattle, shall get financial assistance of such amount as the appropriate Government may decide but not less than fifteen thousand rupees, for construction of cattle shed. Each affected family that is displaced shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than ten thousand rupees, for shifting of the family, building materials belongings and cattle.

Each affected person who is a rural artisan, small trader or self-employed person and who has been displaced shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than twenty-five thousand rupees, for construction of working shed or shop.

In case of a project involving land acquisition on behalf of a requiring body, -

- The requiring body shall give preference to the affected families – at least one person per nuclear family - in providing employment in the project, subject to the availability of vacancies and suitability of the affected person for the employment.
- Wherever necessary, the requiring body shall arrange for training of the affected persons, so as to enable such persons to take on suitable jobs.
- The requiring body shall offer scholarships and other skill development opportunities to the eligible persons from the affected families as per the criteria as may be fixed by the appropriate Government.
- The requiring body shall give preference to the affected persons or their groups or cooperatives in the allotment of outsourced contracts, shops or other economic opportunities coming up in or around the project site.
- The requiring body shall give preference to willing landless labourers and unemployed affected persons while engaging labour in the project during the construction phase.
- The affected persons shall be offered the necessary training facilities for development of entrepreneurship, technical and professional skills for self-employment.

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In case of a project involving land acquisition on behalf of a requiring body, the affected families who have not been provided agricultural land or employment shall be entitled to a rehabilitation grant equivalent to seven hundred fifty days minimum agricultural wages or such other higher amount as may be prescribed by the appropriate Government: Provided that, if the requiring body is a company authorized to issue shares and debentures, such affected families shall be given the option of taking up to twenty percent of their rehabilitation grant amount in the form of shares or debentures of the requiring body, in such manner as may be prescribed provided further that the appropriate Government may, at its discretion, raise this proportion up to fifty per cent of the rehabilitation grant amount.

In cases where the acquisition of agricultural land or involuntary displacement takes place on account of land development projects, in lieu of land-for-land or employment, such affected families would be given site(s) or apartment(s) within the development project, in proportion to the land lost, but subject to such limits as may be defined by the appropriate Government.

In case of a project involving land acquisition on behalf of a requiring body, each affected family which is involuntarily displaced shall get a monthly subsistence allowance equivalent to twenty-five days' minimum agricultural wages per month for a period of one year from the date of displacement.

The project authorities shall, at their cost, arrange for annuity policies that will pay a pension for life to the vulnerable affected persons, of such amount as may be prescribed by the appropriate Government subject to a minimum of five hundred rupees per month.

If land is acquired in cases of urgency under the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014, each affected family which is displaced shall be provided with transit and temporary accommodation, pending rehabilitation and resettlement scheme or plan, in addition to the monthly subsistence allowance and other rehabilitation and resettlement benefits due to them under this policy.

In case of linear acquisitions, in projects relating to railway lines, highways, transmission lines, laying of pipelines and other such projects wherein only an arrow stretch of land is acquired for the purpose of the project or is utilized for right of way, each khatedar in the affected family shall be offered by the requiring body an ex-gratia payment of such amount as the appropriate Government may decide but not less than twenty thousand rupees, in addition to the compensation or any other benefits due under the Act or programme or scheme under which the land, house or other property is acquired provided that, if as a result of such land acquisition, the land-holder becomes landless or is reduced to the status of a "small" or "marginal" farmer, other rehabilitation and resettlement benefits available under this policy shall also be extended to such affected family.

5.8.1. Rehabilitation and Resettlement benefits for Project Affected families belonging to the scheduled tribes and scheduled castes

In case of a project involving land acquisition on behalf of a requiring body which involves involuntary displacement of two hundred or more Scheduled Tribes families, a Tribal Development Plan shall be prepared, in such form as may be prescribed, laying down the detailed procedure for settling land rights due but not settled and restoring titles of tribal on alienated land by undertaking a special drive together with land acquisition. The Plan shall also contain a programme or development of

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alternate fuel, fodder and non-timber forest produce (NTFP) resources on non-forest lands within a period of five years sufficient to meet requirements of tribal communities who are denied access to forests.

The concerned gram sabha or the panchayats at the appropriate level in the Scheduled Areas under Schedule V of the Constitution or as the case may be, Councils in the Schedule VI Areas shall be consulted in all Cases of land acquisition in such areas including land acquisition in cases of urgency, before issue of a notification under the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014, and the consultation shall be in accordance with the provisions of the provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996 and other relevant laws. Further, in cases of involuntary displacement of two hundred or more Scheduled Tribes families from the Scheduled Areas, the concerned Tribes Advisory Councils (TACs) may also be consulted.

Each affected family of Scheduled Tribe followed by Scheduled Caste categories shall be given preference in allotment of land-for-land, if Government land is available in the resettlement area.

In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first installment and the rest at the time of taking over the possession of the land.

In case of a project involving land acquisition on behalf of a requiring body, each Scheduled Tribe affected family shall get an additional one-time financial assistance equivalent to five hundred days' minimum agricultural wages for loss of customary rights or usages of forest produce.

The Scheduled Tribes affected families will be re-settled, as far as possible, in the same Schedule Area in a compact block, so that they can retain their ethnic, linguistic and cultural identity. Exceptions would be allowed only in rare cases where the requiring body in case of a project involving land acquisition, or the State Government in other cases of involuntary displacement is unable to offer such land due to reasons beyond its control.

The resettlement areas predominantly inhabited by the Scheduled Tribes shall get land free of cost for community and religious gatherings, to the extent decided by the appropriate Government.

In case of a project involving land acquisition on behalf of a requiring body, the Scheduled Tribes affected families resettled out of the district will get twenty-five percent higher rehabilitation and resettlement benefits in monetary terms in respect of the items specified in

Any alienation of tribal lands in violation of the laws and regulations for the time being in force shall be treated, as null and void. In the case of acquisition of such lands, the rehabilitation and resettlement benefits would be available to the original tribal land-owners.

In the case of irrigation or hydel projects, the affected Scheduled Tribes, 'other, traditional forest dwellers and the Scheduled Castes families having fishing rights in a river or pond, or' dam in the affected area shall be given fishing rights in the reservoir area of the irrigation or hydel projects.

The Scheduled Tribes and Scheduled Castes affected families enjoying reservation benefits in the affected area shall be entitled to get the reservation benefits at the resettlement area(s).

The affected Scheduled Tribes families, who were in possession of forest / lands in the affected area prior to January, 2013, shall also be eligible for the rehabilitation and resettlement benefits under

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this policy.

5.8.2. Amenities and Infrastructural facilities to be provided at Resettlement areas

In all cases of involuntary displacement of four hundred families or more enmasse in plain areas, or two hundred families or more enmasse in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution, comprehensive infrastructural facilities and amenities notified by the appropriate Government shall be provided in the resettlement area (such facilities and amenities shall, inter alia, include roads, public transport, drainage, sanitation, safe drinking water, drinking water for cattle, community ponds, grazing land, land for fodder, plantation (social forestry or agro forestry), Fair Price shops, panchayat grams, Cooperative Societies, Post Offices, seed-cum-fertilizer storage, irrigation, electricity, health centers, child" and mother supplemental nutritional services, children's playground, community centers, schools, institutional arrangements for training, places of worship, land for traditional tribal institutions, burial / cremation grounds, and security arrangements.

In cases of involuntary displacement of less than four hundred families enmasse in plain areas, or less than two hundred families or more enmasse in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution, all affected families shall be provided basic infrastructural facilities and amenities at the resettlement site(s) as per the norms specified by the appropriate Government. It would be desirable that provision of drinking water, electricity, schools, dispensaries, and access to the resettlement sites, amongst others, be included in the resettlement plan approved by the appropriate Government.

If relocation takes place in a proposed settlement area, the same infrastructure shall also be extended to the host community.

While shifting the population of the affected area to the resettlement area, the Administrator for Rehabilitation and Resettlement shall, as far as possible, ensure that:

a) In case the entire population of the village or area to be shifted belongs to a particular community, such population or families may, as far as possible, be resettle den masseur a compact area, so that socio-cultural relations and social harmony amongst the shifted families are not disturbed.

b) In the case of resettlement of the Scheduled Caste affected families, it may, as far as possible, be ensured that such families are resettled in the areas close to the villages.

The appropriate Government shall ensure that a resettlement area forms part of a gram panchayat or municipality.

5.8.3. Indexation of Rehabilitation grant and other benefits

The rehabilitation grants and other benefits expressed in monetary terms in this policy shall be indexed to the Consumer Price Index (CPI) with the first day of April following the date of coming into force of this policy as the reference date, and the same shall also be revised by the appropriate Government at suitable intervals.

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5.8.4. Periphery Development

In case of a project involving land acquisition on behalf of a requiring body, the requiring body will be responsible for development of the defined geographic area on the periphery of the project site as decided by the appropriate Government, and will be required to contribute to the socio-economic development of the areas contiguous to its area of operation. For this purpose, the requiring body will earmark a percentage of its net profit or, in case no profit is declared by the requiring body in a particular year, for that year, such minimum alternative amount as may be determined by the appropriate Government after consultation with the requiring body, to be spent within the specified zone. The requiring body will carry out the developmental activity within this zone in close coordination with the Commissioner for Rehabilitation and Resettlement. The State Governments will be free to frame their own rules and guidelines for this purpose.

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5.9 GENDER IMPACT AND MITIGATIVE MEASURES

5.9.1. Introduction

The social economical survey and census survey to the project sites identified some critical social issues related to gender impacts associated with project impacts. Typically, vulnerability is relatively higher among this group. Dislocation and loss of livelihood caused by road widening and development may further aggravate their disadvantaged situation, unless special attention is paid to them. This chapter particularly examines the issues from social safeguard considerations to develop specific mitigation measure.

5.9.2. Women's Participation in the Project

No DPs affected in Package-IVB.

5.9.3. HIV/ AIDS and Health Risks

HIV/ AIDS are major development challenges in India. Given the epidemic nature of the problem, it may reverse India's achievements in health and development. According to National AIDS Control Organization (NACO) HIV estimates for 2011, India has close to 4 million HIV infected people. This is less than one percent of the adult population but still more than any country in the region. It is estimated that HIV infection could grow to 5 percent of adult population – more than 57 million by 2016 without successful intervention. HIV infection is typically concentrated among the poor marginalized groups including sex workers, drug users, migrant laborers and truck drivers. These groups, particularly the truckers drive the HIV/AIDS epidemic and many studies indicate that infection is spreading rapidly to the general population. Recently, the Government of India (GOI) has shown increasing commitment to HIV/AIDS control. GOI established a consortium like collaboration of external partners (UNAIDS, USAID, DFID, CIDA and others) to provide technical and financial assistance to NACO to design and help implement GOI's national policy on HIV/AIDS control before mass spread into general community. There is need to improve awareness level in the state, particularly in the project area. Information and education campaign on HIV/AIDS and other sexually transmitted diseases (STDs) will be conducted by PIU during project implementation. The campaign will target the project construction workers at campsites, truckers at truck stops and dhabas and the public at large along the alignment. The PIU will work closely with the relevant state agencies and other proposed networks dedicated to prevention work for further building up of awareness programs in the project area. HIV/AIDS awareness brochures would also be developed for distribution to local communities, local markets, truck/bus stations and other appropriate places to increase awareness about risks/dangers of HIV/AIDS. This would ultimately lead to lowering the risk for the general community in the project affected area.

The Project Area is affected by HIV/AIDS as per NACO reports on 2011 on the study for 2005, 2006 and 2007 the district of the least HIV/AIDS affected districts and the district of Churachandpur lies in the Category A, the second standard HIV/AIDS affected districts of India. As per the guidelines of ADB's SPS 2009 and subsequent publications proper and effective Awareness campaign both in regard of Gender and HIV /AIDS is to be undertaken by the Project Proponent.

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5.10PUBLIC CONSULTATION

Public Consultations or community participation is an integral part and process of any projects which involves resettlement or rehabilitation issues. It helps to incorporate valuable indigenous suggestions and perceptions of development. In the process, stakeholders get the opportunity to address issues, which are resolved after making appropriate changes in design and alternative finalization. The stakeholders become aware of the development schemes and at the same time influence and share to control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur. The Table briefly depicts the plan and implementation of Public Consultation and Disclosure of the Project.

Table 10.1: Public Consultation and Disclosure Implementation and Plan

Activity	Task	Timing (Date/ Period)	No of People	Agencies	Feedback/ Issues/ Concerns Raised	Remarks
Stakeholder Identification	Mapping of the project area					
Project information Dissemination	Distribution of information leaflets to Displaced persons (DPs)					
Consultative Meetings with DPs during Scoping Phase	Discuss potential impacts of the project					
Public Notification	Publish list of affected lands/sites in a local newspaper; Establish eligibility cut-off date					
Socio-Economic Survey	Collect socioeconomic information on DP's perception on the project					
Consultative Meetings on Resettlement Mitigation Measures	Discuss entitlements, compensation rates, grievance redress mechanisms					
Publicize the resettlement plan (RP)	Distribute Leaflets or Booklets in local language					
Full Disclosure of the RP to DPs	Distribute RP in local language to DPs					
Web Disclosure of the RP	RP posted on NHIDCL and/or EA website					
Consultative Meetings during DMS	Face to face meetings with DPs					
Disclosure after Detailed Measurement Survey (DMS)	Disclose updated RP to DPs					
Web Disclosure of the Updated RP	Updated RP posted on NHIDCL and/or EA website					

The overall objectives of the consultation program in preparing RAP were to disseminate project information and to incorporate public and DP's views in Resettlement and Environmental Action Plans, which are guided by specific objectives like:

- ❖ Awareness amongst stakeholders by disclosing the updated R.P. according to GOI's involuntary resettlement policy.

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- ❖ Improvement in project design minimising potential conflicts and delays in implementation.
- ❖ Facilitate development of appropriate and acceptable entitlement options.
- ❖ Increase project sustainability.
- ❖ Reduce problems of institutional co-ordination.
- ❖ Make the R&R process transparent and reduce leakage.
- ❖ Increase re-settler commitment, ensure effectiveness and sustainability of the income restoration strategies, and improve coping mechanisms.
- ❖ Creating sense of belongingness among the stakeholders.

5.10.1. Identification of the stakeholders

The stakeholders are all the people getting affected by the project or are responsible for the project, whether directly or indirectly. The community participation programmes in social assessment ensured that information is disseminated to all the DPs and other stakeholders in appropriate ways. The information dissemination has taken place in vernacular, detailing about the main project features and the entitlement framework. Due consideration has also been given to address the views of the vulnerable groups.

Certain issues conditioned the participation of the stakeholders, as follows:

- ❖ Who might be affected (positively or negatively) by the proposed development?
- ❖ Who are voiceless for whom special efforts may have to be made?
- ❖ Who are representatives of those likely to be affected?
- ❖ Who is responsible for what is intended?
- ❖ Who can make what is intended more effective through their participation or less effective by their non-participation or outright opposition?
- ❖ Who can contribute financial and technical resources?
- ❖ Whose behaviour has to change for the effort to succeed?
- ❖ Both primary and secondary stakeholders were identified, based on the above criteria. They were invited to take part in the consultation series, and were solicited to participate in planning and implementation of the R&R programme.

Primary stakeholders included those affected negatively or positively by the project, like the DPS, project beneficiaries and project implementing agencies. Secondary stakeholders included other individuals and groups, with an interest in the project, viz., the NHIDCL, the highway users etc.

5.10.2. Discloser of Project Information

The sharing of information is essential for sustainable development. It stimulates public debate on and broadens understanding of development issues, and enhances transparency and accountability in the development process. It also strengthens public support to improve the lives of people, facilitates collaboration among the many parties involved in development, and improves the quality

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of projects and programs. It is now accepted everywhere that the expanded access to information by the public will enhance the dialogue on development, and make an important contribution to efforts to reduce poverty and promote sustainable development. In this development project the discloser of project information (during the feasibility stage) to the public in general and to the people who are likely to be impacted negatively in particular have been done by way of consultation process. During the consultation session it was observed that the local people are aware of this project through local newspaper, published from time to time.

5.10.3. Consultations for Determining Principle

The consultation process is not only targeted at project information dissemination to the people but another important aspect covered is determining of principle for formulating an entitlement frame work and eligibility policy for the project. The consultation process throws light of the people's expectations, aspirations etc. from the project as well as their expectations in terms of compensation and assistance from the project in case of adverse impacts.

5.10.4. Participants at different levels

The extent or the likely level of adverse impacts was one of the major criteria in deciding locations for public consultation sessions. The consultation programme has been tiered and conducted at several levels, such as:

- ❖ Heads of the households, likely to be impacted
- ❖ Members of the households, likely to be impacted
- ❖ Clusters of DPS
- ❖ Villagers
- ❖ Village Panchayats
- ❖ Local voluntary organisations and CB0s/NG0s
- ❖ Government agencies and departments

5.10.5. Levels of Consultation

The enactment of the participation and consultations with the stakeholders has been done at different levels throughout the project preparation stage. The Public Consultation was carried out at various stages of project preparation: Social Screening stage and Feasibility stage.

5.10.6. Consultation during Project Preparation

The Census Survey Team carried out preliminary consultations through Focus Group Discussions (FGD) and meetings with the DPs as well as the general public in the project area. FGDs were conducted primarily in settlements with problems of traffic congestion, dense informal/squatter settlement, close junctions and road intersections, and concentration of DPs. During the survey, intensive discussion and consultation meetings were conducted with large number of DPs in nearly every affected village wherein policy related issues; displacements and other related issues were discussed. Suggestions and comments by DPs were incorporated in the project road design as well as

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the policy measures for resettlement management. Public discussions were conducted at important points, where people could assemble in large numbers. Panchayat members were contacted to inform the people. The Team also had informal meetings with village head, panchayat and other district level government officials, leaders of local level organization /association, trucker's association, and village women groups.

Illustration of Public Consultation meetings at our project corridor are tagged below:

Chairman and all the officials of the Village Council explain the local people about the project and its impacts and also promised that they would extend their co-operation in our Project work. During the implementation of the project.

Suggestions are given below:

- Village authority has satisfied as the proposed alignment would be built minimizing resettlement impact in the locality.
- Local People satisfied that the proposed alignment would be increase connectivity.

The meeting ended with vote of thanks to chair.

5.10.7. Plan for further Consultation in the Project

The effectiveness of the R&R program is directly related to the degree of continuing involvement of those affected by the Project. Several additional rounds of consultations with DPs will form part of the further stages of project preparation and implementation. PIU conducting these consultations during RP implementation, which will involve agreements on compensation, assistance options, and entitlement package and income restoration measures suggested for the sub-project. The consultation will continue throughout the project implementation. The following set of activities will be undertaken for effective implementation of the Plan:

In case of any change in engineering alignment planning the DPs and other stakeholders will be consulted in selection of road alignment for minimization of resettlement impacts, development of mitigation measures etc.

The Project Implementation Unit (PIU) will conduct information dissemination sessions in the project area and solicit the help of the local community/ leaders and encourage the participation of the DP's in Plan implementation.

During the implementation of RP, PIU will organize public meetings, and will appraise the communities about the progress in the implementation of project works, including awareness regarding road construction.

Consultation and focus group discussions will be conducted with the vulnerable groups like women, SC, ST, and OBC's to ensure that the vulnerable groups understand the process and their needs are specifically taken into consideration.

To make reasonable representation of women in the project planning and implementation they will be specifically involved in consultation.

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5.10.8. Information Disclosure

To keep more transparency in planning and for further active involvement of DPs and other stakeholders the project information will be disseminated through disclosure of resettlement planning documents. The EA will submit the following documents to NHIDCL for disclosure on NHIDCL's website:

- The final resettlement plan endorsed by the EA after the census of displaced persons has been completed;
- A new resettlement plan or an updated resettlement plan, and a corrective action plan prepared during project implementation, if any; and
- The resettlement monitoring reports.

The EA will provide relevant resettlement information, including information from the above mentioned documents in a timely manner, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. A resettlement information leaflet containing information on compensation, entitlement and resettlement management adopted for the project will be made available in local language (Manipuri) and distributed to DPs.

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5.11OBJECTIVES AND POLICY FRAME WORK

This Resettlement Plan (RP) has been prepared in accordance with National Highway Safeguard Policies and RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. Policies are designed to protect the rights of the affected persons and communities. The primary objectives of the RP are to mitigate the adverse impacts of the project and to assist the displaced persons (DPs) in resettlement and restoration of their income and livelihoods.

The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the GOI, the state Government of Manipur, National Highway Authority of India and in accordance with the principles of NHIDCL. Prior to the preparation of the Resettlement Plan, a detailed analysis of the proposed national and state policies was undertaken and an entitlement matrix has been prepared for the entire program. The section below provides details of the various national and state level legislations studied and their applicability within this framework. This RP is prepared based on the review and analysis of all applicable legal and policy frameworks of the country and NHIDCL's policy requirements. A summary of applicable acts and policies is presented in the following paragraphs and the detailed policy review and comparison is provided in the entitlement matrix.

5.11.1. Objectives of the Policy

The objectives of the Policy are as follows: -

To minimize displacement and to identify non-displacing or least-displacing alternatives;

To plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special needs of Tribal and vulnerable sections;

To provide better standard of living to DPs; and

To facilitate harmonious relationship between the Requiring Body and DPs through mutual cooperation.

5.11.2. The National Highways Act

For LA, the Act defines the various DPs of the process as follows: (i) section 3A - power to acquire land; (ii) 3B - power to enter for surveys; (iii) 3C - hearing of objections; (iv) 3D - declaration of acquisition; (v) 3E - power to take possession; (vi) 3F - power to enter into the land where land has vested in the central government; (vii) 3G - determination of amount payable as compensation; and (viii) 3F - deposit and payment of amount. The Act requires that the processes must be completed within a year from 3A to 3D. The acquisition process is faster due to central government co-ordination and provision for arbitration or power of civil court for trying any LA-related dispute. Although NHAI Act significantly reduces the time frame for acquisition, the rules and principles of compensation are derived from the LA Act of 1894 amended from time to time. The Act covers only legal title holders and provides for: (i) market value of the land; (ii) a solarium of 30% on the market value for compulsory acquisition; (iii) additional amount for trees, crops, houses or other immovable properties; (iv) damage due to severing of land, residence, place of business; (v) compensation to

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sharecroppers for loss of earning; and (vi) an interest of 12% on the market value from the date of notification to award.

The LA Act does not address many of the social and economic issues associated with displacement and resettlement of 'illegal" or non-titled informal settlers/squatters. However, in many donor-funded or DFBOT (Design Finance Built Operate Transfer) projects, EA assisted affected and/or displaced persons even without any legal title. The impacts of the present project are also on the roadside SBEs/households - people who are "non titled" informal dwellers and encroachers.

5.11.3. Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013.

The Government of India (GoI) in December 2013 had enacted RFCTLARR Act, 2014 in accordance to Manipur RFCTLARR Rules, 2014 from 1st January 2015. It recognizes the following essential features:

- That Displaced Households (DHs) not only lose their lands, other assets and livelihoods, they also experience adverse psychological social/cultural consequences.
- The need to minimize large-scale displacement and where displacement and where inevitable, resettlement and rehabilitation has to be handled with care. This is especially necessary for tribal, small and marginal farmers and women.
- That cash compensation alone is often inadequate to replace agricultural land, homesteads and other resources. Landless labour, forest dwellers, tenants, artisans are not eligible for cash compensation. The need to provide relief especially to the rural poor (with no assets) and marginal farmers, SCs/STs and women; the revised draft of NPRR include poor (BPL) and deprived groups, vulnerable, an ex-gratia of Rs 20,000/- for linear acquisition, per family.
- The importance of dialogue between DFs and the administration; responsible for resettlement for smoother implementation of projects R&R.

Displaced agricultural labourer who has been working for a period of minimum three years and who used to earn his livelihood by working on the land which is now under acquisition and who has become jobless because of the acquisition, shall be entitled for onetime payment of two hundred days' wages as fixed by the govt. under minimum wages act and shall also be entitled for National/State level job card under National Rural Employment Guarantee Program.

The policy specifies that the entire cost for Resettlement and Rehabilitation, in addition to the cost of acquisition of land shall be borne by the respective requisitioning authorities. The Requisitioning Authority shall deposit an amount equivalent to 0.5 percent of the estimated cost of land under acquisition for the project to the Collector-cum-Administrator, Resettlement and Rehabilitation through a bank draft subject to maximum of Rs. 2 lacs (Two lacs) only. This amount shall be over and above the amount paid for establishment expenditure under LAA. This additional amount shall be paid for outsourcing the work of survey for Resettlement, Monitoring, Stationeries, POL and other incidentals like vehicle, Computer, Computer Operator, Amins, Drafts man, Chainman etc.

5.11.4. NHIDCL Policy of Social Safeguard

The NHIDCL Guidelines for Confirmation of Environmental and Social Considerations refer not only to

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the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous peoples.

The objective of the Guidelines is to encourage project proponents seeking funding from NHIDCL to implement appropriate environmental and social considerations in accordance with the Guidelines. In doing so, it endeavours to ensure transparency, predictability and accountability in its confirmation of environmental and social considerations.

One of the basic principles of Guidelines regarding confirmation of environmental and social considerations is that the responsibility for environmental and social considerations for the project shall be that of the project proponent. NHIDCL confirms environmental and social considerations by undertaking screening, environmental review, and monitoring and follow ups.

Environmental and social considerations required for funded projects cover underlying principles, examination of measures, scope of impact to be examined, compliance with laws, standards and plans, social acceptability and social impacts, involuntary resettlement, indigenous peoples and monitoring.

The following are summary of requirements under the Guidelines. Social acceptability and social impacts

Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which the project is planned. For projects with a potentially large environment impact, sufficient consultations with stakeholders, such as local residents, must be conducted via disclosure of information from an early stage where alternative proposals for the project plans may be examined. The outcome of such consultations must be incorporated into the contents of the project plan; and

Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor and ethnic minorities who are susceptible to environmental and social impact and who may have little access to the decision-making process within society.

5.11.5. Involuntary resettlement

Involuntary resettlement and loss of means of livelihood are to be avoided where feasible, exploring all viable alternatives. When, after such examination, it is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected;

People to be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents, etc., in a timely manner. The project proponents, etc. must make efforts to enable people affected by project, to improve their standard of living,

Income opportunities and production levels, or at least to restore them to pre project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting the means for an alternative sustainable livelihood, and providing expenses necessary for relocation and re-establishment of community at relocation sites; and

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Appropriate participation by the people affected and their communities must be promoted in the planning, implementation and monitoring of involuntary resettlement plans and measures against the loss of their means of livelihood.

5.11.6. Indigenous peoples

When a project may have adverse impact on indigenous peoples, all of their rights in relation to land and resources must be respected in accordance with the spirit of the relevant international declarations and treaties. Efforts must be made to obtain the consent of indigenous peoples after they have fully informed.

5.11.7. National Highway Policy of Social Considerations

The NHAI Guidelines for Confirmation of Environmental and Social Considerations refer not only to the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous peoples.

The objective of the Guidelines is to encourage project proponents seeking funding from MoRTH or Funding Agency to implement appropriate environmental and social considerations in accordance with the Guidelines. In doing so, it endeavors to ensure transparency, predictability and accountability in its confirmation of environmental and social considerations.

One of the basic principles of Guidelines regarding confirmation of environmental and social considerations is that the responsibility for environmental and social considerations for the project shall be that of the project proponent. NHIDCL confirms environmental and social considerations by undertaking screening, environmental review, and monitoring and follow ups.

Environmental and social considerations required for funded projects cover underlying principles, examination of measures, scope of impact to be examined, compliance with laws, standards and plans, social acceptability and social impacts, involuntary resettlement, indigenous peoples and monitoring.

The following are summary of requirements under the Guidelines.

Social acceptability and social impacts

Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which the project is planned. For projects with a potentially large environment impact, sufficient consultations with stakeholders, such as local residents, must be conducted via disclosure of information from an early stage where alternative proposals for the project plans may be examined. The outcome of such consultations must be incorporated into the contents of the project plan; and

Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor and ethnic minorities who are susceptible to environmental and social impact and who may have little access to the decision-making process within society.

5.11.8. Policy Framework for this Project

Based on the above analysis of applicable legal and policy frameworks of the country and in

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consistent with state policy requirements the broad resettlement principle for this project shall be the following:

The involuntary resettlement would be avoided wherever possible or minimized as much as possible by exploring project and design alternatives.

The Project or all sub-projects under the program will be screened to identify past, present, and future involuntary resettlement impacts and risks. The scope of resettlement planning will be determined through a survey and/or census of displaced persons, including a gender analysis, specifically related to resettlement impacts and risks.

Meaningful consultations with affected persons, host communities, PIU will be carried out and all displaced persons will be informed of their entitlements and resettlement options. DP's participation in planning, implementation, and monitoring and reporting of resettlement programs will be ensured.

Particular attention will be paid to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land, and ensure their participation in consultations.

An effective grievance redress mechanism will be established to receive and facilitate resolution of the displaced persons' concerns. The social and cultural institutions of displaced persons and their host population will be supported through proper planning. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be preceded by a social preparation phase.

The livelihoods of all displaced persons will be improved or at least restored through (i) land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement value for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where possible.

Physically and economically displaced persons will be provided with needed assistance, including (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities; (ii) Transportation support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.

The standards of living of the displaced poor and other vulnerable groups, including women, will be improved to at least national minimum standards. In rural areas legal and affordable access to land and resources will be provided, and in urban areas appropriate income sources and legal and affordable access to adequate housing will be provided to the displaced poor.

If land acquisition is through negotiated settlement, procedures will be developed in a transparent, consistent, and equitable manner to ensure that those people who enter into negotiated settlements

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will maintain the same or better income and livelihood status. If, however, the negotiated settlement fails, the normal procedure of land acquisition will be followed.

Displaced persons without titles to land or any recognizable legal rights to land will be ensured that they are eligible for resettlement assistance and compensation for loss of non-land assets.

A resettlement plan will be prepared elaborating on displaced persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.

The draft resettlement plan, including documentation of the consultation process will be disclosed in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. The final resettlement plan and its updates will also be disclosed to displaced persons and other stakeholders.

Involuntary resettlement will be conceived and executed as part of a development project or program. Full costs of resettlement will be included in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.

All compensation will be paid and other resettlement entitlements will be provided before physical or economic displacement. The resettlement plan will be implemented under close supervision throughout project implementation.

Resettlement outcomes, their impacts on the standards of living of displaced persons will be monitored; it will be accessed whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Monitoring reports will be disclosed to DPs.

Land acquisition for the project would be done as per both National Highway Safeguard Policies and the RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014. To meet the replacement cost of land payment of compensation in revised market rate.

The uneconomic residual land remaining after land acquisition will be acquired as per the provisions of Land Acquisition Act. The owner of such land/property will have the right to seek acquisition of his entire contiguous holding/ property provided the residual land is less than the average land holding of the district.

People moving in the project area after the cut-off date will not be entitled to any assistance. In case of land acquisition, the date of publication of preliminary notification for acquisition under the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 will be treated as the cut-off date.

All common property resources (CPR) lost due to the project will be replaced or compensated by the project.

The project will recognize three types of displaced persons like (i) persons with formal legal rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized

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or recognizable under national laws; and (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land. The involuntary resettlement requirements apply to all three types of displaced persons.

5.11.9. Methodology for Determination of Valuation of Assets

All lands proposed to be acquired under this project will be compensated as per replacement cost. Land surveys to determine compensation rates will be conducted on the basis current land use and assessment of market value. Records as they are on the cut-off date will be taken into consideration while determining the current use of land. The EA will determine the replacement cost as per RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014 based on market survey and in consultation with DPs. After notification for acquisition as per National Highway Safeguard Policies, the EA will negotiate with DPs for voluntary acquisition and ensure payment of additional registration cost and solatium to all DPs. The EA will ensure that the rates established for the project are sufficient to purchase the same quality and quantity of land in the specific area.

The compensation for houses, buildings and other immovable properties will be determined on the basis of replacement cost as on date without depreciation. The EA will determine the replacement cost of structures in consultation with the owners by assessing (i) sources and cost of materials, whether the materials are locally available; (ii) type of shops (private or state-owned); (iii) distance to be traveled to procure materials; (iv) obtaining cost estimates through consultation with three contractors/suppliers in order to identify cost of materials and labor; (v) identifying the cost of different types of houses of different categories and compare the same with district level prices.

Cash compensation for properties belonging to the community if opted by the community, will be provided to enable construction of the same at new places through the community/ local self-governing bodies / appropriate authority in accordance with the modalities determined by such bodies / authority to ensure correct use of the amount of compensation.

Compensation for trees will be based on their market value. Loss of timber trees will be compensated at their replacement cost while the compensation for the loss of fruit bearing trees will be calculated as annual produce value for at next 15 years depending on the nature of crops/trees.

5.11.10. Procedure and Steps of Land Acquisition

The land acquisition in this project context will be accordingly the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014, along with additional provision made under RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014. The process for land acquisition in the project will be as follows:

- All the land identified for the project will be placed under the RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014 and a notification with Government's intension to acquire land will be issued by the District Collector (DC).
- Objections if any must be made within 30 days to the District Collector by the landowners.
- The land will be then placed under the LA Authority where a declaration will be made by the Government for acquisition of land for public purpose.

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- The DC will take steps for the acquisition, and the land is placed and notice will be issued by the DC in the name of persons interested.
- Once the land is placed under the EA will negotiate with DPs for voluntary acquisition to ensure payment of additional registration cost and solatium to all DPs.
- The DC will make declaration of award and disburse the compensation to the DPs

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5.12ENTITLEMENTS, ASSISTANCE AND BENEFITS

5.12.1. Definition of DPs and Eligibility

The project will have three types of displaced persons i.e., (i) persons with formal legal rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land. The involuntary resettlement requirements apply to all three types of displaced persons. DPs entitled for compensation, assistance and rehabilitation provisions under the sub project are:

All DPs losing land either covered by formal legal title, recognizable title, or without legal status;

Tenants and sharecroppers whether registered or not;

Owners of buildings, crops, plants, or other objects attached to the land; and DPs losing business, income, and salaries

Compensation eligibility is limited by a cut-off date as set for this project on the day of the beginning of the census survey which is December 2019 or as decided by the EA. DPs who settle in the affected areas after the cut-off date will not be eligible for compensation. They, however, will be given sufficient advance notice, requested to vacate premises and dismantle affected structures prior to project implementation. Their dismantled structures materials will not be confiscated and they will not pay any fine or suffer any sanction.

5.12.2. Entitlements

The entitlement provisions various categories of DPs in terms loss of land house and income as per census survey are detailed below:

Agricultural land impacts will be compensated at replacement cost. Cash compensation at replacement cost will be determined according to RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. If the residual plot(s) is (are) not viable, i.e., the DP becomes a marginal farmer, three options are to be given to the DP, subject to his acceptance which are (i) The DP remains on the plot, and the compensation and assistance paid to the tune of required amount of land to be acquired, (ii) Compensation and assistance are to be provided for the entire plot including residual part, if the owner of such land wishes that his residual plot should also be acquired by the EA, the EA will acquire the residual plot and pay the compensation for it and (iii) If the DP is from vulnerable group, compensation for the entire land by means of land for land will be provided if DP wishes so, provided that land of equal productive value is available. All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the EA.

Loss of homestead /Commercial land will be compensated at replacement cost. Cash compensation at replacement cost will be determined according to RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the EA.

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Loss of Structures Residential/Commercial/Other will be compensated at replacement value with other assistance. The details on the determination of compensation will be as (i) Compensation of structure will be paid at the replacement cost to be calculated as per latest prevailing basic schedules of rates (BSR) without depreciation or the replacement cost, (ii) Shifting assistance of Rs. 50,000/-, (iii) Right to salvage material from demolished structure and frontage etc., and (iv) Rental assistance as per the prevalent rate in the form of grant to cover maximum three month rentals.

Loss of rental accommodation by the tenants will be compensated as rental assistance and shifting assistance. The details assistance will be as per (i) Rental assistance for both residential & commercial tenants as per the prevalent rate in the form of grant to cover maximum three month rentals, (ii) Additional structures erected by tenants will also be compensated and deducted from owner's compensation amount, (iii) Shifting assistance based on type of house and household assets, (iv) Any advance deposited by the tenants will be refunded from owners total compensation package to the tenant on submission of documentary evidences and (v) Right to salvage material from demolished structure and frontage etc. erected by tenants

Loss of Trees will be compensated to Land holders, Share- croppers and Lease holders based on the market value to be computed with assistance of horticulture department. This can further be detailed in specific ways such as (i) Advance notice to DPs to harvest fruits and remove trees, (ii) b) For fruit bearing trees compensation at average fruit production for next 15 years to be computed at current market value and (iii) For timber trees compensation at market cost based on kind of trees

Loss of Crops will be compensated to Land holders, Share- croppers and Lease holders based on the market value to be computed with assistance of agricultural department. The detailed compensation methods are (i) Advance notice to DPs to harvest crops and (ii) In case of standing crops, cash compensation at current market cost to be calculated of mature crops based on average production.

Loss of Livelihood due to Loss of primary source of income will be compensated through rehabilitation assistances. There are various categories of entitled persons under this category which are (i) Titleholders losing income through business, (ii) Titleholders losing income through agriculture, (iii) Wage earning employees indirectly affected due to displacement of commercial structure, (iv) Agricultural labourer/share-cropper and (v) Licensed mobile vendors and kiosk operators. Details of entitlements for the above categories are described below:

Title holders losing their business establishment due to displacement will be provided rehabilitation assistance through a lump sum Transportation allowance of Rs. 9,000/-

Titleholders losing income through agriculture will be provided with the rehabilitation assistance which are (i) Training Assistance will be provided for income generating vocational training and skill up gradation options as per DPs choice at the rate of Rs. 5,000 per affected household to those households losing their primary source of income and (ii) Employment opportunity for DPs in the road construction work, if available and if so desired by them.

Wage earning employees indirectly affected due to displacement of commercial structure will be assisted through rehabilitation assistance which are; (i) persons indirectly affected due to the employer having being displaced, on case-by-case, based on local wage rates for three months, (ii) Employment opportunity for DPs in the road construction work, if available and if so desired by

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them, or (iii) National/State level job card under National Rural Employment Guarantee Program.

Rehabilitation assistance for Agricultural labourer/share-cropper will be paid as per the details such as (i) Assistance is to be paid as per the prevailing local wage rates for 100 days., (ii) b) Employment opportunity for DPs in the road construction work, if available and if so desired by them, or (iii) National/State level job card under National Rural Employment Guarantee Program.

Licensed mobile vendors and kiosk operators will be provided with the rehabilitation assistance which are (i) Mobile vendors are not eligible for compensation or assistance (ii) Those mobile vendors in possession of a permit from local authorities to operate in the affected area will be treated as kiosks operators, (iii) Kiosk operators and vendors licensed to operate from affected locations will be entitled to a one time lump sum assistance of Rs. 10,000/-.

Loss of community infrastructure/common property resources will be compensated either by cash compensation at replacement cost or reconstruction of the community structure in consultation with the affected community

Additional Assistance to vulnerable groups (Vulnerable households including BPL, SC, ST, WHH, disabled and elderly) will be paid with Special Assistance which will be one time lump sum assistance of Rs. 20,000/ to vulnerable households. This will be paid above and over the other assistance(s) as per this entitlement matrix.

Other Unanticipated Impacts (Temporary impact during construction like disruption of normal traffic, damage to adjacent parcel of land / assets due to movement of heavy machinery and plant site) will be compensated to either individual or community in the form of (i) The contractor shall bear the cost of any impact on structure or land due to movement of machinery during construction or establishment of construction plant and (ii) All temporary use of lands outside proposed RoW to be through written approval of the landowner and contractor. Location of Construction camps by contractors in consultation with RCD.

Any unanticipated impacts (if any) due to the project will be documented and mitigated based on the spirit of the principle agreed upon in this entitlement matrix.

5.12.3. Entitlement Matrix

Compensation for the lost assets to all displaced persons will be paid on the basis of replacement cost. Resettlement assistance for lost income and livelihoods will be provided to title holders. Special resettlement and rehabilitation measures will be made available to the "Vulnerable Group" comprises of DPs living below poverty line (BPL), SC, ST, women headed households, the elderly and the disabled. An Entitlement Matrix has been formulated, which recognizes and lists various types of losses resulting out of the project and specific compensation and resettlement packages.

Table 12.1: Entitlement Matrix

Sl.	Impact Category	Entitlements	Implementation Guidelines
PART I.TITLE HOLDERS-Compensation for Loss of Private Property			

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1	Loss of Land (agricultural, homestead, commercial or otherwise)	1.1	Compensation for land at Replacement Cost or Land for land, where feasible	Land will be acquired by the competent authority in accordance with the provisions of RFCTLARR Act, 2013. Replacement cost for Land will be, higher of(i) market value as per Indian Stamp Act, 1899 for the registration of sale deed or agreements to sell, in the area where land is situated; or(ii)average sale price for similar type of land, situated in the nearest village or nearest vicinity area, ascertained from the highest 50% of sale deeds of the preceding 3years; or (iii) consented amount paid for PPPs or private companies. Plus 100%solatium and 12%interest from date of notification to award. The multiplier factor adopted by GoM for land in rural area, based on the distance from urban area to the affected area, will be applied. In case of severance of land, house, manufactory or other building, As per Section 94(1), the whole land and /or structure shall be acquired, if the owner so desires.
2	Loss of Structure (house, shop, building or immovable property or assets attached to the land)	2.1	Compensation at replacement cost	The market value of structures and other immovable properties will be determined by replacement cost and/or PWD on the basis of relevant PWD Schedule of rates (SR)N as on date without depreciation. Plus 100% solatium For partly affected structures, the DP will have the option of –claiming compensation for the entire structure, if the remaining portion is unviable.
PART II. REHABILITATION AND RESETTLEMENT- Both Land Owners and Families Whose Livelihood is Primarily Dependent on Land Acquired				

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3	Loss of land	3.1	Employment to at least one member per affected family in the project or arrange for a job in such other project as may be required after providing suitable training and skill development in the required field and at a rate not lower than the minimum wages provided for in any other law for the time being in force. Or One-time payment of Rs.5,00,000/-for each affected household. Or Annuity policy that shall pay Rs, 2000/- per month for 20 years with appropriate indexation to CPIAL	
		3.2	Monthly subsistence allowance of Rs, 3000/-per month for a period of one year to affected households who require to relocate due to the project	
		3.3	Transportation assistance of Rs, 50,000/- for affected households who require to relocate due to the project	
		3.4	One time assistance of Rs, 25,000/- to all those who loss a cattle shed	
		3.5	One time Resettlement Allowance of Rs, 50,000/- for affected house \hold who have to relocate	
		3.6	Additional onetime assistance of Rs, 50,000/-to scheduled caste and scheduled tribe families who are displaced from scheduled areas and who require to relocate due to the project	

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4	Loss of Residence	4.1	An alternative house for those who have to relocate, as per IAY specification in rural areas and constructed house/flat of minimum 50sq.m. in urban areas or cash in lieu of house if opted (the cash in lieu of house will be Rs, 70,000/-in the line with GoI IAY standards in rural areas and Rs, 1,50,000 in case of urban areas) , for those who do not have any homestead land and who have been residing in the affected areas continuously for a minimum period of 3years	Stamp Duty and registration charges will be borne by the project in case of new houses or sites.
		4.2	Employment to at least one number per affected family in the project or arrange for a job in such other project as may be required after providing suitable training and skill development in the required field and at a rate not lower than the minimum wages provided for any other law for the time being in force. Or One Time payment of Rs, 5,00,000/- for each affected household Or Annuity policy that shall pay Rs, 2000/- per month or 20 years with appropriate indexation to CPIAL	
		4.3	Monthly subsistence allowance of Rs, 3000/- per month for a period of one year to affected households who require to locate due to the project	
		4.4	Transportation assistance of Rs, 50,000/- for affected households who require to relocate due to the project	
		4.5	One time assistance of Rs, 25,000/-to all those who lose a cattle shed	
		4.6	One time assistance of Rs, 25,000/- for each affected family of an artisan or self-employed and who has to relocate	
		4.7	One time Resettlement Allowance of Rs, 50,000/-for affected household who have	

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			to relocate	
		4.8	Additional onetime assistance of Rs, 50,000/-to scheduled caste and scheduled tribe families who are displaced from scheduled areas and who require to relocate due to the project	
		4.9	Right to salvage affected materials.	
5	Loss of shop /trade /commercial structure	5.1	Employment to at least one number per affected family in the project or arrange for a job in such other project as may be required after providing suitable training and skill development in the required field and at a rate not lower than the minimum wages provided for in any other law for the Or One-time Payment of Rs,5,00,000/-for each affected household Or Annuity policy that shall pay Rs, 2000/-per month for 20 years with appropriate indexation to CPIAL	
		5.2	Monthly subsistence allowance of 3000/- per month for a period of one year to affected household who require to relocate due to the project	
		5.3	Transportation assistance of Rs, 50,000/-for affected household who require to relocate due to the project	
		5.4	One time assistance of Rs, 25,000/-for each affected family of an artisan or self-employed or small trader and who has to relocate	
		5.5	One time Resettlement Allowance of Rs, 50,000/-for affected household who have to relocate	

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		5.6	Additional onetime assistance of 50,000/-to scheduled caste and scheduled tribe families who are displaced from scheduled areas and who require to relocate due- to the project	
		5.7	Right to salvage affected materials	
PART IV.IMPACT TO VULNERABLE HOUSEHOLD				
8	Vulnerable Household	8.1	Training for skill development. This assistance includes cost of training and financial assistance for travel/conveyance and food.	One adult member of the affected household, whose livelihood is affected, will be entitled for skill development. The PIU will identify the number of eligible vulnerable displaced persons during joint verification and updating of the RP and will conduct training need assessment in consultations with the DPs so as to develop appropriate training programmes suitable to the DPs skill and the region. Suitable trainers or local resources will be identified by PIU in consultation with local training institutes.
		8.2	One time assistance of Rs,25,000/-to DHs who have to relocate	
PART V.IMPACT DURING CIVIL WORKS				
9	Impact to structure / assets/tree/crops	9.1	The contractor is liable to pay damages to assets/tree/crops in privet/public land, caused due to civil works	The PIU will ensure compliance
10	Use of private land	10.1	The contractor should obtain prior written consent from the landowner and pay mutually agreed rental for use of private land for storage of material or movement of vehicles and machinery or diversion of traffic during civil works	
PART VI. COMMION PROPERTY RESOURCES				
11	impact to common property resources such as places of worship, community buildings, schools, etc.	11.1	Relocation or restoration, if feasible, or cash compensation at replacement cost.	
12	Utilities such as water supply, electricity, etc.	12.1	Will be relocated and services restored prior to commencement of civil works	The PIU will ensure that utilities are relocated prior to commencement of civil works in that stretch of the road corridor in accordance with the civil works schedule

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PART VII. UNFORSEEN IMPACT
Unforeseen Impacts encountered during implementation will be addressed in accordance with the principles of RFCTLARR2013/ Safeguard policy Guidelines of Multilateral Institutions

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5.13GRIEVANCE REDRESS CELL

There is a need for an efficient grievance redressal mechanism, which will assist the DPs in resolving queries and complaints. Any disputes will be addressed through the grievance redressal mechanism.

Formation of Grievance Redressal Cell (GRC) is most important for grievance redressal and it is anticipated that most, if not all grievances, are settled by the GRC. Detailed investigation will be undertaken which may involve field investigation with the concerned DPs. The GRCs are expected to resolve the grievances of the eligible persons within a stipulated time.

The GRCs will continue to function, for the benefit of the DPs, during the entire life of the project including the defects liability period. The response time prescribed for the GRCs is 15 days. The GRC will meet once in a fortnight to expedite redressal of grievances.

People are not debarred from moving to the court for issues including those related to R&R Entitlement. However, it is expected that the GRCs will play a very crucial role in redressing grievances of the DPs, and will help the implementation of the project as scheduled.

5.13.1. Constitution of Grievance Redressal Committee (GRC)

The committee will comprise of representatives of PIU; public representatives (viz., Member of Parliament, Member of Legislative Assembly, etc.) from respective district; representative of women group, squatters and vulnerable DPs; line department and affected persons especially women as well as the representative of respective District Administration. Minimum participation of women in GRC will be 33%. At least two persons from each group will be there in the GRC. The functions of the GRC will be:

- To provide support for the DPs on problems arising out of Land/ Property acquisition.
- To record the grievances of the DPs, categorizes and prioritize and solve them within a month.
- To inform PIU of serious cases within an appropriate time frame; and
- To report to the aggrieved parties about the development regarding their grievance and decision of PIU.

5.13.2. Operational Mechanism

It is proposed that GRC will meet regularly (at least once in 15 days) on a pre-fixed date (preferably on first 7th day of the month). The committee will look into the grievances of the people and will assign the responsibilities to implement the decisions of the committee. The committee will deliver its decision within a month of the case registration.

The mechanism will be based on proposed laws. The Grievance Redressal Cell (GRC) will be set up at each district. Grievance not resolved amicably at the district level will be routed through PIU to the GRC. Arbitrator may also be appointed for unresolved cases. Arbitrator will be selected by PIU.

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The various queries, complaints and problems that are likely to be generated among the DPs will primarily relate to disputes of ownership of assets, identification of legal heirs of deceased property owner and other non-land related issues.

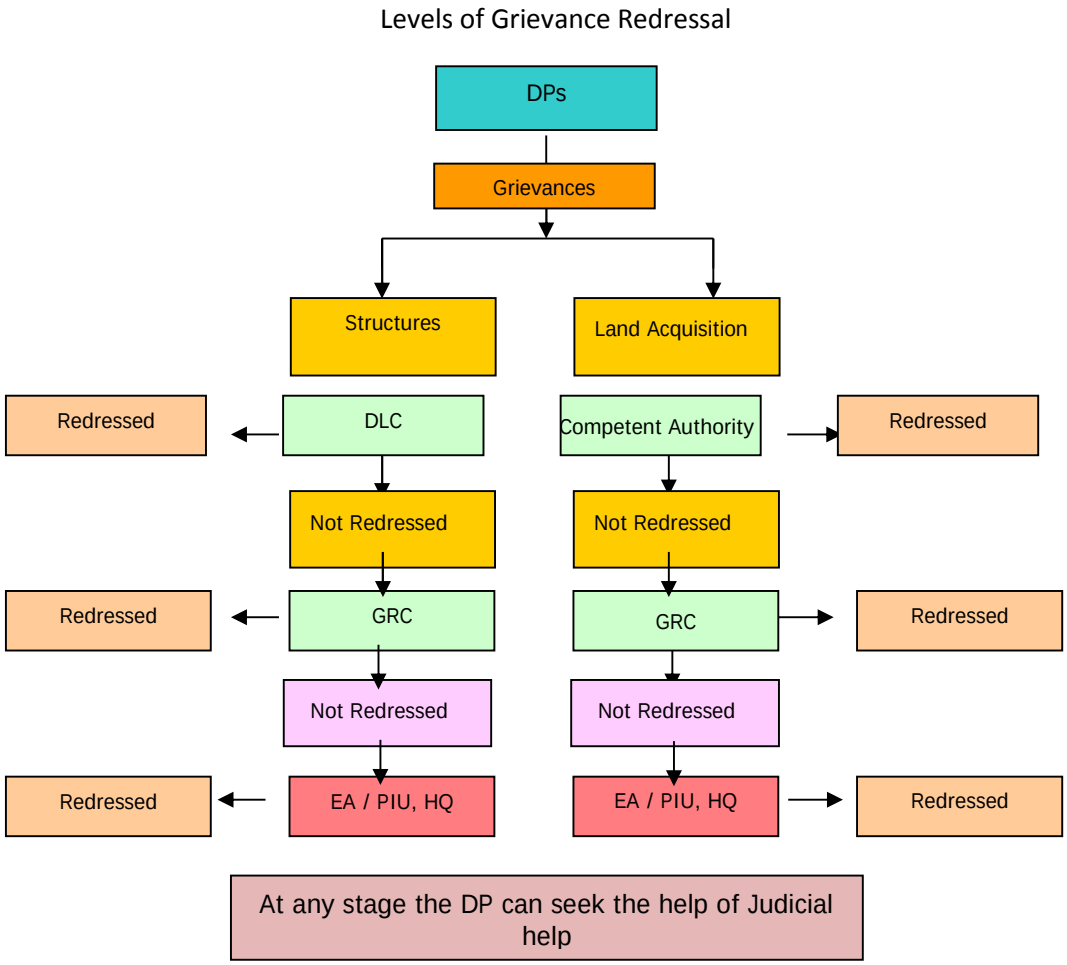
The PIU and office of NHIDCL will act as Public Information Centres, which will be in possession of all documents relating to the Project including compensation packages and grievance redressal procedures, and will provide any information regarding compensation and grievance redressal.

Through public consultations, the DPs will be informed that they have a right to grievance redressal. The DPs can present their grievances or queries to the GRC. The PIU will act as an in-built grievance redressal body.

5.13.3. Grievance Redressal Mechanism for DPs

The successive grievance redressal stages are illustrated in the flow chart shown below:

Flow Chart



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District Level Committees: The first stage will be District Level Committees (DLCs). The DPs will be encouraged to be part of DLCs composed of:

- Representatives of affected persons;
- Panchayat members of the affected villages; and
- PIU's Field worker

33% participation of women from affected families and full participation of women from the women headed households will also be encouraged.

The DLCs will meet at regular intervals as decided by the community, specifically for grievance redressing purposes at a pre-decided date, time and place. The DPs can be formally present in these meetings and discuss their queries and grievances. At the community level, the committee will have the power to resolve matters either by providing information or agreeing on a follow-up action. It may also reject some grievances for not being legitimate. However, it will have to explain to the AP, the premise for not recording the grievance. Legitimate grievances, which the DLC is unable to resolve, will be taken to the GRC, which will then take the necessary action after reviewing the findings of a thorough investigation. The DLC will maintain a register of all queries and grievances, and the subsequent action taken.

The DPs will present their grievance, concerning compensation for structures / land and R&R assistance to the DLC. The DLC will examine the grievance, and where required will review with DRO/CA and will do utmost to reach an amicable settlement to the satisfaction of the DPs.

5.13.4. Role of NHIDCL/EA Headquarters

The DPs, who would not be satisfied with the decision of the GRC, will have the right to take the grievance to the NHIDCL/EA Head Office for its redressal. Failing the redressal of grievance at NHIDCL/EA, the DPs will take the case to Arbitration. The Arbitrator(s) will be independent but appointed by NHIDCL. Taking grievances to arbitration and Judiciary will be avoided as far possible and the PIU will make utmost efforts at reconciliation at the GRC level.

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5.14INCOME RESTORATION MEASURES

5.14.1. Introduction

The Development projects have an adverse impact on the income of project-affected persons. They also have a negative impact on the socio- cultural systems of affected communities. Restoration of pre-project levels of income is an important part of rehabilitating socio-economic and cultural systems in affected communities.

As indicated by the Income Restoration Study in road sector projects, income restoration interventions are much more complex due to occupational diversity of DPs. For example, there may be a mix of a large number of land title holders (big, small and marginal farmers) or/and engaged in small business enterprises (vehicle repairing shops, small hotels, other rural/semi urban small activity based shops, commercial squatters etc.) as displaced people. This complex nature of occupational diversity poses a problem for mitigation measures in the context of economic rehabilitation. The task becomes even more challenging due to the inherent pressure of completion of road construction work in a time bound manner.

However, the R&R framework proposed for the project has adequate provisions for restoration of livelihood of the affected communities. Attempts have been made towards improving the Income restoration strategies. The focus of restoration of livelihood is to ensure that the Affected Persons (DPs) are able to at least "regain their previous living standards". To restore and enhance the economic conditions of the DPs, certain income generation and income restoration programs are incorporated in the RP. To begin with, providing employment to the local people during construction phase will enable them to participate in the benefits of the project, reduce the size of intrusive work forces & keep more of the resources spent on the project in the local economy. It will also give the local communities a greater stake & sense of ownership in the project.

The R&R framework of the project provides that the loss of livelihood which would mainly result from the loss of land will be compensated by way of:

- Alternate economic rehabilitation support and training for up-gradation of skills or imparting new skills; and various R&R assistance such as Transportation Allowance, Economic rehabilitation grant for vulnerable.
- Preference of providing employment through the contractors for road works specially to those belonging to vulnerable groups.

Alternate village income sources such as village based industries will be promoted by the project in association with the local NGOs/CBOs. Villagers will be supported & encouraged to develop industries that are suited to their resources, skills and interests. Support in the form of technical assistance and training, marketing, business management and coordination will be provided by the PIU. The project affected families eligible for Income Restoration is shown in table below:

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Table 14.1: Income Restoration for displaced persons

Sl.	Loss	No. of Person	Percentage
1	Owners of Commercial Structure	0	0%
2	Owners of Residential cum Commercial Structure (TH)	0	0%
3	Commercial tenant	0	0%
4	Employee in commercial Structures	0	0%
	Total	**0**	**0%**

Source: Census Survey on December 2019

The project will assist the DPs in liaison with PIU, to encourage the DPs to work in the road construction services. The project will:

- ❖ Assist to establish contact with the construction contractors for road works;
- ❖ Encourage to enlist labour for work to handle road related contract services;
- ❖ Compensate them for the loss of livelihood and income resulting from land acquisition;
- ❖ Identify training needs & modules;
- ❖ Assist access to poverty alleviation programs of the Govt. such as Swarnjayanti Gram Swa Rojgar Yojna especially for those below poverty line.
- ❖ Also assist to identify self-employment options.

5.14.2. Self-Employment Generation Scheme

PAPs will be encouraged to take up training for income generating activities, with active support from the project through the PIU, in self-employment schemes.

Besides the land losers, other DPs namely homestead losers; daily wage labourers and DP in the vulnerable category are eligible for enrolment into the training program. For training and upgradation of skills Rs. 5000 per family has been worked out as per the entitlement matrix. The PIU will take the initiative to make necessary arrangements for providing infrastructure and other institutional support that will be required, to assist the DP to get financial support through local bank and Government program. The PIU would generate awareness among the DPs about the different income earning opportunities and facilitate and training among DPs. The PIU-R&R cell will not only take the initiative for self-employment generating schemes and also arrange for appropriate training programmes so that the trained DPs will be eligible for others jobs.

The principles governing the resettlement and rehabilitation will take into consideration:

- ❖ Rehabilitation assistance in the form of shop space if opted by 50 people or more;
- ❖ Transportation allowance.
- ❖ Women, handicapped and BPLs will be in the vulnerable category, will be given priority in allotment of shops.
- ❖ Compensation for those who don't want shop space, these DPs will be assisted for alternate livelihood scheme. Till then, the amount paid for assistance will be kept in banks as joint

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account with the Project Authority.

- ❖ Only one shop per DP will be considered, multiple occupations will not be considered.
- ❖ Only those DPs will be eligible for such compensation whose primary source of income is from shops that will be lost.
- ❖ Conditions for shop allotment to DPs will be laid down which will include formation of market committees with DP participation, representative of this committee for smooth operation and maintenance of the complex. A nominal license fee will be charged.
- ❖ Access to loans will be facilitated by the Project Authority.
- ❖ Shops will be allotted based on the type of business carried out prior to eviction.

5.14.3. Option of self-employment and EA's Assistance

It is perceived that the EA will be unable to provide direct employment to the DPs. Hence, an alternative programmes are proposed as outlined in the above sections. Training for self-employment and assistance in setting up micro-enterprises is the primary vehicle of rehabilitation.

The following order of priority would be considered for the DPs entitled for self-employment:

Have the requisite educational qualification.

Have taken training in some micro-enterprise scheme and appeals to the EA for assistance; and

Possess previous experience in running micro-enterprises.

However, relaxation will be made for women, those below poverty line, and minorities and vulnerable DPs who have taken training, but may not have requisite educational qualifications and experience. In both cases, the R&R cell in consultation with the PIU and the DLCs will vet appeals.

The key parameters of the EA level of assistance in setting up of micro-enterprises are as follows:

Survey of marketing opportunities by the PIU and information on DPs under the supervision of R&R Cell.

Identification of training needs and modules that matches market opportunities. This will be done by the PIU.

PIU to assist the DPs to form groups/cooperatives that can bid for contracts tendered by the construction contractors or its sub-contractors. Activity to be supervised by R&R Cell.

R&R cell through the PIU will assist the DPs to get access to capital by facilitating formation of a credit window affordable to the DPs as individuals or groups in the local bank.

EA will co-ordinate with the local bank to extend credit to the DPs. EA will extend a letter of introduction to the bank.

Encourage the DPs to service loans and through awareness generation and training programmes by the PIU.

R&R cell in collaboration with the PIU will also facilitate the DPs access to poverty alleviation programmes of the Government.

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R&R cell will monitor the ventures established and incomes derived from these programmes. The information will be fed into the R&R database. The ventures and incomes derived will again be monitored by an independent agency and the Lending Institute vets the reports submitted by the PIU-R&R cell.

5.14.4. Market Feasibility Study

No business enterprise or income restoration program will sustain until and unless it is based on the market need and demand. Hence, EA through it's PIU who will undertake the detailed market feasibility study to clearly prepare the list of all viable and feasible enterprises. The scope of this study covers service and non-service based enterprises, the raw material availability and assured consumer market. The findings of the study will also be matched with the profile of the DPs and accordingly the options will be offered to the DPs. However, R&R consultants in the local district and village markets to make reconnaissance of the proposed demand and supply situation conducted rapid market survey. The local district markets comprise of all types of shops; hardware, construction materials, general store, vegetable markets, cloth stores, auto repair shops etc. The development of the project is expected to increase urbanization and commercialization of the society in particular along the project corridor. Demand for consumer goods in the area would consequently increase. Initiation of road construction activities will also result in a heavy spree of construction activities in and around the project area. This would consequently increase cash flow in the area.

Co-operatives of women markets can be set up for preparation of jams and pickles, basket making and moulding of leaf cups and plates. Poultry and animal husbandry units can also be set up in villages. Nursery to raise plants could also be quite viable since EA is committed to plant trees, as they would be felling many for the project. PIU will facilitate marketing facilities support through backward and forward linkages in order to make the self-employment schemes successful and will conduct periodical monitoring of these units over the implementation period and will take midterm correction measures if required. For marketing purposes, the PIU may tie these units up with khadi and village industries cooperatives (KVIC) or with the export promotion board or similar organizations. After establishment of the initial marketing linkages, the PIU will have to be gradually phase out their involvement.

5.14.5. Training Needs of DPs

Very few DPs possess any professional skills in the project area. Hence, a large scale and intensive training programme need to be undertaken. The DPs eligible for training will either be trained in the Training Institutes identified by PIU. Training will be provided to vulnerable DPs as per the entitlement matrix. It is expected that such training will be organized within 12 months of property acquisition. PIU shall carry out the detail exercise of skill mapping and training need assessment before finalization of any training schemes.

5.14.6. Comprehensive Training Policy

Training is an important part of RP. Following training modules will be developed;

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5.14.7. Training of DPs

The training imparted will be essentially of two types: a technical training relevant for jobs and the other for non-land and land based self-employment and skill development schemes. The policy is devised under the following parameters:

- ❖ Eligible DPs will get training assistance.
- ❖ Provision for training has already been made in the RP budget. This amount is not redeemable in cash. It is based on an estimate of a minimum of 6 weeks of training per person, which may be stretched to:
- ❖ Maximum of one year, which could allow daily allowance to EP, cost of experts, trainers and other incidental expenses. In case where the type of training requested by the DPs exceeds the budgeted amount, the EA will review the request on a case-by-case basis through the R&R cell or the shortfall will be met from ERG in case DP is eligible for that.
- ❖ DPs will have the right to participate in institutional form of training at proposed institutions facilitated by PIU. DPs will have the right to transfer his/her training entitlement to his/her immediate family member if the DP desires to do so. The PIU will coordinate the process.
- ❖ DPs shall request the EA for participation in a particular training in consultation with the PIU. The EA will approve and pay the Training Institution directly and the cost will be deducted from the DPs training entitlement.
- ❖ Eligibility criteria for training will feature on the ID card.
- ❖ On completion of training DPs will receive an introductory letter/certificate from the EA. This will assist the DPs in approaching the bank for loans to start micro enterprises.

5.14.8. Training Mechanism

The implementation of the training procedure would involve the following DPs:

- ❖ Regular survey of perceived training needs of DPs by PIU in collaboration with the R&R cell and Panchayat level committees will lead to prioritizing and selection of schemes for training.
- ❖ Identification of Training Institutes/individuals/experts by the PIU can be subcontracted to conduct relevant training demanded by DPs within the financial means of the entitlement and preparation of TOR for the same by the PIU.
- ❖ Preparation of list of trainees (phase wise) by the PIU in collaboration with the DLCs and R&R Cell.
- ❖ Awareness generation and information dissemination on the schemes by the PIU to the selected trainees to ensure transparency about the training schemes and the entitled amounts.
- ❖ Registration of the DPs, payment of courses and maintenance of all records, regarding portion of entitlement used by DP for a particular course, will be done by the PIU. The PIU will submit the information to the R&R cell, for inclusion in the R&R database.

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The PIU, EA will co-ordinate with the different recognized training organization, including professionals who will be engaged by the EA, to impart training in different trades to the DPs either in the project area or any other place fixed by the institutes. Care shall be taken by the R&R cell that the funds for training are utilized in best possible ways.

5.14.9. Women's Needs & Participation

In the process of R&R, women require special attention. Change caused by relocation does not have equal implications for members of both the sexes and may result in greater inconvenience to women. Due to disturbance in production system, reduction in assets like land and livestock, women may have to face the challenge of running a large household in limited income and resources. This in turn may force woman as well as children to participate in work for supplementing the household income. In contrast to this, due to changes that are likely to take places for any development project, especially changes in environment and land labour ratio, those women who at present are engaged in activities like agriculture labour, or collection and sale of forest produce may find themselves unemployed and dependent.

EA would, therefore, make efforts to maintain the social support network for women headed households as far as possible so that they remain closer to their locations and /or provide special services at the new sites. Special assistance would consist of the following:

- Allowing them priority in site selection
- Relocating them near site wherever possible
- Arranging with the contractor to construct their houses
- Providing assistance with dismantling salvageable materials from their original home
- Providing them priority access to all other mitigation and development assistance, and
- Monitoring their nutritional & health status.

Some examples of meeting practical needs of women that will be implemented by EA are: -

- Reduce women's workloads by providing standpipes, toilet facilities, and the likes.
- Improve health services by providing safe drinking water, family planning and HIV/AIDS counselling, sanitation training, immunization, etc.
- Assist in childcare services for wage earning mothers, primary schools, inputs in kitchen gardening etc.
- Increase access to productive resources.
- Promote equal opportunities for women's employment.

Encouraging women's participation in development projects is a policy being followed by GoI. There are several ways in which women will be able to participate in the implementation programme: -

- The independent agency for monitoring and evaluation will have 33% representation of women key professionals and technical support team.

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5.14.10. Measures towards income restoration and uplift of vulnerable people

EA has evolved a number of measures towards resettlement and rehabilitation of the vulnerable families including the women headed households, SC/ST below poverty line and the poor (BPL in general) getting affected by its projects. The considerations therein have been compiled as follows:

- ❖ All the affected families falling under the vulnerable category including the BPL are going to be assisted to uplift their economic status irrespective of their ownership status. Thus, it implies that whether they do or do not possess legal title of the lands/assets, whether they are tenants or encroachers or squatters, they will be assisted in restoring their livelihood.
- ❖ Additional grant for severance of land, residual plots, expenses on fees, taxes, etc. and alternative economic rehabilitation support and training for up-gradation of the skills.
- ❖ In case of loss of non-agricultural private property, option for residential/commercial plot at resettlement site will be provided free of cost to vulnerable families if so opted by a group of them apart from all other considerations like compensation at replacement value, Transportation allowance, shifting allowance, rental allowance for disruption caused to BPL tenants, compensation for advance rental deposits, right to salvage materials for the demolished site, etc.
- ❖ There is a provision for additional support to the vulnerable people who have been affected by the loss of livelihood / primary source of income. The assistance will be the economic rehabilitation grant supported with vocational training of DPs choice. The training will include starting of a suitable production or service activity. In case the money is not spent on the training program, the equivalent amount is to be paid as per DPs choice.
- ❖ Inter agency linkages for income restoration.

Majority of the eligible families for income restoration earn their livelihood from marginal agriculture or petty businesses, and it is imperative to ensure that the DPs are able to reconstruct their livelihood. Based on the market feasibility study, the list of livelihood schemes will be developed, and based on felt needs of the target group population the activities will be prioritized through people's participation. Further, these options will be tested for their viability against availability of skill, raw material and available appropriate technology. Suitable alternative livelihood schemes will be finally selected, where training on skill up gradation, capital assistance and assistance in the form of backward-forward linkages (with respect to the selected livelihood schemes) can be provided for making these pursuits sustainable for the beneficiaries, of the target group. Income generation schemes will be developed in consultation with the project affected/displaced families. The grants received for such purpose for the project, will be used for the skill development training to upgrade their proposed skill, purchase of small scales capital assets etc. While developing the enterprise development or the income generation activities, the PIU will contact the local financial institutions for financing the economic ventures. The marketing and milk federations will also be contacted for planning sustainable economic development opportunities.

5.14.11. Short-Term Income Restoration Activities

Short term IR activities mean restoring DPs' income during periods immediately before and after

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relocation. Such activities will focus on the following:

- ❖ Ensuring that adequate compensation is paid before relocation.
- ❖ Transit allowances.
- ❖ Providing short term, welfare based grants and allowances such as:
- ❖ One-time relocation allowance or free transport to resettlement areas or assistance for transport.
- ❖ Free or subsidized items.
- ❖ Special allowance for vulnerable groups as per entitlement framework capacity. Timely establishment & involvement of appropriate R&R institutions would significantly facilitate achievement of objectives of the R&R program. The main R&R institution would include:
  - EA,
  - Local Administration
  - Line departments
  - PIU
  - DLC/GRC
  - Training Institutions
  - M&E Agency

5.14.12. The Process

EA will initiate the following activities to commence and implement the RP:

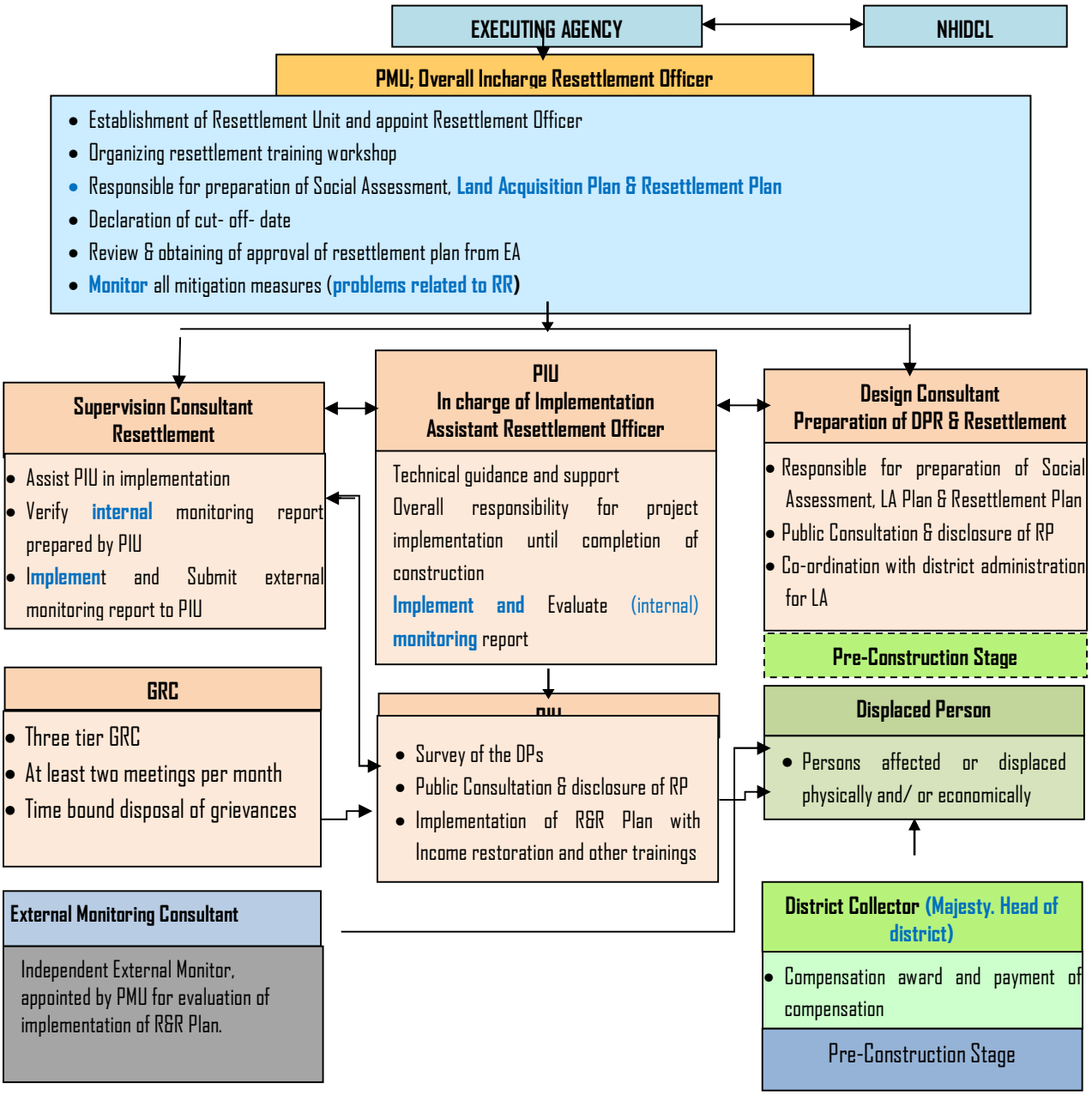
- ❖ Establish PIU and field offices
- ❖ Orientation and awareness seminars for Project Implementation Unit (PIU).
- ❖ Appointment of external monitoring and evaluation consultants

Effective RP implementation will require institutional relationships & responsibilities, rapid organizational development & collaborative efforts by EA, State Govt. The ESDU will establish operational links within EA (for e.g. finance for release of money on approval of micro plan) & with other agencies of Govt. involved in project induced settlement. It will provide means & mechanism for coordinating the delivery of the compensation & assistance entitled to those who will suffer loss. On behalf of EA, ESDU will assure the responsibility for representing the social impact & resettlement component of the project. The ESDU will also be responsible for disseminating the information to the public & providing additional opportunities for public comment. The ESDU at the apex level will have overall responsibility for policy guidance, coordination, contingency planning, monitoring and overall reporting during RP implementation.

The Organogram for the R&R cell is given in (***Figure 5.no. 8***):

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Figure 5.8: Implementation Structures for RAP



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5.15INSTITUTIONS FOR PLANNING & IMPLEMENTATION OF RP

5.15.1. Introduction

Institutions for planning & implementation of RP vary substantially in terms of their respective roles & capacity. Timely establishment & involvement of appropriate R&R institutions would significantly facilitate achievement of objectives of the R&R program. The main R&R institution would include:

- EA
- Local Administration
- Line departments
- PIU
- DLC/GRC
- Training Institutions
- M&E Agency

5.15.2. The Process

EA will initiate the following activities to commence and implement the RP:

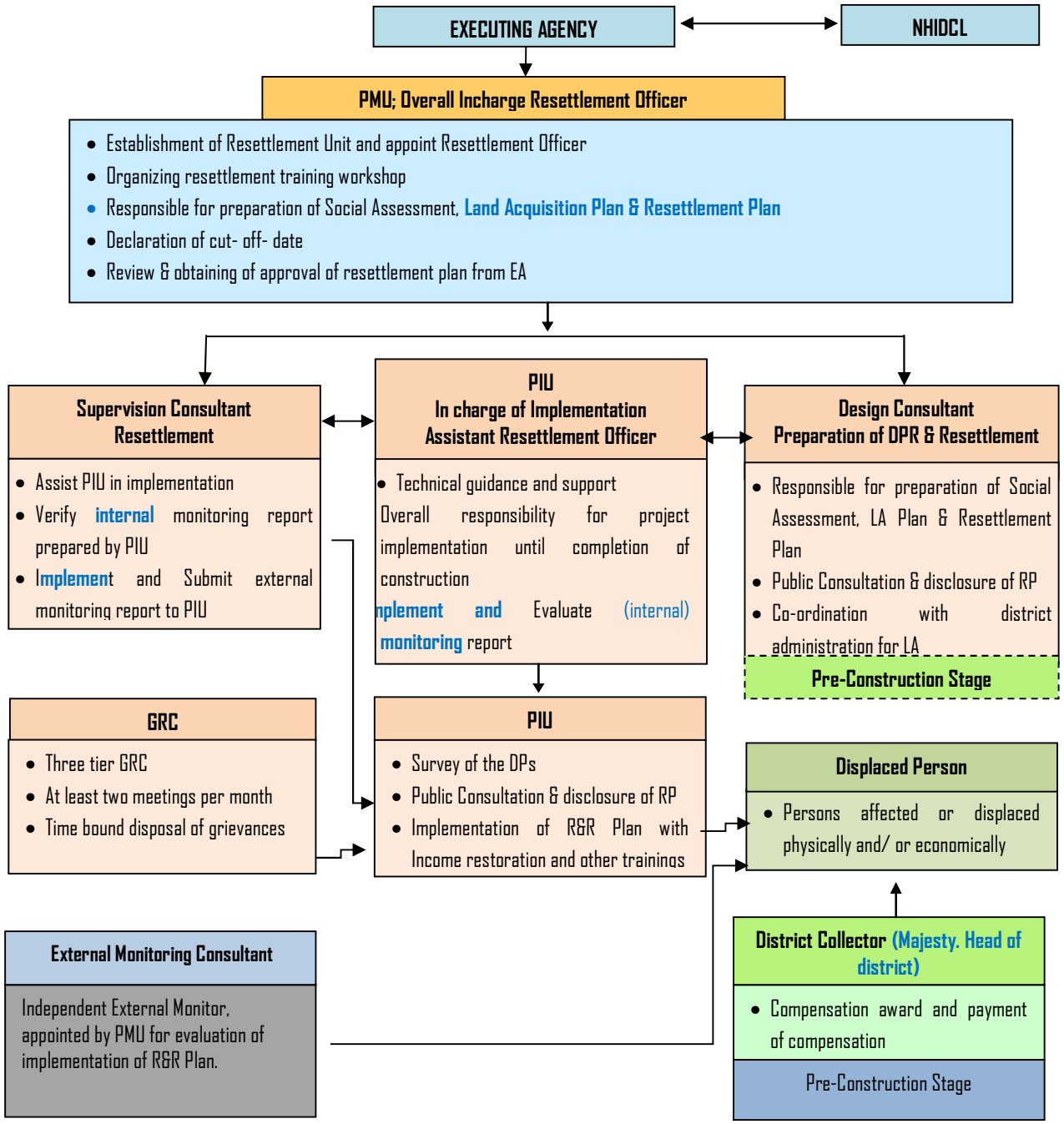
- ❖ Establish PIU and field offices.
- ❖ Orientation and awareness seminars for Project Implementation Unit (PIU).
- ❖ Appointment of external monitoring and evaluation consultants.

Effective RP implementation will require institutional relationships & responsibilities, rapid organizational development & collaborative efforts by EA, State Govt. The ESDU will establish operational links within EA (for e.g. finance for release of money on approval of micro plan) & with other agencies of govt. involved in project induced settlement. It will provide means & mechanism for coordinating the delivery of the compensation & assistance entitled to those who will suffer loss. On behalf of EA, ESDU will assume the responsibility for representing the social impact & resettlement component of the project. The ESDU will also be responsible for disseminating the information to the public & providing additional opportunities for public comment.

The ESDU at the apex level will have overall responsibility for policy guidance, coordination, and contingency planning, monitoring and overall reporting during RP implementation.

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Figure 5.9: Institutional arrangement for RAP



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5.15.3. Roles and Responsibilities

The role and responsibilities of the various offices in R&R implementation are presented below:

15.3.a At Corporate Level

The Project Director: -

- ❖ In-charge of overall project activities.
- ❖ Participate in the State Level Committees to facilitate land acquisition, pre- construction activities and implementation of R&R activities.

EA: -

- ❖ Co-ordinate the implementation of R&R activities with **corporate** and field staff.
- ❖ Review the micro plans prepared by the PIU.
- ❖ Review monthly progress report.
- ❖ Monitor the progress on R&R and land acquisition.
- ❖ Advice PIU/M&E Agency on policy related issues during implementation.
- ❖ Ensure early release of money to PIUs for R&R activities.

5.15.4. Project Implementation Unit (PIU)

This unit will coordinate the process for land acquisition. Relocation and rehabilitation, distribution of project provided assistance and DPs access to government programs.

- ❖ Survey and verification of the DPs.
- ❖ Verification of land records followed by verification on the spot related to identified plots and owners.
- ❖ Develop rapport with the DPs.
- ❖ Verify and Photograph of each DP for ID cards.
- ❖ Assist to issue identity cards to the DPs.
- ❖ Co-ordinate with the DRO to implement R&R activities.
- ❖ Conduct market feasibility study.
- ❖ Valuation of properties/assets for finalization of replacement value.
- ❖ Participate with the DRO to undertake public information campaign at the commencement of the projects.
- ❖ Distribute the pamphlets of R&R policy to the DPs.
- ❖ Assist the DPs in receiving the compensation.
- ❖ Facilitate the process of arranging loans for DPs.

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- Facilitate the opening of joint accounts.
- Generate awareness about the alternate economic livelihood and enable the DPs to make informed choice.
- Prepare micro-plans for R&R.
- Enable the DPs to identify the alternate sites for agriculture, residential and commercial plots.
- Participate in the consultation on allotment of shops and residential plots.
- Ensure the DPs have received their entitlements.
- Ensure the preparation of rehabilitation sites.
- Participate in the meetings organized by the PIU.
- Submit monthly progress reports.
- Identify training needs and institutions for the DPs for income generating activities.
- Participate in the disbursement of cheques for the assistance at public places.
- Coordinate the training programs of the DPs for income generating activities.
- Coordinate the meeting of District Level Committees.
- Accompany DP to GRC.
- Awareness campaigns for highway related diseases.
- Ensure the DP judiciously uses compensation and R&R assistance

5.15.5. RP Implementation Field Offices and Tasks

The PD-PIU will be responsible to carry out the following tasks concerning resettlement of the project:

- Overall responsibility of Implementation of R&R activities of RP.
- Responsible for land acquisition and R&R activities in the field.
- Ensure availability of budget for R&R activities.
- Liaison with District Administration for support for land acquisition and implementation of R&R.
- Participate in the district level committees.

15.5.a District Resettlement and Rehabilitation Officer (DRRO)

- Co-ordinate with District Administration and PIU for land acquisition and R&R.
- Translation of R&R policy in local language.
- Prepare pamphlets of the policy.

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- ❖ Printing of the policy and identity cards for the DPs.
- ❖ Ensure development of resettlement sites, wherever required.
- ❖ Participate in the allotment of residential, commercial and agricultural plots.
- ❖ Liaison with District Administration for dovetailing government's income generating and developmental programs for the DPs.
- ❖ Ensure the inclusion of those DPs who may have not been covered during the census survey; facilitate the opening of joint accounts in local banks to transfer assistance for R&R for DPs and organize disbursement of cheques for assistance in the affected area in public.
- ❖ Monitor physical and financial progress on land acquisition and R&R activities.
- ❖ Participate in regular meetings.
- ❖ Organize Bi-monthly meetings with the PIU to review the progress on R&R.
- ❖ Review micro plan & monthly reports submitted by PIU.

5.15.6. District Level Committee (DLC)

RP will be implemented through District Level Committees that will be established in the districts of Churachandpur in Manipur. The committee would include District Magistrate or his representative, District Land Acquisition Officer, Pradhan of Panchayat Samities, representative of affected villages including women, representative of Revenue Department, Line Departments, PWD, Mining Departments, people's representatives, and representatives of affected population. The formation of DLCs would be facilitated by PIU. The functions of the DLC will be as follows: (i) to meet regularly to review the progress of land acquisition/ R&R; (ii) approval of the micro-plan on the basis of methodology defined in the RP; and (iii) facilitate the implementation of the RP programs in the project-affected area.

The DLC would also: (i) meet regularly at pre-decided dated specifically for grievance redressing purpose; (ii) help in amicable settlement of disputes at community level; (iii) carry forward the ones which are not reconciled at the Grievance Redressal Committee (iv) coordination with local govt. authorities & field offices.

15.6.a Coordination with Other Agencies and Organizations

R&R Cell will establish networking relationships with line departments and other Govt. & non-Govt. organizations. The Revenue Department has an influencing role in land acquisition proceedings, and initiation of resettlement process. Unless the compensation process is prompt and efficient, implementation process will get delayed. R&R Cell will coordinate with the Project Land Acquisition Officer to expedite the land acquisition process.

Income restoration will be sole responsibility of the Project Authority. PIU will facilitate linkages to be established with the agencies implementing centrally sponsored poverty alleviation programs to restore the income of DPs.

Restoration of community assets such as hand pumps, bore wells will require help from PHED. EA

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will extensively work on developing lateral linkages for mobilization of resources to benefit the DPs and to achieve the desired results expected from implementation of RP.

The Revenue Department is responsible for providing land records, acquiring land and other properties and handing them over to the proper authorities. The District Rural Development Agency (DRDA) will extend the IRDP and other developmental schemes to include the DPs. The representative of these departments/agencies will be in contact with the R&R Cell, which will facilitate the integration of the various agencies, involved in the R&R process.

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5.16RESETTLEMENT AND REHABILITATION BUDGET

5.16.1. Introduction

The resettlement cost estimate for this project includes eligible compensation, resettlement assistance and support cost for RP implementation. The support cost, which includes staffing requirement, monitoring and reporting, project implementation and other administrative expenses are part of the overall project cost. The unit cost for structures and other assets in this budget has been derived through field survey, consultation with affected families, relevant local authorities and reference from old practices. Contingency provisions have also been made to take into account variations from this estimate. Some of the major items of this R&R cost estimate are outlined below:

- ❖ Compensation for agricultural, residential and commercial land at their replacement value
- ❖ Compensation for structures (residential/ commercial) and other immovable assets at their replacement cost
- ❖ Compensation for crops and trees
- ❖ Assistance in lieu of the loss of business/ wage income/ employment and livelihood
- ❖ Assistance for shifting of the structures
- ❖ Resettlement and Rehabilitation Assistance in the form of Training allowance
- ❖ Special assistance to vulnerable groups for their livelihood restoration
- ❖ Cost for implementation of RP.

5.16.2. Compensation

16.2.a Private Agricultural Land:

The unit rate for agricultural land has been estimated as per Land Acquisition Resettlement and Rehabilitation Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 and National Highway Authority of India Act, 1956. To meet the replacement cost of land compensation will be calculated over updated land rate with additional as registration cost plus solatium or as decided by District Magistrate. It may be noted that the District Magistrate have the discretionary power in valuation of land in his jurisdiction. The State Government may also announce packages for Land Acquisition.

16.2.b Residential/ Commercial and other structures:

The compensation cost of structures are arrived at by assessment of market value, consultation with DPs and data collected from building contractors and property agents this meets the replacement cost of the structures.

- The R & R budget has been calculated on the following basis: -
- The R & R budget is calculated on the basis of DLC rates or market value.
- The budget for the compensation of affected structures is based on the rates of various types as described in Basic Schedule Rates (BSR), PWD, Govt. Of Manipur, 2016 and/or the

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market values.

The average estimated rate for permanent structures without land has been calculated at Rs. 16,218/m^2, semi-permanent structures have been calculated at Rs. 12,448/m^2, and temporary structures have been calculated at the rate of Rs. 3,769/m2. The compensation for boundary walls at per running metre is Rs. 6,244/ per metre.2

5.16.3. Assistance

Shifting allowance: Shifting allowance will be provided to all the affected households losing structures and tenants. The unit cost has been derived on a lump sum basis of Rs. 50,000/-.

Rental Assistance: Rental assistance to titleholder (structures) and tenants in structures will be provided in the form of grants to cover maximum three months' rentals @ Rs. 4,000/- per month.

Rehabilitation Assistance to DPs Losing Business Establishment: Title holders losing their business establishment due to displacement will be provided with a lump sum transitional allowance of Rs. 50,000/-. This rate has been fixed based on the estimates of average income for a period of three months.

Training Assistance to Agricultural Titleholders: Training Assistance will be provided for income generating vocational training and skill up-gradation options as per DPs choice at the rate of Rs. 5,000/- per affected household to those households losing their primary source of income.

Rehabilitation Assistance to Employees in Structure: Wage earning employees indirectly affected due to displacement of commercial structure will be provided assistance as per the prevailing local wage rate for 3 plus months i.e. @ Rs. 146/- for 100 days.

Rehabilitation Assistance to Agricultural Labourers/Sharecroppers: Agricultural Labourers/ Sharecroppers will be provided with assistance as per the prevailing local wage rate for 100 days @ Rs. 173/- per day.

Assistance to Vulnerable Households: One time lump sum assistance of Rs. 50,000/- will be paid to each vulnerable households. (This will be paid above and over the other assistance(s) as per the entitlement matrix).

5.16.4. Compensation for Community and Government Property

Religious and Community Structures: The religious and community structures are being partially affected and do not require full replacement. However, a lump sum provision of Rs. 3,00,000/- per structure is made in the budget to rebuild are enhance the ambience of these structures. However, any religious or community structure requires full relocation will be compensated in replacement rate.

5.16.5. RP Implementation and Support Cost

For grievance redress process a lump sum of Rs 4,80,000/- is provided for two years and cost of other RP implementation and administrative activities will be a part of proposed departmental

[2] Annexure attached.

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expenditure. The separate fund for grievance redressal for this project is made based on intensity of impacts. In addition, the process will involve interdepartmental arrangement and include participation by representatives of DPs, particularly of vulnerable DPs, local government representatives, representative of other interest groups besides PIU.

5.16.6. Source of Funding and Fund Flow Management

The cost related to land acquisition and resettlement cost will be borne by the EA. EA will ensure allocation of funds and availability of resources for smooth implementation of the project R&R activities. The EA will, in advance, initiate the process and will try to keep the approval for the R&R budget in the fiscal budget through the ministry of finance. In the case of assistance and other rehabilitation measures, the EA will directly pay the money or any other assistance as stated in the RP to DPs. The PIU will be involved in facilitating the disbursement process and rehabilitation program.

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5.16.7. R&R Budget

A detailed indicative R&R cost is given in Table

Table 16.1: Estimates of Entitlements for Package-IVB

Item	Rate (as per Minimum Guidance Value)	Rate (as per Average Market Rate)	Total Area (Ha)/Number	Cost (as per Average Market Rate)
	(in Rs. Per Ha)	(in Rs. Per Ha)		(in Rs.)
I. Compensation for loss of Private Property				
1. Loss of Land (agricultural, homestead, commercial or otherwise)				
Effective Average Cost of Urban Land	2152780	32291700.00	0	0
Effective Average Cost of Rural Land	107639	5381950.00	17.1	92031345
			Sub Total (A) =	**92031345**
2. Loss of Structure (house, shop, building or immovable property or assets attached to land				
Type of Structure		Rs. Per Sqm	Area Sqm	
Permanent		16218.00	0	0
Semi-Permanent		12448.00	0	0
Temporary		3769.00	0	0
Compound Wall		6244.00	0	0
Private memorial Structures (In Numbers)		32000.00	0	0
			Subtotal (B)	**0**
			100% Solatium for Structure (C)	**92031345**
II. Rehabilitation and Resettlement (Land owners & families dependent on Land)				
3. Loss of Residence				
Special Cash Assistance of Rs. 5 lakhs		500000.00	0.00	0.00
Shifting Assistance to DPs		50000.00	0	0.00
Subsistence Allowance for 12 months		36000.00	0	0.00
Additional Assistance to Vulnerable Groups		50000.00	0	0.00
One Time Resettlement Allowance		50000.00	0	0.00
			Subtotal (D) =	**0.00**
4. Loss of Shop/trade/commercial structure				
Special Cash Assistance of Rs. 5 lakhs		500000.00	0	0
Subsistence Allowance for 12 months		36000.00	0	0
Additional Assistance to Vulnerable Groups		50000.00	0	0
Transitional Allowance		50000.00	0	0
One Time Resettlement Allowance		50000.00	0	0
			Subtotal (E) =	**0**
III. Impact to Standing Crops and Trees				
Average cost of the fruit bearing trees		0.00	0	0
			Subtotal (F) =	0
IV. Impact to Vulnerable Household				
One time Assistance who have to relocate		25000.00	0	0
			Subtotal (G) =	0
V. Impact to Tenant during Construction				
Subsistence Allowance for 3 months		18000.00	0	0
Rental Assistance of Rs. 9,000		9000.00	0	0
			Subtotal (H) =	**0**
VI. Common Property Resource				
Religious Structures		250000.00	0	0
School/Community Property/office		100000.00	0	0
Quasi Govt/ VC Buildings		250000.00	0	0
Cost of structure in lieu of community Land		2500000.00	0	0
			Subtotal (I) =	**0**
VII. Unforeseen Impacts				
Contingency of 5%		Total of (A to I)	5%	9203134.5
			Subtotal (J) =	**9203134.5**

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Item	Rate (as per Minimum Guidance Value)	Rate (as per Average Market Rate)	Total Area (Ha)/Number	Cost (as per Average Market Rate)
	(in Rs. Per Ha)	**(in Rs. Per Ha)**		**(in Rs.)**
VIII. Implementation of RAP				
Support for implementation of RAP (lumpsum)[9]		2225000.00	1	2225000
M & E consultant (lumpsum)		240000.00	1	240000
			Subtotal (K) =	**2465000**
			Grand Total(L) = (A to K) =	**195730824.50**

Source: Census Survey on December, 2019

The above estimate is based on rates vide Entitlement Matrix as per the norms of RTFCLARR 2013 and in accordance with National Highway Authority of India's Policies. The total project R and R Cost is Rs. 19.57 Crore as per Average Market Rate Value.

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5.17IMPLEMENTATION SCHEDULE

5.17.1. Introduction

Implementation of RP mainly consists of compensation to be paid for affected structures and rehabilitation and resettlement activities. The time for implementation of resettlement plan will be scheduled as per the overall project implementation. All activities related to the land acquisition and resettlement must be planned to ensure that compensation is paid prior to displacement and commencement of civil works. Public consultation, internal monitoring and grievance redress will be undertaken intermittently throughout the project duration.

However, the schedule is subject to modification depending on the progress of the project activities. The civil works contract for each project will only be awarded after all compensation and relocation has been completed for project and rehabilitation measures are in place.

5.17.2. Schedule for Project Implementation

The proposed project R&R activities are divided in to three broad categories based on the stages of work and process of implementation. The details of activities involved in these three phases i.e. Project Preparation phase, RP Implementation phase, Monitoring and Reporting period are discussed in the following paragraphs.

Project Preparation Phase

The major activities to be performed in this period include establishment of PMU and PIU at project and project level respectively; submission of RP for approval NHIDCL; and establishment of GRC etc. The information campaign & community consultation will be a process initiated from this stage and will go on till the end of the project.

5.17.3. RP Implementation Phase

After the project preparation phase the next stage is implementation of RP which includes issues like compensation of award by EA; payment of all eligible assistance; relocation of DPs; initiation of economic rehabilitation measures; site preparation for delivering the site to contractors for construction and finally starting civil work.

5.17.4. Monitoring and Reporting Period

As mentioned earlier the internal monitoring will be the responsibility of PMU, PIU and will start early during the project when implementation of RP starts and will continue till the complementation of the sub-project. The independent monitoring and reporting will be the responsibility of Construction Supervision Consultant (CSC) to be hired for the sub project.

5.17.5. R&R Implementation Schedule

A composite implementation schedule for R&R activities in the project including various sub tasks and time line matching with civil work schedule is prepared and presented in the form of Table. The cut-off date will be notified formally for titleholder as the date of LA notification. However, the

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sequence may change or delays may occur due to circumstances beyond the control of the Project and accordingly the time can be adjusted for the implementation of the plan. The implementation schedule can also be structured through package wise. The entire stretch can be divided in to various contract packages and the completion of resettlement implementation for each contract package shall be the pre-condition to start of the civil work at that particular contract package.

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Table 17.1: Implementation Schedule of NH

	2017												2018												2019												2020					
	1Q			2Q			3Q			4Q			1Q			2Q			3Q			4Q			1Q			2Q			3Q			4Q			1Q			2Q		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Project Preparation Stage																																										
Scree project impact										■	■	■																														
Public Consultation on alignment										■	■	■																														
Prepare Land Acquisition Plan										■	■	■																														
Carry out Census Survey													■	■	■																												
Prepare Resettlement Plan (RP)													■	■	■																												
RP Implementation Stage																																										
Obtaing RP approval from NHIDCL																■	■	■																								
Disclosure of RP																■	■	■	■	■	■	■	■	■																		
Formation of GRC (Grievance Mechanism)																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Implementation of GRC																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Public Consultation													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Co-ordination with district authority for LA										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																		
Submission of LA proposals to DC													■	■	■	■	■	■																								
Declaration of cut-off date (LA notification)													■	■	■	■	■	■	■	■	■																					
Payment of compensation																	■	■	■	■	■	■	■	■																		
Taking procession of acquired land																	■	■	■	■	■	■	■	■																		
Handling over the acquired land to contractor																						■	■	■	■	■	■															
Rehabilitation of DPs																	■	■	■	■	■	■	■	■	■	■	■	■														
Monitoring and Reporting Period																																										
Internal monitoring and reporting													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Hiring Construction Supervision Consultant																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
External monitoring and reporting																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						

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5.18MONITORING AND EVALUATION

5.18.1. Introduction

Monitoring is a periodic assessment of planned activities providing midway inputs, facilitates changes and gives necessary feedback of activities and the directions on which they are going, whereas Evaluation is a summing up activity at the end of the project, assessing whether the activities have actually achieved their intended goals and purposes. In absence of an effective monitoring strategy it would be impossible to ensure that all anticipated benefits and entitlements reach DPs in time and in an efficient grievance free manner. It will be a systematic and continuous process of collecting and analysing information about the progress of the project and a tool for identifying strengths and weaknesses within a project. Resettlement monitoring will include the collection, analysis, reporting and use of information about the progress of resettlement, based on the RP. Monitoring in resettlement will focus on restoration of income and standard of 1iving of the affected persons as the primary focus. Several key activities such as delivery of entitlements will also be monitored. EA will have two tiers (Internal and External) monitoring system.

5.18.2. The Internal Monitoring

The internal monitoring will be handled by PIU. A monitoring cell will be established in PIU with individuals having appropriate skills and capacity. A comprehensive and relevant database and management 'information system (MIS) will be established and updated periodically for monitoring various activities of the project. The RP information generated through various surveys like census, baseline socio-economic, land and structures will become important input of the information system. Effective Monitoring will help accomplish this task and facilitate appropriate changes in resettlement implementation based on the information obtained, through routine collection of data. Therefore, EA will develop a monitoring plan that covers all essential stages of resettlement i.e. preparatory stage, relocation stage & rehabilitation stage.

PIU, EA will form independent monitoring cell which will work at the time of Project Implementation.

5.18.3. Key Indicators of Monitoring

EA, considering the importance of the various stage of project cycle, will handle the monitoring at each stage as stated below:

5.18.4. Preparatory Stage

During the pre-relocation phase of resettlement operation, monitoring is concerned with administrative issues such as, establishment of resettlement unit, budget, land acquisition, consultation with DPs in the preparation of resettlement plan, payments of entitlements due, grievance redressal, and so on.

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- The key indicators for monitoring at this stage will be:
- Conduct of baseline survey
- Consultations
- Identification of DP and the numbers
- Identification of different categories of DPs and their entitlements
- Collection of gender disaggregated data
- Inventory & losses survey
- Asset inventory Entitlements
- Valuation of different assets
- Budgeting
- Information dissemination
- Institutional arrangements
- Implementation schedule review, budgets and line items expenditure

5.18.5. Relocation Stage

Monitoring during the relocation phase covers such issues as site selection in consultation with DPs, development of relocation sites, assistance to DPs (especially to vulnerable groups) in physically moving to the new site. Likewise, aspects such as adjustment of DPs in the new surroundings, attitude of the host population towards the new-comers and development of community life are also considered at this stage. The key indicators for monitoring will be:

- Payment of compensation
- Delivery of entitlement
- Grievance handling
- Land acquisition
- Preparation of resettlement site, including civic amenities '(water, sanitation, drainage, paved streets, electricity)
- Consultations
- Relocation
- DPs who do not relocate
- Payment of compensation
- Livelihood restoration assistance.

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5.18.6. Rehabilitation Stage

Once DPs have settled down at the new sites, the focus of monitoring will be on issues of economic recovery programmes including income generating schemes (IGSs), acceptance of these schemes by DPs, impact of IGSs on living standards, and the ability of the new livelihood patterns. The key indicators for monitoring will be:

- Initiation of income generation activities
- Provision of basic civic amenities and essential facilities in the relocated area
- Consultations
- Assistance to enhance livelihood and quality of life

18.6.a The most crucial components/indicators to be monitored are specific contents of the activities and entitlement matrix.

- Input and output indicators related to physical progress of the work will include items as:
- Training of PIU, ROs and other staff completed
- Public meetings held
- Census, assets inventories, assessments and socio-economic studies completed.
- Meeting of DLCs
- Meeting of GRCs
- Grievance redresses procedures in-place and functioning.
- Compensation payments disbursed.
- Shops space allotted.
- Relocation of DPs completed.
- Employment provided to DPs.
- Community development activities completed.
- Infrastructure repaired, bus stands, water and sanitation facilities provided.
- Village roads repaired.
- Training of DPs initiated.
- Income restoration activities initiated.
- Number of families displaced and resettled.
- Extent of government land identified and allotted to the DPs.
- Monitoring and evaluation reports submitted.

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5.18.7. Reporting Mechanism

As stated earlier one of the main roles of PIU will be to oversee proper and timely implementation of all activities in RP. Internal Monitoring will be a regular activity for PIU and Rehabilitation Manager will oversee the timely implementation of R&R activities. Internal Monitoring will be carried out by the PIU (through the R&R Cell) and its agents, PIU will prepare monthly/quarterly reports on the progress of RP Implementation. PIU will collect information from the project site and assimilate in the form of monthly progress to access the progress and results of RP implementation and adjust work programme where necessary, in case of delays or problems. Both monitoring and evaluation will form parts of regular activities and reporting on this will be extremely important in order to undertake mid-way corrective DPs. The reports can broadly be classified as:

- Progress reports during Implementation of the RP
- Qualitative reports highlighting the qualitative aspects
- Financial reports
- Evaluation reports based on benefits and impact of assistance provided.

5.18.8. Resources Requirement and Database Management

For the PIU to function, EA will allocate adequate financial resource towards office space, computers, transport and staff budget. The following essential requirements will be planned:

- Annual budget for Monitoring
- Office space
- Tables, chairs and furniture.
- Computer dedicated to the monitoring unit
- Transport
- Administrative support staff
- Appropriate technical staff
- Add on database management

5.18.9. External or Independent Monitoring

External (or Independent) monitoring will be hired to provide an independent periodic assessment of resettlement implementation and impacts to verify internal monitoring, and to suggest adjustment of delivery mechanisms and procedures as required. A social and economic assessment of the results of delivered entitlements and measurement of the income and standards of living of the DPs before and after resettlement will be integral components of this monitoring activity.

To function effectively, the organization responsible for external monitoring will be independent of the governmental agencies involved in resettlement implementation. The agency will submit monthly and quarterly monitoring reports. Mid-term and final evaluation will be done by the agency

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to find out if the R&R objectives have been achieved as against the performance impact indictors.

5.18.10. Scope of Work of External Monitor:

- ❖ Examine and verify internal monitoring system and suggest changes.
- ❖ Prepare independent reports based on monitoring visits.
- ❖ Major recommendations for remedial actions.
- ❖ Major recommendations for policy changes.
- ❖ Maintenance of database.

18.10.a Detail Activities to be undertaken by External Monitor:

The scope of activities will include but not be limited to:

- ❖ Verification of internal reports, by field check of delivery of the following:
- ❖ Payment of compensation including its levels and timing.
- ❖ Land readjustment.
- ❖ Preparation and adequacy of resettlement sites.
- ❖ House construction.
- ❖ Provision of employment, its adequacy and income levels.
- ❖ Training.
- ❖ Rehabilitation of vulnerable groups.
- ❖ Infrastructure repair, relocation or replacement.
- ❖ Enterprise relocation, compensation and its adequacy.
- ❖ Transition allowances.

5.18.11. Property and demographic survey of the following affected persons:

- ❖ 100% census survey of persons who were severely affected by Project works and have relocated either to group resettlement sites or preferred to self-relocate.
- ❖ 20% sample survey of persons who had property, assets, incomes and activities marginally affected by Project works and did not relocate.
- ❖ 20% sample survey of those affected by off-site project activities by contractors' subcontractors, including employment, use of land for contractor's camps, pollution, public health etc.
- ❖ Generate gender disaggregated socio-economic data, socio-economic condition, needs and priorities of women etc.

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5.18.12. Evaluation of Delivery and Impacts of Entitlements

- Identify the categories of impacts and evaluate the quality and timeliness of delivery of entitlements (compensation and rehabilitation measures) for each category of impact. He/she will ensure that how the entitlements were used and examine impact and adequacy to meet the specified objectives of the RP.
- Ensure the quality, sufficiency of funds and on-time delivery of entitlements according to RP. Also verify other monitoring reports prepared during implementation by an independent source.
- Establish by appropriate investigative and analytical techniques, the pre-and post- Project socio-economic conditions of the affected people. In the absence of baseline socio-economic data on income and living standards, and given the difficulty of DPs having accurate recollection of their pre-Project income and living standards, develop some quality checks on the information to be obtained from the DPs. Such quality checks could include verification by neighbours and local village leaders. The methodology for assessment should be very explicit.

18.12.a Evaluation of Consultation and Grievance Procedures

Identify, quantify and qualify the types of conflicts and grievances reported and resolved and the consultation and participation procedures.

5.18.13. Declaration of Successful Implementation

Provide a summation of whether involuntary resettlement was implemented (a) in accordance with the RP, and (b) in accordance with Policy on Involuntary Resettlement.

5.18.14. Actions Required

Describe any outstanding actions that are required to bring the resettlement into compliance with Policy on Involuntary Resettlement. Describe further mitigation measures needed to meet the needs of any affected person or families judged and/or perceiving themselves to be worse off as a result of the Project.

Provide a timetable and define budget requirements for these supplementary mitigation measures and detail the process of compliance monitoring and final "signing off" for these DPs.

5.18.15. Reporting Cycle/Frequency

PIU is responsible for supervision and implementation of the RP & will prepare monthly progress reports on resettlement activities. The external M&E expert will submit bi-annual review directly to EA and determine whether resettlement goals have been achieved, more importantly whether livelihoods and living standards have been restored/enhanced and suggest suitable recommendations for improvement.

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5.18.16. Participation of affected people in M&E

The general approach to be used is to monitor activities and evaluate impacts ensuring participation of all stakeholders especially women and vulnerable groups. Monitoring tools would include both quantitative and qualitative methods:

- Baseline household survey of a representative sample, disaggregated by gender and vulnerable groups to obtain information on the key indicators of entitlement delivery, efficiency, effectiveness, impact and sustainability. 20% percent random sample of DPs will be covered.
- Focused Group Discussions (FGD) that would allow the monitors to consult with a range of stakeholders (local government, resettlement field staff, PIU, community leaders and DPs).
- Key informant interviews: select local leaders, village workers or persons with special knowledge or experience about resettlement activities and implementation.
- Community public meetings: open public meetings at resettlement sites to elicit: -
- Information about performance of various resettlement activities.
- Structured direct observations: field observations on status of resettlement
- Implementation, plus individual or group interviews for crosschecking purposes.
- Informal surveys/interviews: informal surveys of DPs, host village, workers, resettlement staff, and implementing agency personnel using non-sampled methods. In the case of special issues, in-depth case studies of DPs and host populations from various social classes will be undertaken to assess impact of resettlement.

5.18.17. Impact on Women

The project will have both positive and negative impact on the women of the region. The women, by virtue of their biological difference, enjoy a low privilege status in the society as compared to their male counterpart. Any negative impact of the project would have greater magnitude on this less privileged class of the society. It is imperative to have a continuous monitoring and evaluation of implication of RP implementation on the women.

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5.19CONCLUSION

The Government of Manipur has taken up the initiative to develop, maintain the highways and other district roads of the State of Manipur under the big push of agricultural as well as tourist growth and increase of trade with outer world where the intensity of traffic has increased considerably and there is necessity for augmentation of capacity for safe and efficient movement of traffic. One such project is the development for 2-laning of NH-102B from Churachandpur to Tuivai for a length of 141.029 km (design chainage).

The project road starts from Churachandpur Town (Junction of NH-102B and old NH-2) and ends at Tuvai in the district of Churanchandpur. As per design the total length of the project road comes out as 130.562 km. The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E. Most part of the District is in through mountainous / hilly terrain and very small portion. The topography is mostly rural in nature. This Road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and Tuivai. The 4th (IVB) package starts from Chainage 130.000 to 141.029 km and it lie on Churachandpur district only.

From Drain Edge to Drain Edge in Built up area is varying from 6 m to 16 m & in hilly area from hill toe to valley edge is varying from 4 m to 8 m. However, the existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area and hence land is required to be acquired to adhere to the codal provision.

As discussed the scope of land acquisition is quite significant in the project but due to some restrictions/constrains of land acquisition is kept within low degree to minimize the Impact of Resettlement and Rehabilitation. A project census survey was carried out to identify the persons both private owners and customary right holders who would be displaced by the project and to make an inventory of their assets that would be lost to the project, which would be the basis of calculation of compensation. The cut-off date is finalized as December, 2019.

The public consultation on the focus groups and the stakeholders give the opportunity to address issues, which were already resolved after making appropriate changes in design and alternative finalisation. The stakeholders become aware of the development schemes and at the same time influence and share to control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur.

Decisions regarding providence of the resettlement and rehabilitation entitlement would be done as per the guidelines of EA and Government of India. The DPs may go to the Grievance Redressed Cell and to the Arbitrator as per the provision laid in the Guidelines. It may be noted that the redress to the grievances of the DPs may be done with consideration.

In the total SIA, there is very little impact of resettlement and rehabilitation programmes as there is no major impact in their livelihood and their socio economic as well as cultural way of life of the

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people of these areas.

According to the proposed alignment of the Project Road the estimated cost for the various categories of Affected Persons for different purpose and objective of Resettlement and Rehabilitation based on rates vide Entitlement Matrix (June-July 2018) followed for EA road development works with an escalation of 12% on the said matrix. The estimated cost of Resettlement and Rehabilitation is not the total socio – economic cost of the project. The PIU should look into the income restoration of the Affected Families with the objective that the families are 'as well off as before'. The Resettlement Budget is Rs. 63.30 Lacs as per Minimum Guidance Value.

The Resettlement Impact is summarized in Tabular format.

Table 19.1: Resettlement Impacts for Package-IVB

Sl.	Impacts	Number
1	Total land acquisition requirements (in ha)	17.1
2	Total no. of private Residential structures	0
3	Total no. of private Commercial structures	0
4	Total number of Residential cum Commercial structures	0
5	Total number of other private structure	0
6	Total No. of Affected Families by affected structure	0
7	Total Number of Vulnerable households affected of Affected structure	0
8	Total number of displaced persons (DPs)	0
9	Total number of CPRs affected Community and Religious)	0

Source: Census Survey on December, 2019

The widening of the NH gives an immense scope of development of the region in regards of easy accessibility. Other than the development of the agricultural sector there would be easy accessibility of the other industrial and consumerable products to the region and the finished Handicrafts and cottage industrial products with the rest the country as well as for International Market. The socio – economic status of the region is being changing drastically with inflow venture and human capital. The changing climate of the socio – economic and political scenario of the state of Manipur with the working culture of the people with a huge supply of local skilled and unskilled labourers would increase the scope of developments by manifolds. Infrastructural investment such as the NH 102B would remove the bottle neckness of development and help in taking a huge positive leap of sustainable socio- economic growth of the region.

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ACRONYMS

AROa	:	Assistant Resettlement Officer
AWC	:	Anganwadi Centre
BDO	:	Block Development Officer
BPL	:	Below Poverty Line
BSR	:	Basic Schedule Rates
CPR	:	Common Property Resource
DC	:	District Commissioner
DGM	:	Deputy General Manager
DPR	:	Detailed Project Report
EA	:	Executing Agency
EPC	:	Engineering, Procurement and Construction
FGD	:	Focus group discussions
GoI	:	Government of India
GP	:	Gram Panchayat
GRC	:	Grievance Redressal Committee
GSB	:	Paved sub base
HIV/AIDS	:	Human Immunodeficiency virus / Acquired immunodeficiency syndrome
IA	:	Implementing Agency
ICDS	:	Intregreted Child Development Service
ICDS	:	Integrated Child Development Services
KII	:	Key Informant Interview
MT	:	Motorized traffic
NGO	:	Non-Government Organization
NH	:	National Highway
NHAI	:	National Highway Authority of India
NHIDCL	:	National Highway Infrastructural Development Corporation Limited
NMT	:	Non-motorized traffic
NRRP	:	National Rehabilitation and Resettlement Policy
OBC	:	Other Backward Castes
PHC	:	Primary health centre
PMU	:	Project Monitoring Unit
PIU	:	Project Implementation Unit
PT	:	Pedestrian traffic
R&R	:	Resettlement and Rehabilitation
RCD	:	Road Construction Department
SC	:	Scheduled Castes
SH	:	State Highway
ST	:	Scheduled Tribes
WHH	:	Women Headed Household

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NH – 102B

CHURACHANDPUR-TUIVAI ROAD

(CHURACHANDPUR DISTRICT)

STRUCTURE AND LAND DETAILS

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Sl. No.	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	AadharNo	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total Area (Sqm/M)	Affected Area (Sqm/M)	Remarks	Owner Pic	Str. Pic
1	130+000-141+029	BOTH	SINZAWL	MUALNUAM	SZP-2	ABSENT	ABSENT	Private	-	-	-	-	-	-		ABSENT	-

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CHAPTER - 6
TRAFFIC SURVEYS AND ANALYSIS

6.1 INTRODUCTION

The National Highways & Infrastructure Development Corporation Limited (NHIDCL) has been entrusted with the assignment of Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning of Churachandpur - Tuivai road section on NH-102B on Engineering, Procurement and Construction mode in the state of Manipur.

The project road starts from 3-legged junction of NH-102B and NH-150 (old NH-2) at New Lamka in Churachandpur and ends near Manipur-Mizoram state border at Tuivai village in the district of Churachandpur. This road is passing through Churachandpur town, New Lamka town, Munnuam village, Mata village, Muallam village, Bulian village, Singngat village, Suangdoh village, Tuimai village, Lungthul village, Mualnuam village, Sinzawl village and ends at Tuivai village. As per preliminary study the total length of the project road comes out as 161.349 km.

6.2 OBJECTIVE & SCOPE

The objective of the traffic studies carried out as part of this assignment is for technical understanding and assessment of the project. In order to assess the project, volume of traffic that uses the corridor and the future traffic demand were estimated with various types of traffic surveys as stipulated in the TOR.
The detailed scope of services is as follows:

- To carry out 7 days continuous 24 hrs Classified Traffic Volume Count Survey at locations informed to Client.
- To analyze the data collected through possible leakage points and study of travel pattern to determine through traffic for important segments of the route.
- Determination of possible leakage points and alternative diversion routes by detailed network study.
- To carry out Intersection count survey (1day x 12 hours) at Major Intersections along the project road.
- To carry out OD and Axle Load survey.
- Calculation of MSA values based on Traffic volume for use in the pavement design.
- The details of the data collection, primary as well as secondary, results from its analysis are presented in the following sections.

6.3 TRAFFIC SURVEYS

In order to understand the characteristics and the volume of traffic using the project road, data on existing road network, traffic volume on the project road were collected through primary surveys. For this purpose, a detailed reconnaissance survey was conducted to identify appropriate locations for

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primary traffic surveys. The details on the types of primary traffic surveys carried out on the Project Road and their locations are given in the following sections, followed by findings from the analysis of this data.

6.3.1 SURVEY LOCATIONS

At the beginning of the study, a detailed reconnaissance survey has been carried out to identify traffic homogeneous sections so that each homogeneous section will have similar traffic volume and composition. Based on the above, the length of total project road has been considered as two homogeneous sections.

Homogeneous Section I : Km 0+000 to Km 74+000 (Churachandpur – Lungthul)
Homogenous Section II : km 74+000 to km 161+665 (Lungthul – Tuivai)

6.3.2 CLASSIFIED TRAFFIC VOLUME COUNT LOCATIONS

Locations have been considered for classified Traffic volume counts (7days x 24hrs). The locations are:

- ✓ **At Churachandpur on old NH 02 (Now NH 150) (Near Ch. 0+000 km)**
- ✓ **At Buallian (Ch. 5+500 km)**
- ✓ **At Singngat (Ch. 34+175 km)**
- ✓ **At Khuanggin (Ch. 135+500 km)**
- ✓ **At Sinzawl (Ch. 149+200 km)**

6.3.3 TURNING MOVEMENT COUNT SURVEY LOCATIONS

Five major intersections were identified on the project road corridor. 1 Day x 12 hour turning movement count survey was carried out at following five intersections on the project road. The intersection points taken into consideration are as follows:

- ✓ **3-legged intersection at Churachandpur (Ch. 0+000 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 0+526 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 1+840 Km)**
- ✓ **3-legged intersection at Singngat (Ch. 34+175 Km)**
- ✓ **3-legged intersection at Sinzawl (Ch. 149+582 Km)**

6.3.4 AXLE LOAD SURVEY LOCATION

Axle Load survey (2 days x 24hrs) has been conducted at two locations which are as follows:

- ✓ **At Churachandpur on NH 102B (Ch. 0+500 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

6.3.5 ORIGIN DESTINATION SURVEY LOCATION

Origin Destination survey (1day x 24hrs) has been conducted at two locations which are as follows:

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- ✓ **At Churachandpur on NH 102B (Ch. 0+000 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

6.3.6 PEDESTRIAN SURVEY LOCATION

Pedestrian survey (1day x 12 hrs.) has been conducted at six locations along the road stretch which are as follows:

- ✓ **At Churachandpur (Ch. 0+000 Km)**
- ✓ **At Mata (Ch. 7+250 Km)**
- ✓ **At Singngat (Ch. 34+155 Km)**
- ✓ **At Maokot (Ch. 48+300 Km)**
- ✓ **At Suangdoh (Ch. 64+200 km)**
- ✓ **At Sinzawl (Ch. 148+450 km)**

Detailed Traffic Survey Schedule is mentioned in Table 6.1

TABLE 6.1: TRAFFIC SURVEY SCHEDULE

Sl.	Type of Survey	Nos. Proposed	Locations
1	Classified Traffic Volume Count	5	• **ATCC-1** at Churachandpur on old NH-2 (Near Ch. 0+000 km) • **ATCC-2** at Buallian(Ch. 5+500 km) • **ATCC-3** at Singngat (Ch. 34+175 km) • **ATCC-4** at Khuanggin (Ch. 135+500 km) • **ATCC-5** at Sinzawl (Ch. 149+200 km)
2	Turning Movement Count Survey	5	• **TMC-1** at Churachandpur (Ch. 0+000 km) • **TMC-2** at New Lamka (Ch-0+526 km) • **TMC-3** at New Lamka (Ch-1+840 km) • **TMC-4** at Ch-34+175 (Singngat) • **TMC-5** at Ch. 149+582 km (Sinzawl)
3	Axle Load Survey	2	• **Axle-1** at Churachandpur (Ch.0+500) • **Axle-2** at Sinzawl (Ch. 149+200 km)
4	Origin-Destination Survey	2	• **OD-1** at Churachandpur (Ch.0+000) • **OD-2** at Sinzawl (Ch. 149+200 km)
5	Pedestrian Count/Animal Cross Traffic Count Survey	6	• **Pedestrian-1** at Churachandpur (Ch.0+000 km) • **Pedestrian-2** at Mata (Ch.7+250 km) • **Pedestrian-3** at Singngat (Ch.34+155 km) • **Pedestrian-4** at Maokot (Ch.48+300 km) • **Pedestrian-5** at Suangdoh (Ch.64+200 km) • **Pedestrian-6** at Sinzawl (Ch.148+450 km)
6	Speed & Delay Survey	162 Km	• Total Project Stretch

Trained enumerators were used for counting traffic under the supervision of qualified and experienced transport planners/supervisors. The data collected from the traffic surveys was coded and entered into the computer for its analysis and interpretation of results with respect to existing traffic, travel pattern and for forecasting purposes. The details from the analysis of survey data are presented in the following sections. A traffic survey location map is given in Figure 6.1

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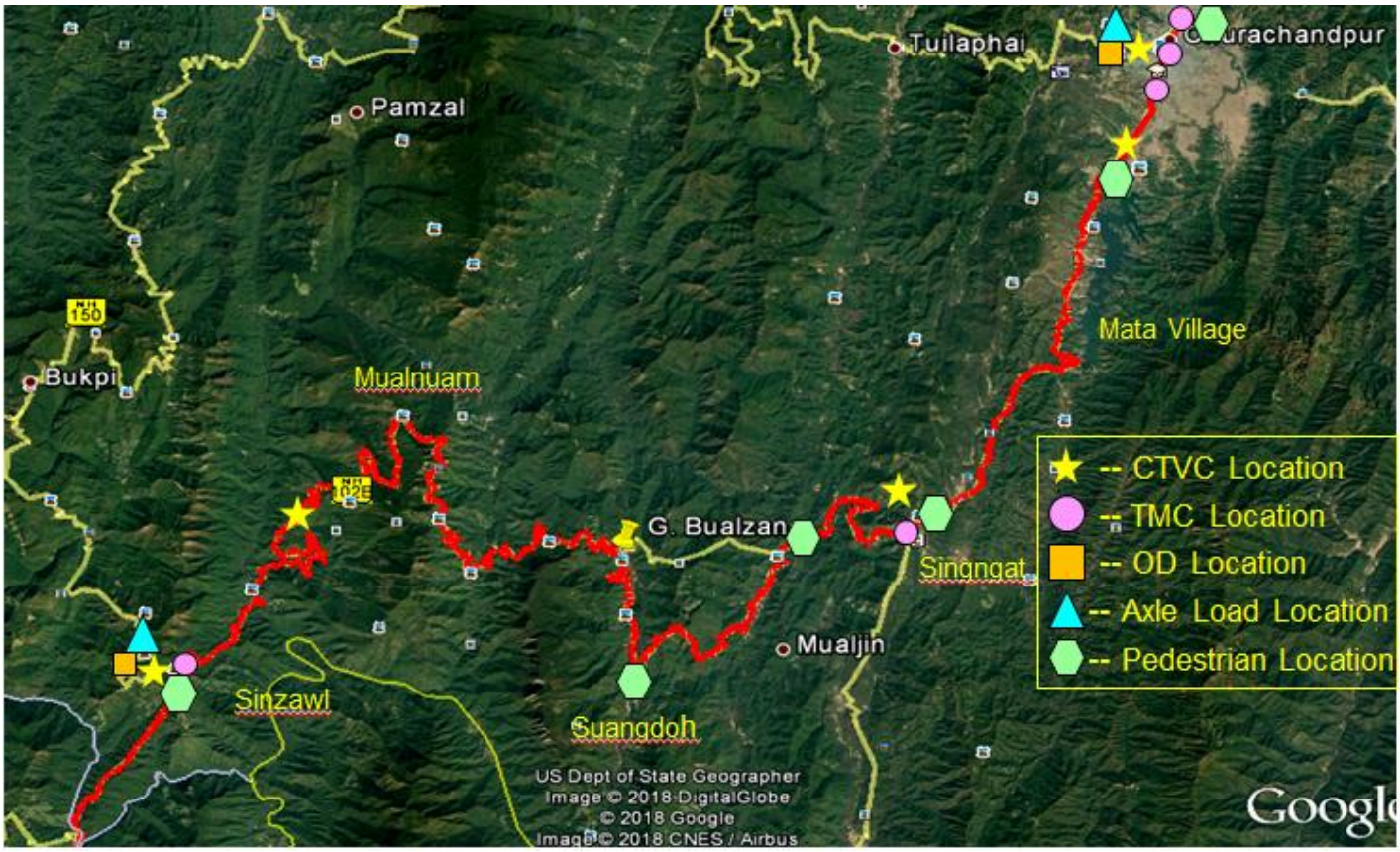


Fig 6.1: Location Map of Traffic Survey

6.4 CLASSIFIED TRAFFIC VOLUME COUNTS



Classified directional traffic volumes were conducted with ATCC for 7 days 24 hours at five identified locations on the project road which are as follows:

- ✓ **At Churachandpur on old NH 02 (Now NH 150) (Near Ch. 0+000 km)**
- ✓ **At Buallian (Ch. 5+500 km)**
- ✓ **At Singngat (Ch. 34+175 km)**
- ✓ **At Khuanggin (Ch. 135+500 km)**
- ✓ **At Sinzawl (Ch. 149+200 km)**

Classified directional traffic volumes were conducted to obtain the following.

- Average Daily Traffic (ADT)
- Temporal Variation
- ✓Daily Variation
- ✓Hourly Variation
- Directional Distribution
- Traffic Composition

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- Seasonal Variation

✓Annual Average Daily Traffic (AADT)

✓Peak Season AADT

The details of the above are presented in the following sections.

6.4.1 AVERAGE DAILY TRAFFIC (ADT)

The traffic volumes counted in 15 minute intervals have been aggregated to one-hour volumes. These are presented in Appendix to Main Report. The hourly volumes have been aggregated into daily volumes for the entire survey period (7-days). The daily volumes are then averaged for ADT. To express the classified vehicular count in terms of PCUs, the PCU factors as given in IRC-108: 1996 have been considered. For ready reference, the PCU Factors considered in the analysis are given in Table-6.2

TABLE 6.2: PCU FACTORS CONSIDERED FOR THE STUDY

Sl. No.	Vehicle Type		PCU Factor
1	**Two Wheeler**		0.50
2	**Car/Jeep/ Van/Taxi/ Auto**		1.00
3	**BUS**	Mini	1.50
4		Standard	3.00
5	**LCV**		1.50
6	**Truck**	2-Axle	3.00
7		3 -Axle	3.00
8		Multi-Axle	4.50
9	**Agricultural Tractor**	With Trailer	4.50
10		Without Trailer	1.50
11	**Cycle**		0.50
12	**Cycle Rickshaw**		2.00
13	**Hand Cart**		3.00
14	**Animal Drawn**	Bullock Cart	8.00
15		Horse	4.00

The summary of ADT, as observed on the Project Road, in terms of vehicles and PCUs at different survey locations is given in Table 6.3.

TABLE 6.3: ADT (FEBRUARY 2018) AS OBSERVED ON THE PROJECT ROAD

Vehicle Type	On Old NH-2	Buallian (Ch. 5+500 km)	Singngat (Ch. 34+175 km)	Khuanggin (Ch. 135+500)	Sinzawl (Ch. 149+200)
Two Wheeler	10235	166	116	1	2
Car/Jeep/Van/Taxi/Auto	11173	190	74	11	12
Mini Bus	11	5	1	0	0
Standard Bus	30	6	5	0	0
LCV	383	65	68	13	12
2-Axle	205	61	49	21	4

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Vehicle Type	On Old NH-2	Buallian (Ch. 5+500 km)	Singngat (Ch. 34+175 km)	Khuanggin (Ch. 135+500)	Sinzawl (Ch. 149+200)
3-Axle	5	1	1	0	0
Multi-Axle	0	0	0	0	0
Tractor With Trailer	1	0	0	0	0
Tractor Without Trailer	14	0	0	0	0
Cycle	211	3	4	0	0
Cycle Rickshaw	255	0	0	0	0
Hand Cart	4	1	0	0	0
Bullock Cart	0	0	0	0	0
Horse Cart	0	0	0	0	0
Total Motorized Vehicles (Number)	22059	495	315	46	30
Total Non Motorized Vehicles (Number)	469	4	4	0	0
Total Vehicles(Number)	22528	499	318	46	30
Total Motorized Vehicles (PCU)	17631	583	401	93	44
Total Non Motorized Vehicles (PCU)	627	4	2	0	0
Total Vehicles(PCU)	18258	587	403	93	44
Total Commercial Vehicle per day(Number)	636	138	124	34	16

6.4.2 TEMPORAL VARIATION

Analysis has been carried out to understand the following parameters on temporal variation of traffic on the Project Road

- Hourly variation of traffic, and
- Peak Hour Factor (PHF)

The results and findings from the above analysis are given below.

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Daily Variation

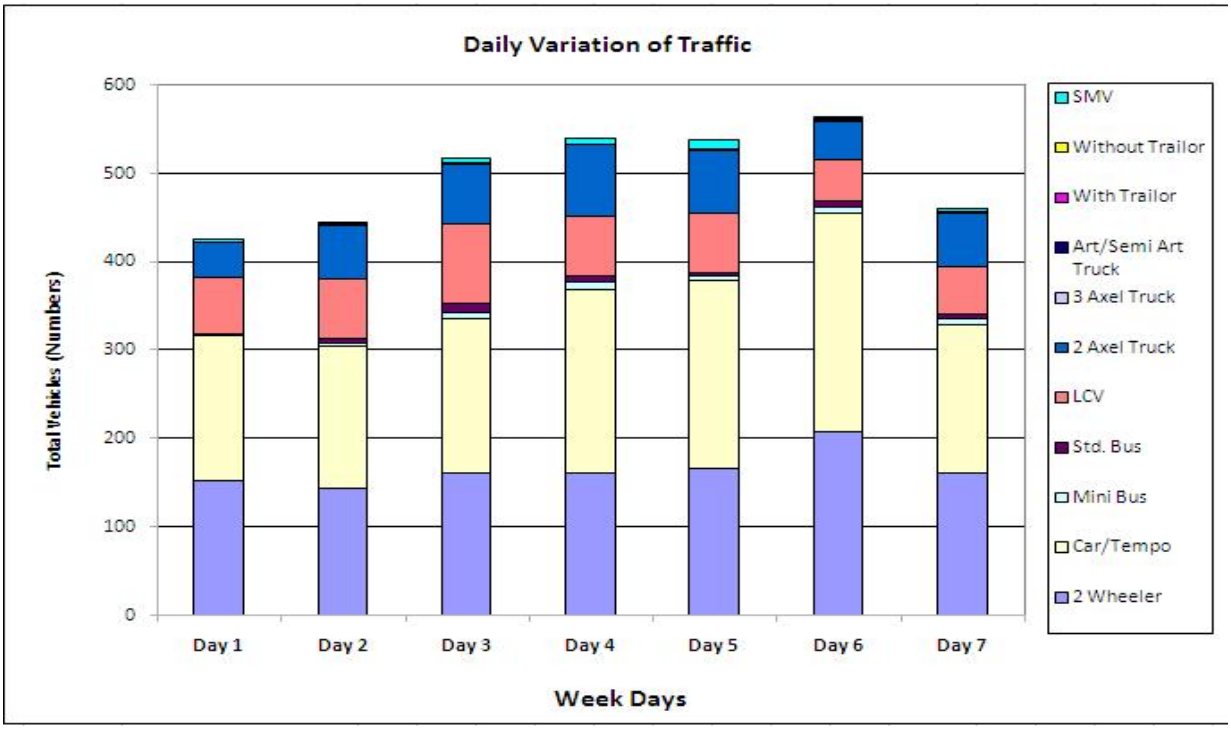


Figure 6.2: Daily Variation of Traffic at 5+500 Km in Vehicles per Day

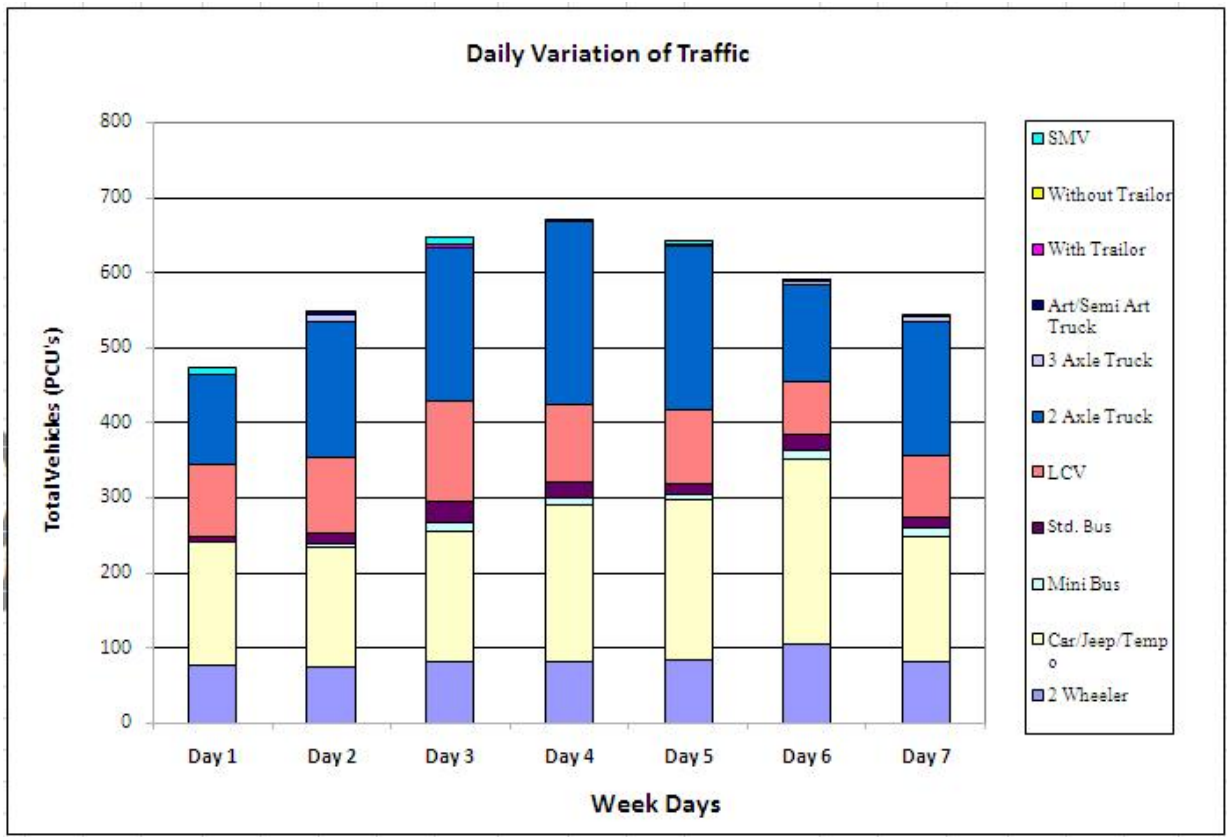


Figure 6.3: Daily Variation of Traffic at 5+500 Km in PCU per Day

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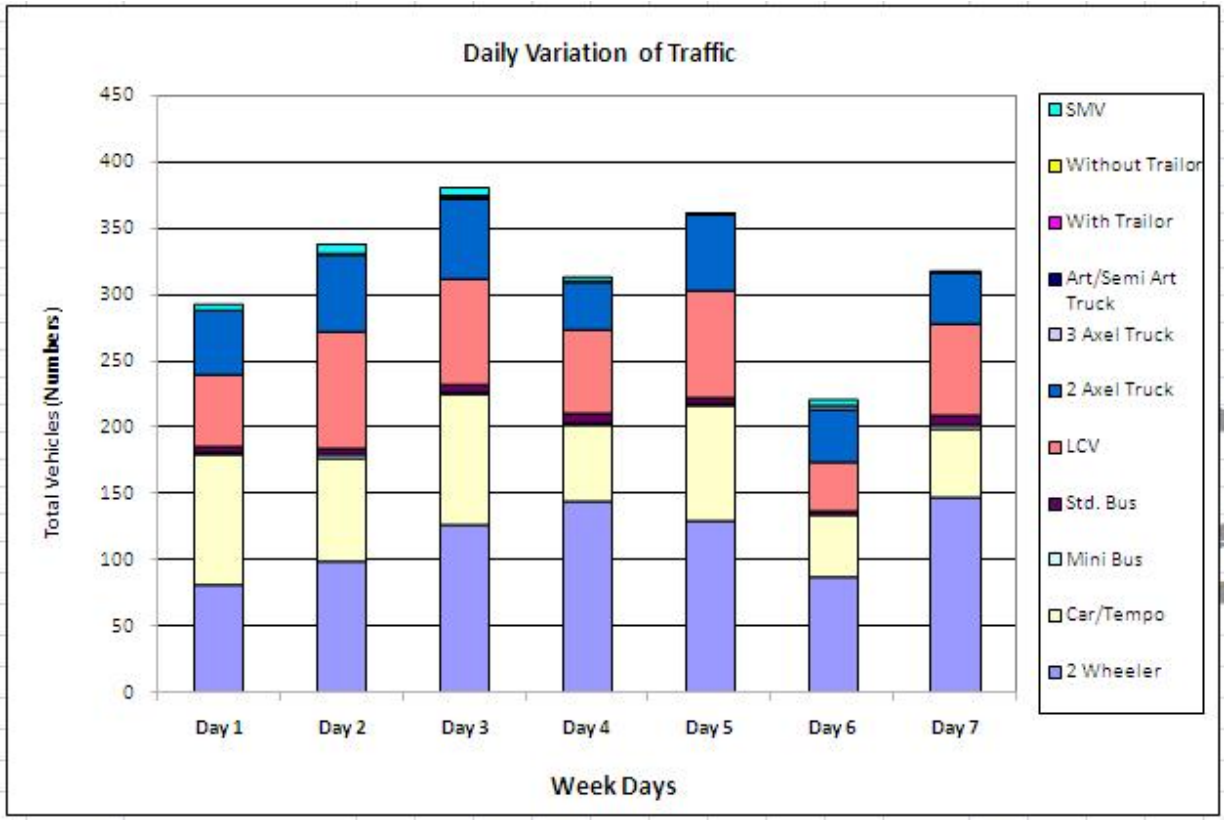


Figure 6.4: Daily Variation of Traffic at 34+175 Km in Vehicles per Day

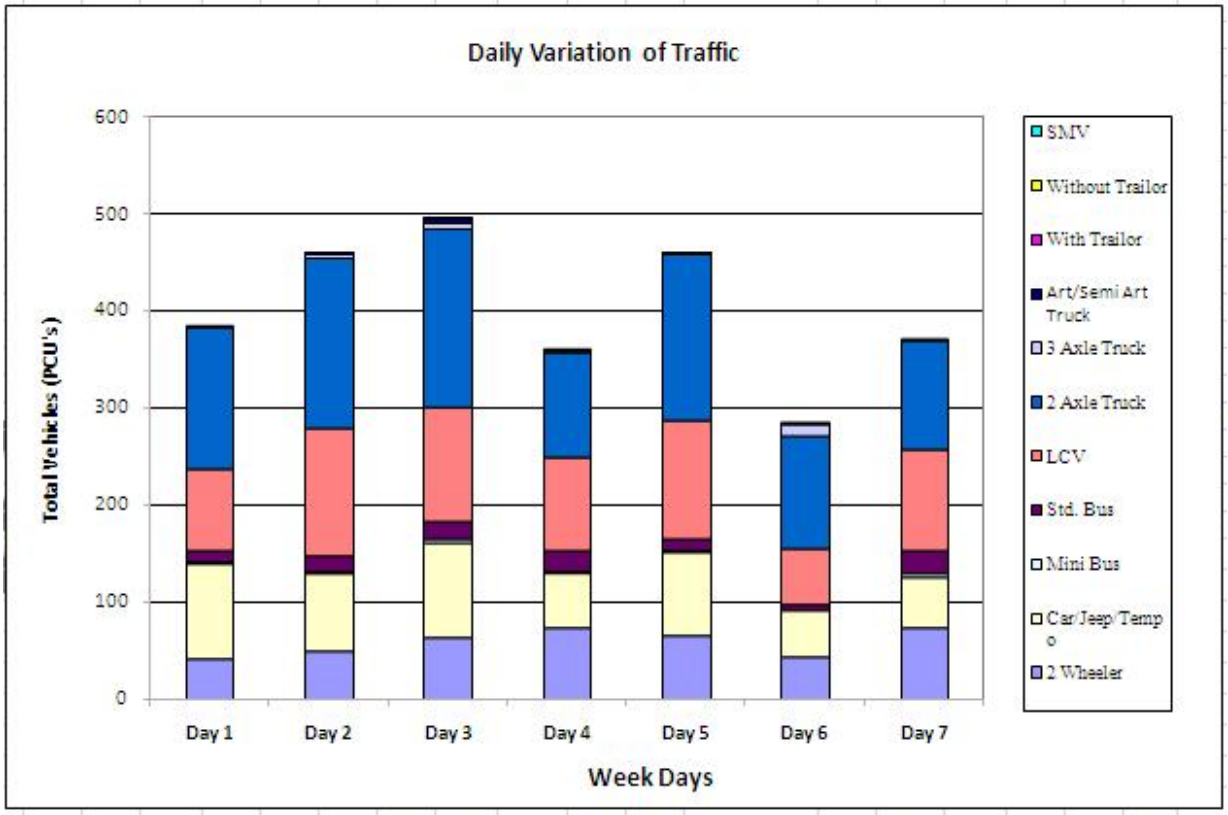


Figure 6.5: Daily Variation of Traffic at 34+175 Km in PCU per Day

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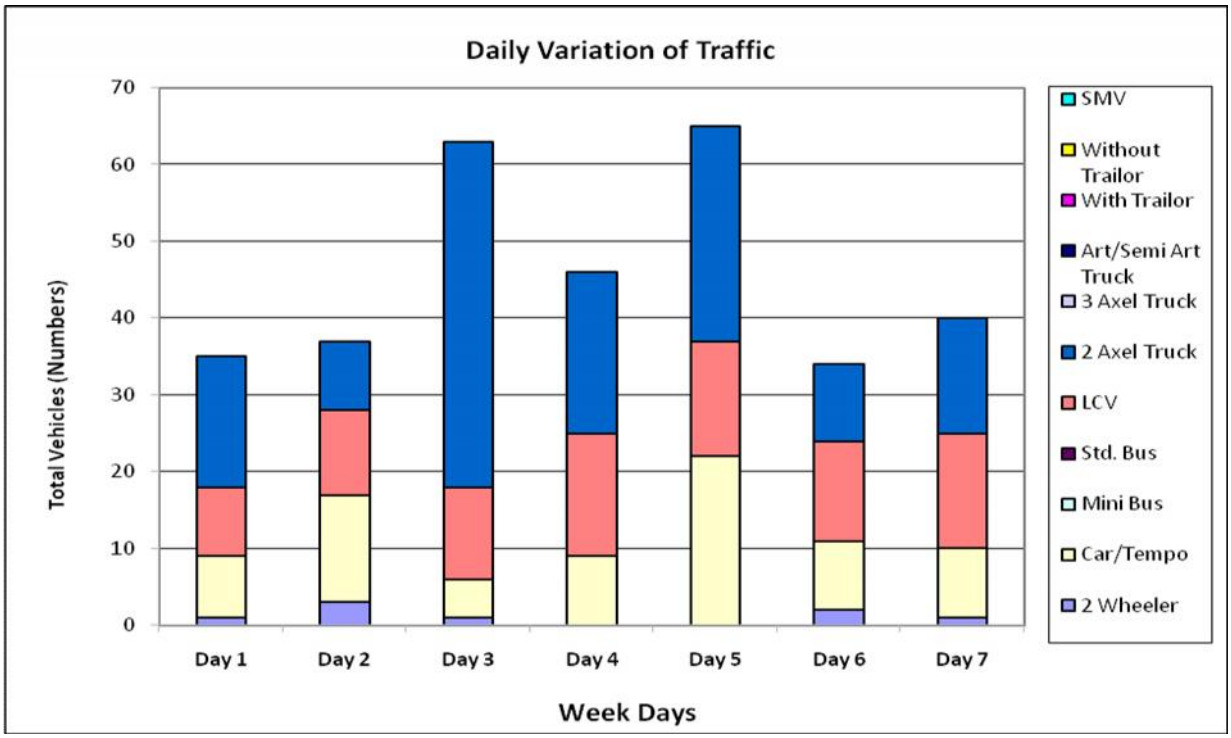


Figure 6.6: Daily Variation of Traffic at 135+500 Km in Vehicles per Day

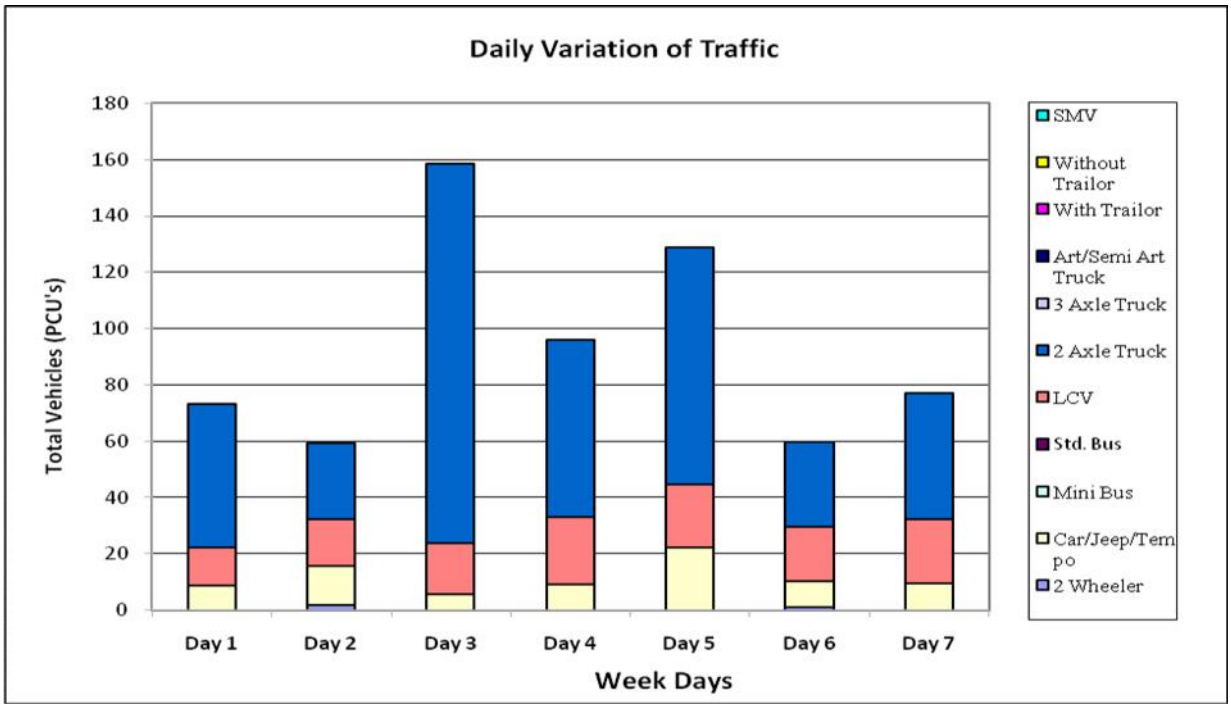


Figure 6.7: Daily Variation of Traffic at 135+500 Km in PCU per Day

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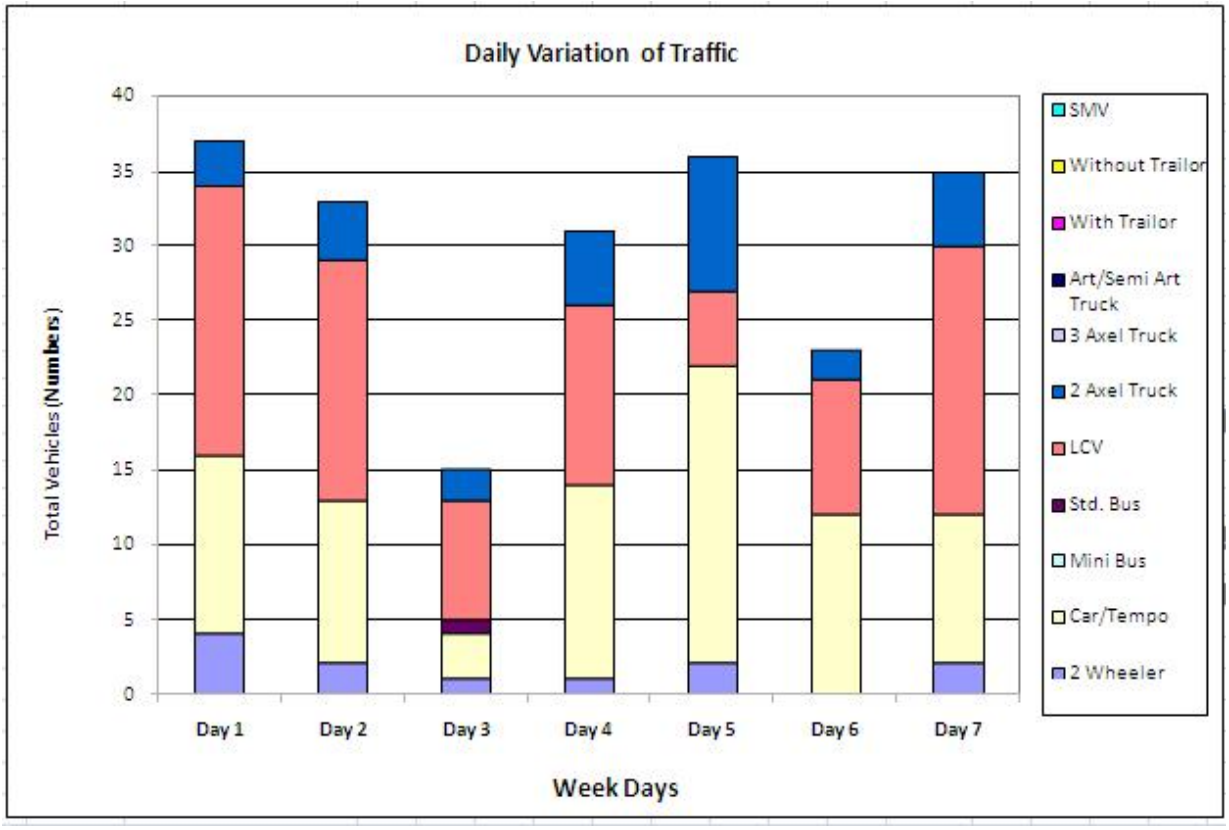


Figure 6.8: Daily Variation of Traffic at 149+200 Km in Vehicles per Day

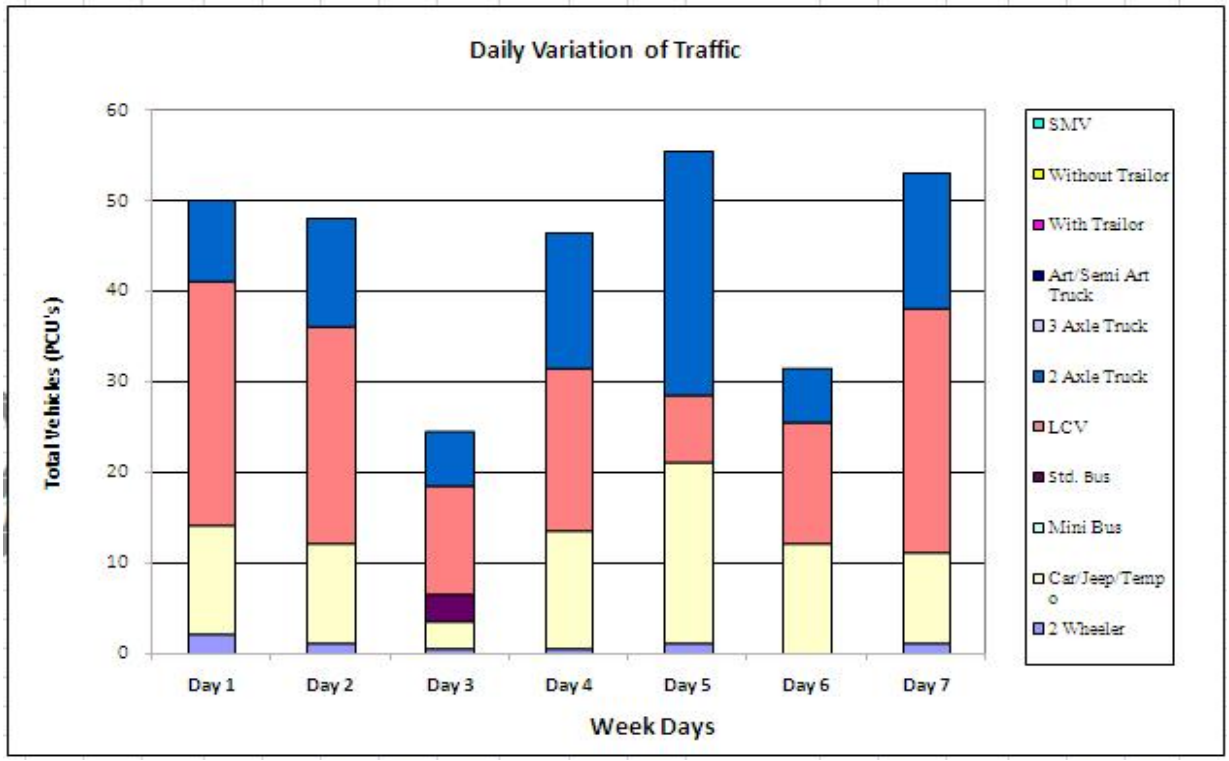


Figure 6.9: Daily Variation of Traffic at 149+200 Km in PCU per Day

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From the above figure, the following conclusions are made:

- At location-2, Chainage 5.500 km near Buallian the daily variation of fast moving vehicle in number is within 13.80 % to -14.50% and in PCU is within 14.38% to -20.69% with respect to average daily traffic.

  The daily variation of slow moving vehicle in number is 100% and in PCU is within 100 % with respect to average daily traffic.
- At location-2, Chainage 34.175 Km near Singngat ,the daily variation of fast moving vehicle in number is within 19.53% to -31.02% and in PCU is within 23.23% to -29.48% with respect to average daily traffic.

  The daily variation of slow moving vehicle in number is within 68.00% to -72.00% and in PCU is within 68.00% to -72.00% with respect to average daily traffic.
- At location-3, Chainage 135.500 Km near Khuanggin ,the daily variation of fast moving vehicle in number is within 42.19% to -25.63% and in PCU is within 70.30% to -36.61% with respect to average daily traffic.
- At location-4, Chainage 149.200 Km Sinzawl, the daily variation of fast moving vehicle in number is within 23.33% to -50.00% and in PCU is within 25.73% to -44.50% with respect to average daily traffic.

Hourly Variation

Similar to daily variation, analysis has also been carried out for hourly variation. The hourly variations in traffic (in Vehicles and PCUs per Day) observed at both the count stations on the Project Road have been presented in the following figures.

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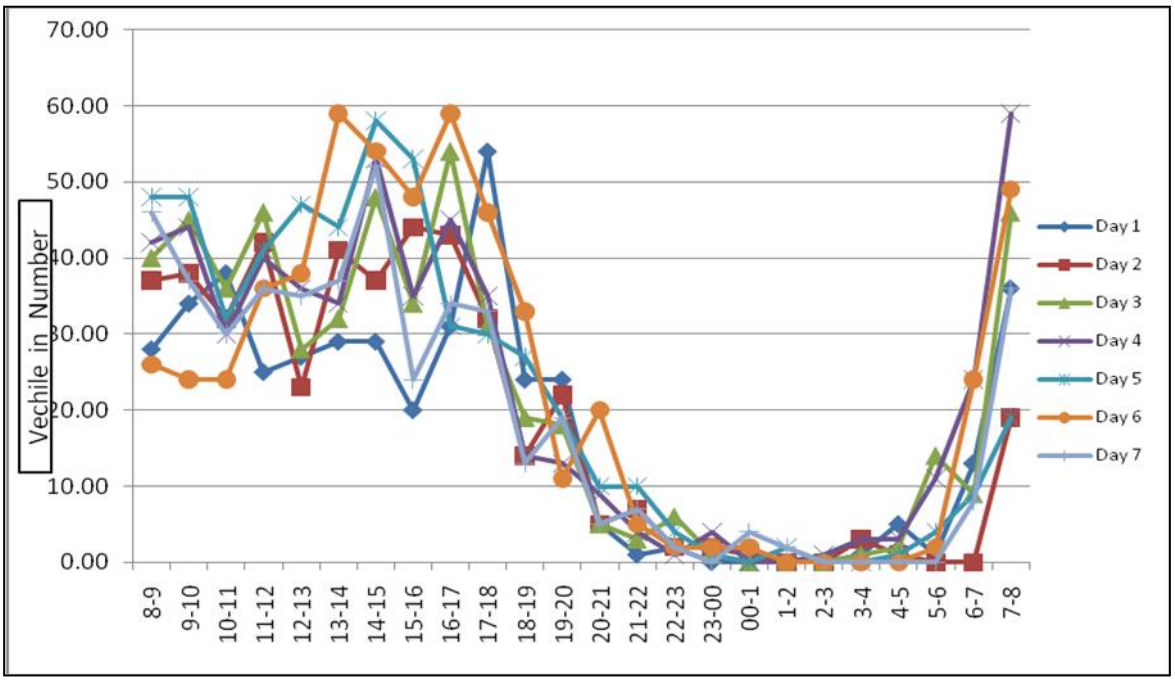


Figure 6.10: Hourly Variation of Traffic at 5+500 Km in Vehicles per Day

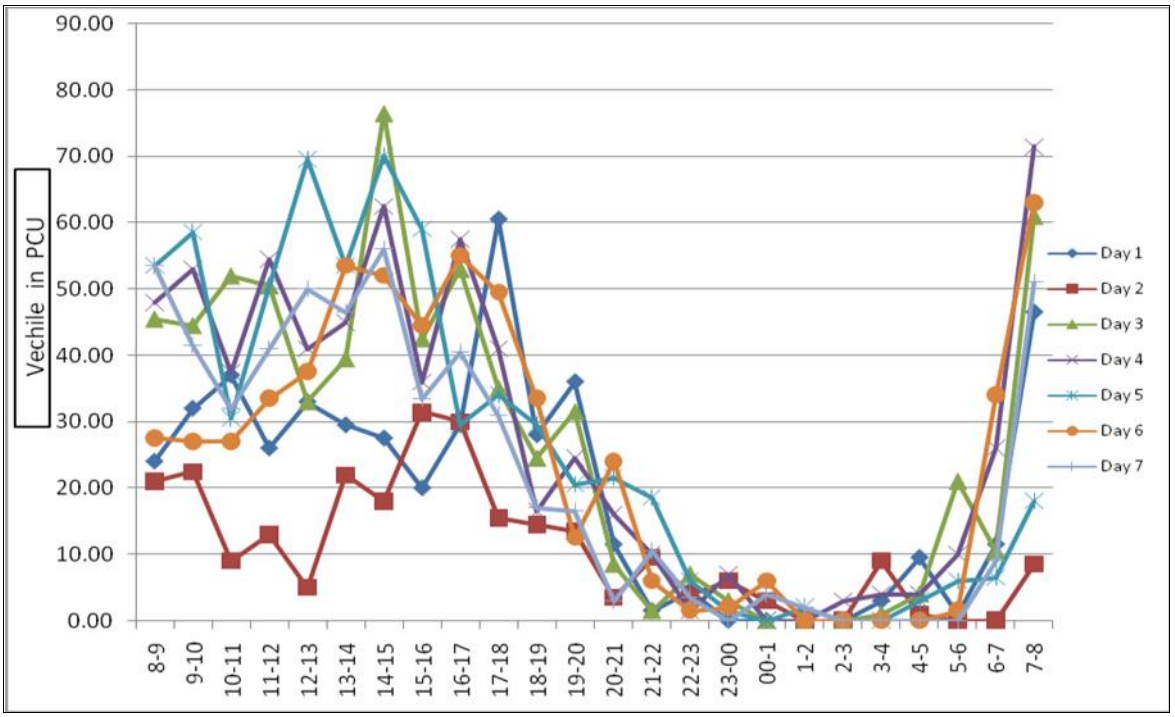


Figure 6.11: Hourly Variation of Traffic at 5+500 Km in PCU per Day

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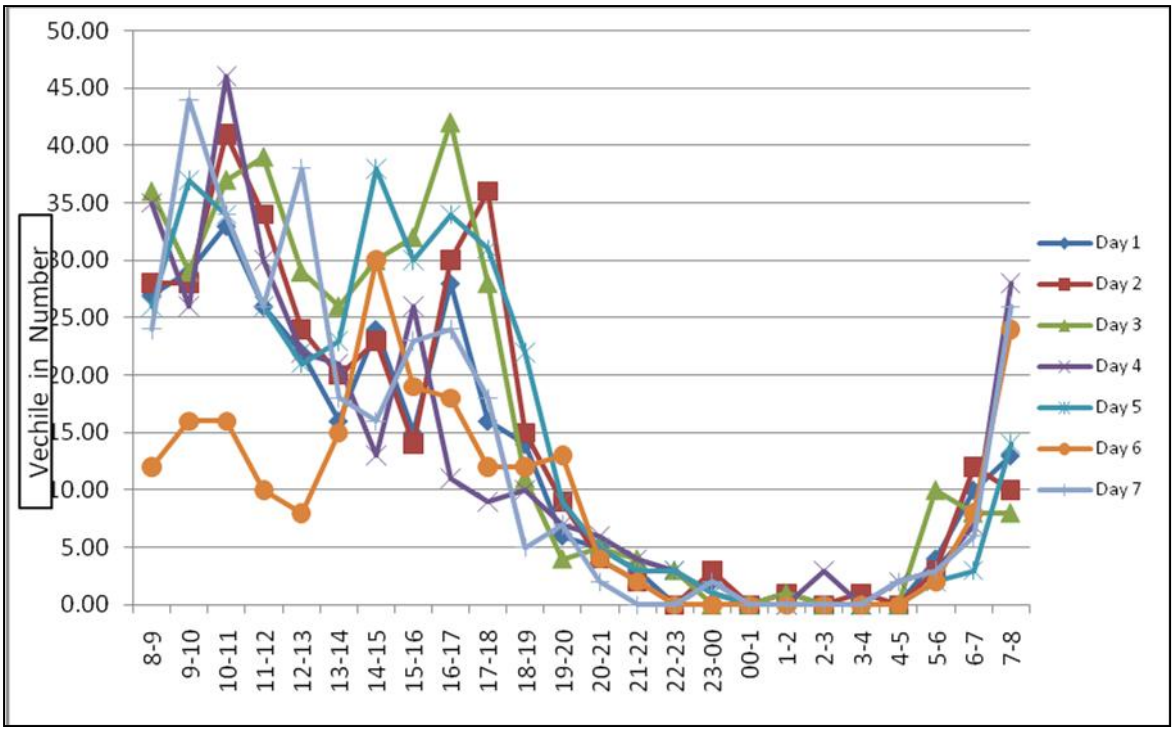


Figure 6.12: Hourly Variation of Traffic at 34+175 Km in Vehicles per Day

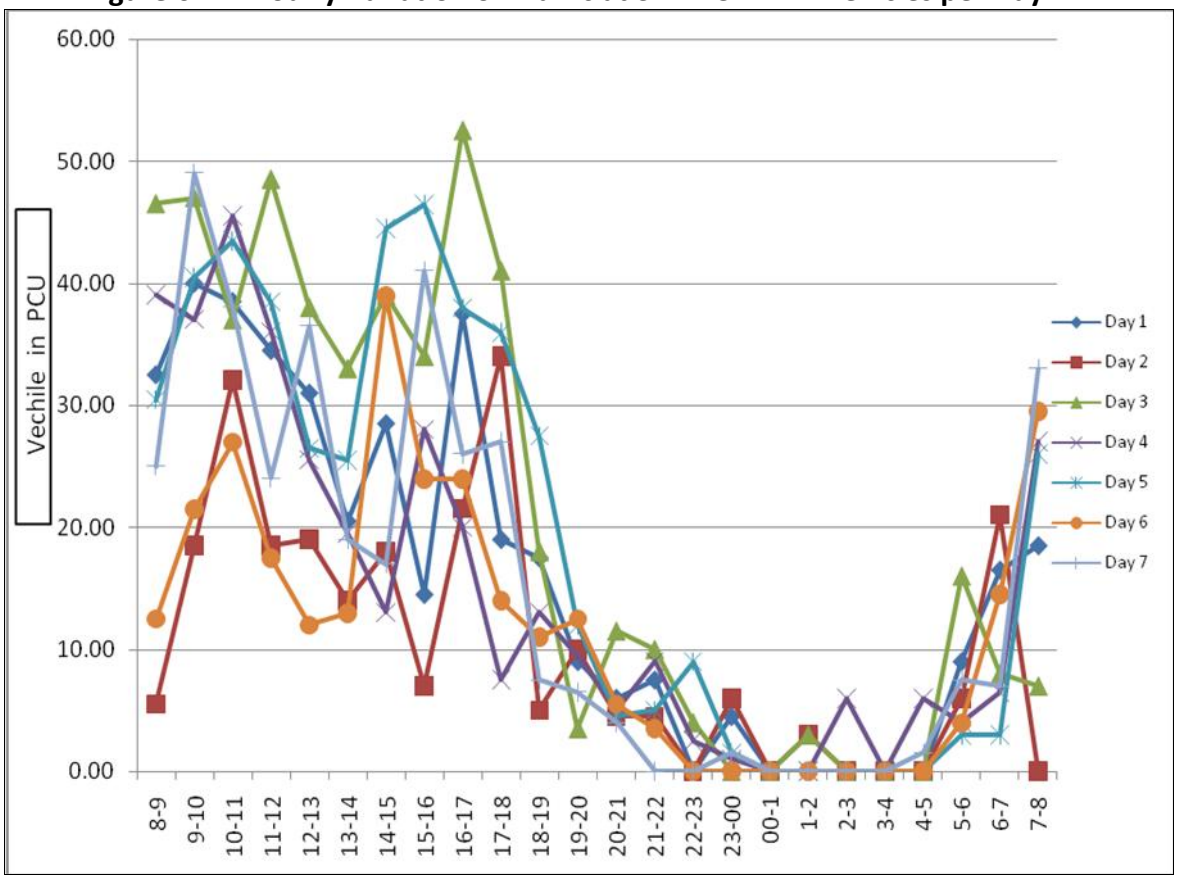


Figure 6.13: Hourly Variation of Traffic at 34+175 Km in PCU per Day

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 124A, N.S.C. BOSE ROAD

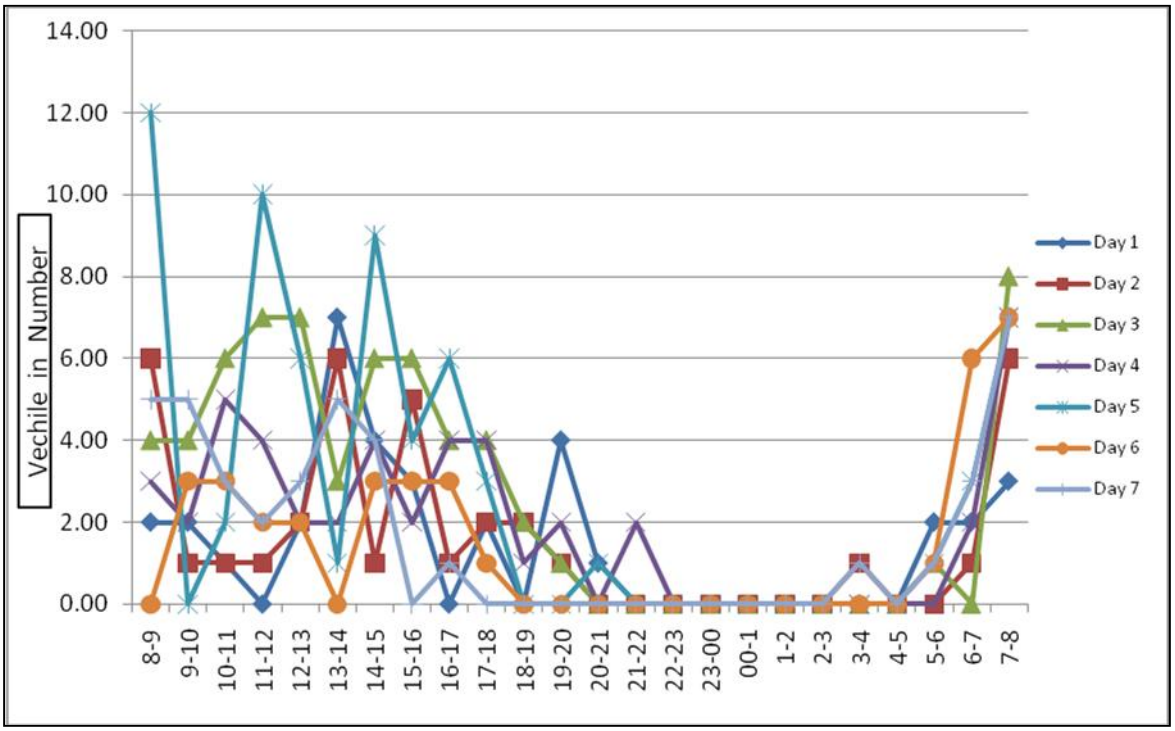


Figure 6.14: Hourly Variation of Traffic at 135+500 Km in Vehicles per Day

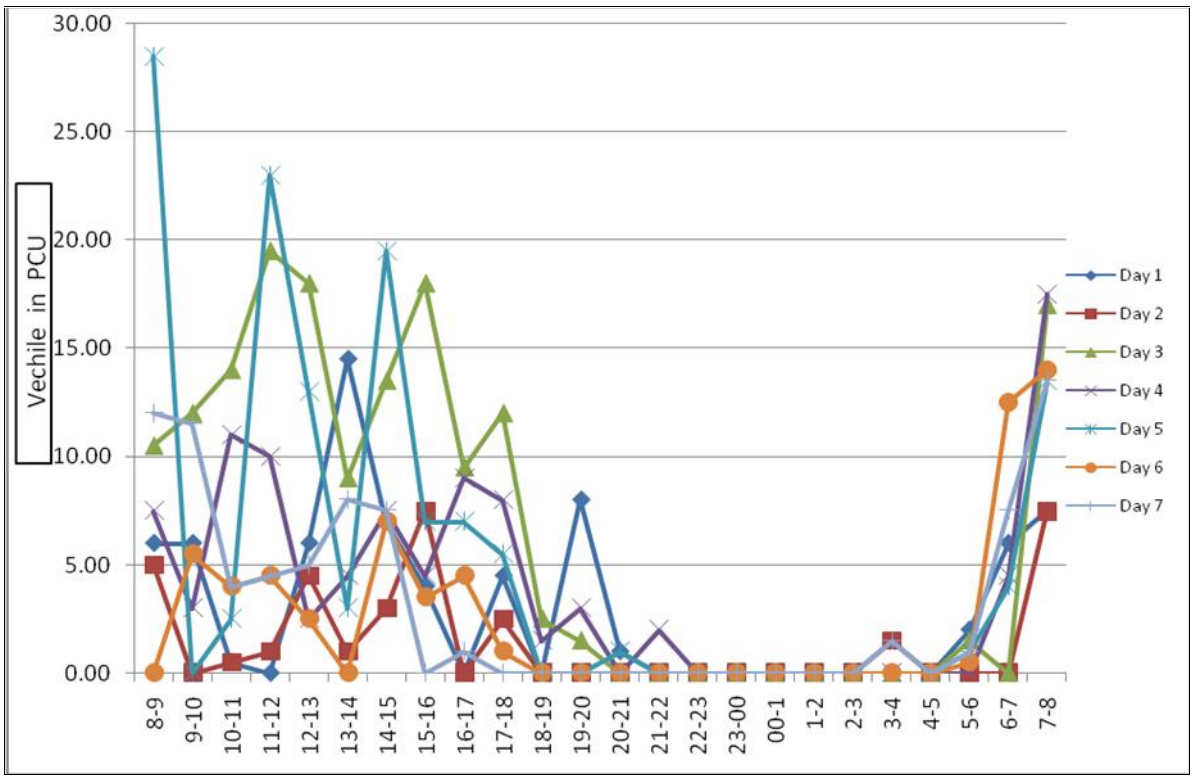


Figure 6.15: Hourly Variation of Traffic at 135+500 Km in PCU per Day

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 124A, N.S.C. BOSE ROAD

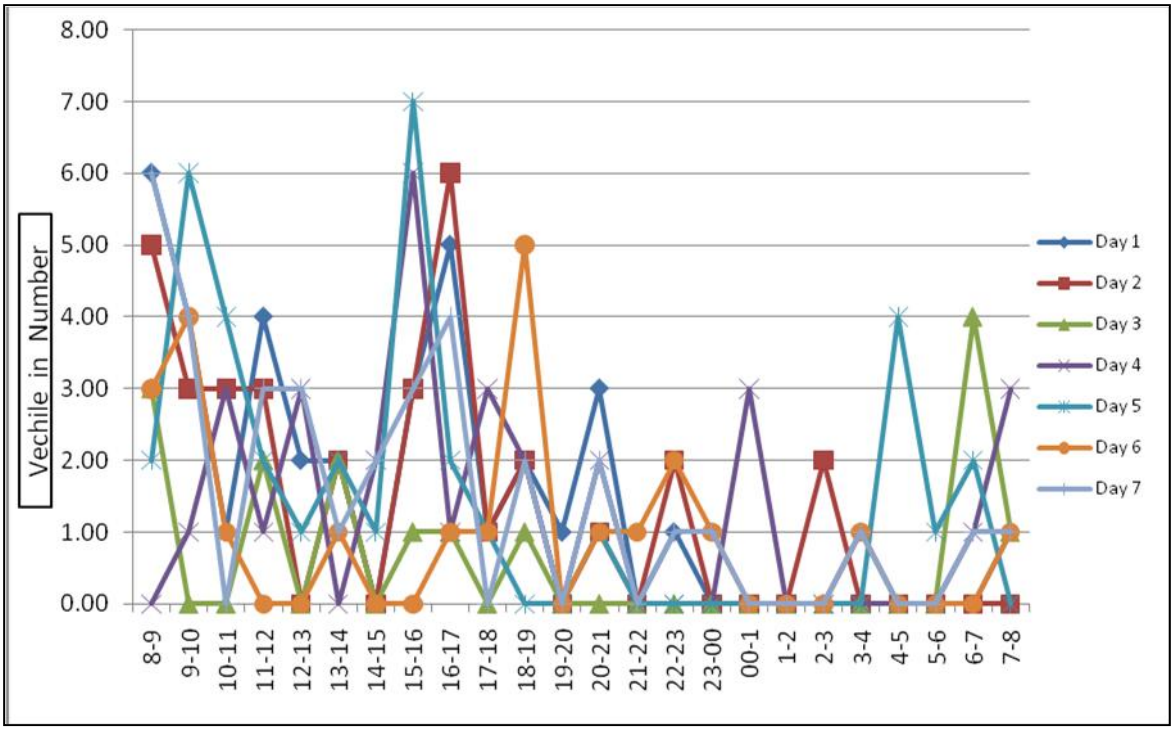


Figure 6.16: Hourly Variation of Traffic at 149+200 Km in Vehicles per Day

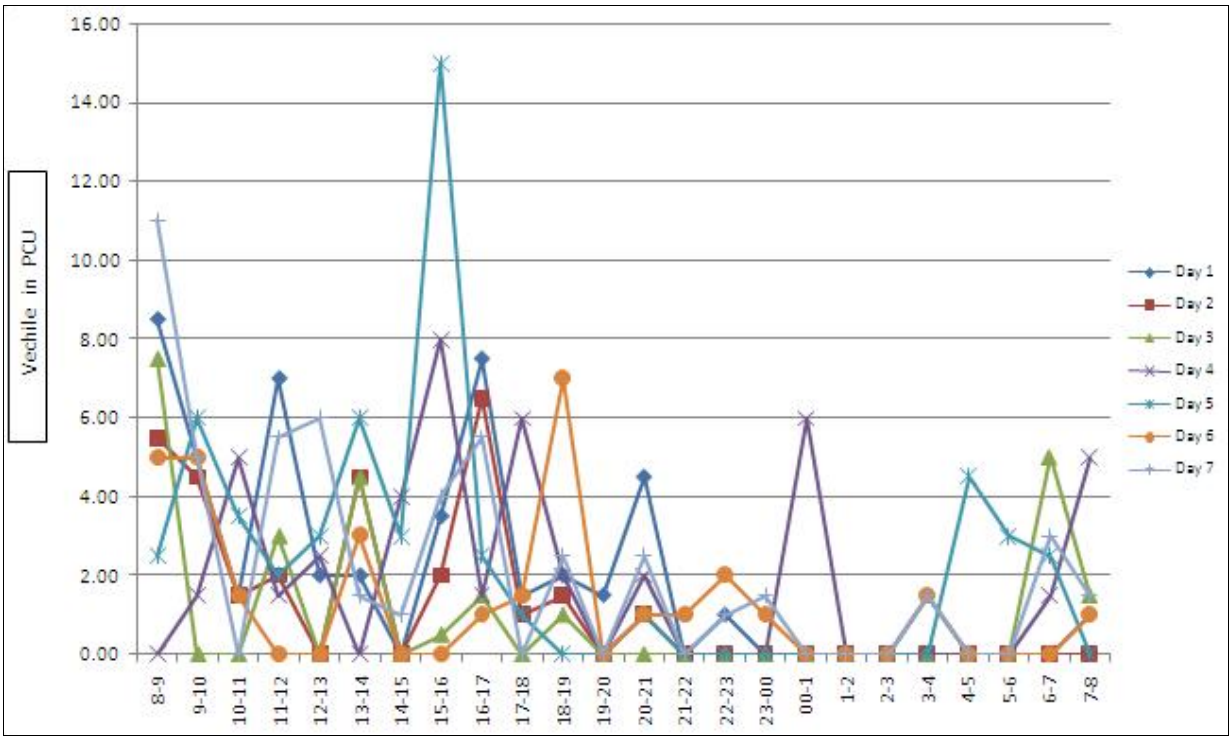


Figure 6.17: Hourly Variation of Traffic at 149+200 Km in PCU per Day

From these above figures on hourly variation the following can be derived:
The passenger traffic found at all the locations and therefore on the Project Road, moves mostly during the day time, and it is very low particularly in the night.

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6.4.3 Directional Distribution

The directional distribution observed at the count stations on the Project Road have been presented in **Table 6.4**.

Table 6.4: Directional Distribution

Time Interval (Hour)		Km 5+500				Km 34+175				Km 135+500				Km 149+200			
		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)	
From	To	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
8	9	167	193	46.45%	53.55%	201	127	61.37%	38.63%	84	108	43.60%	56.40%	72	109	39.61%	60.39%
9	10	179	209	46.12%	53.88%	214	176	54.81%	45.19%	96	111	46.38%	53.62%	87	107	44.82%	55.18%
10	11	221	193	53.38%	46.62%	192	234	45.06%	54.94%	131	121	52.09%	47.91%	117	115	50.32%	49.68%
11	12	204	206	49.76%	50.24%	170	198	46.19%	53.81%	96	121	44.21%	55.79%	82	120	40.69%	59.31%
12	13	206	148	58.19%	41.81%	168	168	50.00%	50.00%	105	102	50.61%	49.39%	94	87	51.93%	48.07%
13	14	185	178	50.96%	49.04%	130	150	46.42%	53.58%	98	108	47.45%	52.55%	78	95	45.09%	54.91%
14	15	265	199	57.11%	42.89%	145	178	44.89%	55.11%	113	123	47.88%	52.12%	99	104	48.64%	51.36%
15	16	173	172	50.15%	49.85%	156	140	52.71%	47.29%	101	95	51.53%	48.47%	98	83	54.14%	45.86%
16	17	200	205	49.38%	50.62%	210	142	59.66%	40.34%	115	82	58.52%	41.48%	112	89	55.75%	44.25%
17	18	160	198	44.62%	55.38%	157	135	53.86%	46.14%	99	78	56.09%	43.91%	85	73	53.80%	46.20%
18	19	59	91	39.33%	60.67%	73	48	60.17%	39.83%	34	19	64.15%	35.85%	31	24	56.36%	43.64%
19	20	85	104	44.95%	55.05%	53	40	57.07%	42.93%	43	19	69.11%	30.89%	37	13	73.74%	26.26%
20	21	26	45	36.17%	63.83%	29	33	46.72%	53.28%	17	11	61.82%	38.18%	20	17	53.42%	46.58%
21	22	18	28	39.13%	60.87%	10	32	24.10%	75.90%	7	6	56.00%	44.00%	7	4	66.67%	33.33%
22	23	5	21	19.61%	80.39%	6	6	52.17%	47.83%	4	1	80.00%	20.00%	8	1	88.89%	11.11%
23	0	7	17	29.17%	70.83%	13	10	57.78%	42.22%	7	1	87.50%	12.50%	9	1	89.47%	10.53%
0	1	5	3	62.50%	37.50%	1	0	100.00%	0.00%	1	0	100.00%	0.00%	1	6	14.29%	85.71%
1	2	0	2	0.00%	100.00%	0	6	0.00%	100.00%	0	0	0.00%	0.00%	0	0	0.00%	0.00%
2	3	0	3	0.00%	100.00%	3	3	50.00%	50.00%	0	0	0.00%	0.00%	3	0	100.00%	0.00%
3	4	1	18	5.26%	94.74%	2	2	42.86%	57.14%	2	4	30.00%	70.00%	3	2	60.00%	40.00%
4	5	15	8	65.91%	34.09%	6	6	50.00%	50.00%	1	3	28.57%	71.43%	1	3	28.57%	71.43%

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Time Interval (Hour)		Km 5+500				Km 34+175				Km 135+500				Km 149+200			
		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)	
From	To	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
5	6	27	10	72.97%	27.03%	17	32	34.69%	65.31%	6	4	57.89%	42.11%	2	3	40.00%	60.00%
6	7	33	46	41.67%	58.33%	22	58	27.50%	72.50%	20	21	49.38%	50.62%	16	15	52.46%	47.54%
7	8	207	136	60.44%	39.56%	77	103	42.74%	57.26%	66	83	44.11%	55.89%	34	57	37.36%	62.64%
Total		**2444**	**2428**	**50.16%**	**49.84%**	**2050**	**2021**	**50.36%**	**49.64%**	**1242**	**1217**	**50.52%**	**49.48%**	**1092**	**1125**	**49.26%**	**50.74%**

The overall directional distribution is 50:50 at Km 5+500, 50:50 at Km 34+175, 51:49 at Km 135+500 and 49:51 at Km 149+200 considering the traffic flow at all the count stations.

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6.4.4 TRAFFIC COMPOSITION

While detailed traffic counts are presented in Appendix to Main Report, for ready reference and easier appreciation, the composition of traffic at various count locations has been shown in Figure 6.18, 6.19, 6.20 & 6.21.

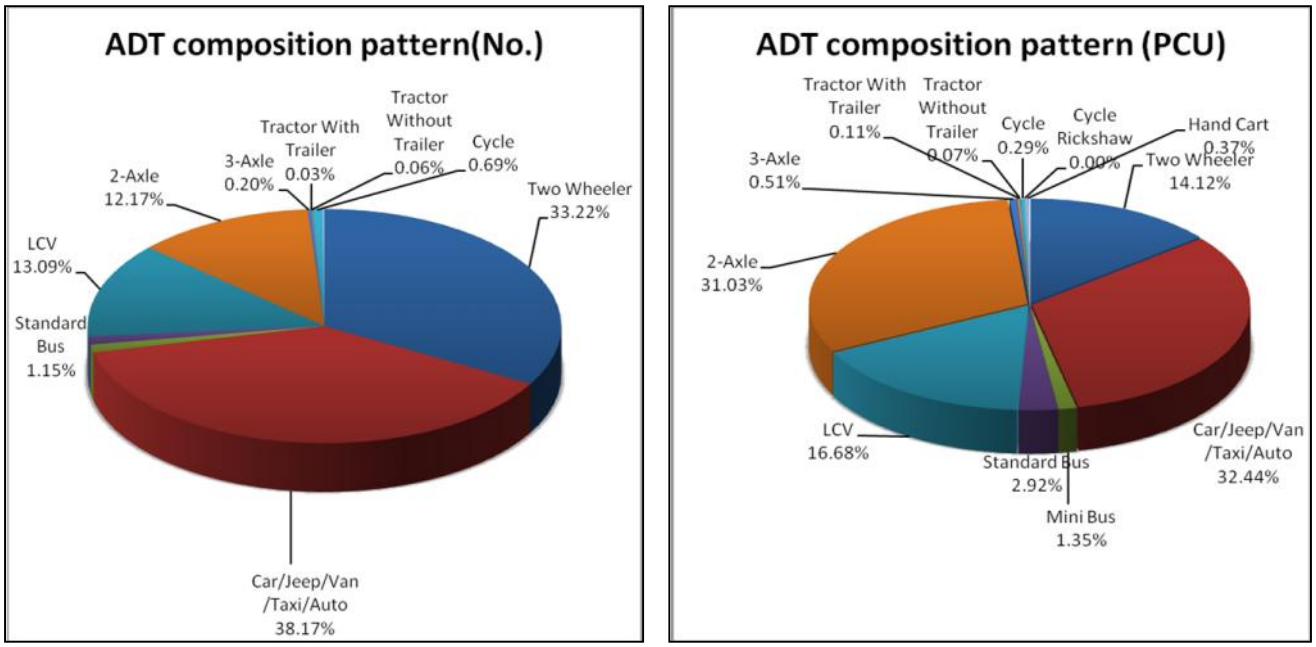


Figure 6.18: Traffic Composition (5+500 km)

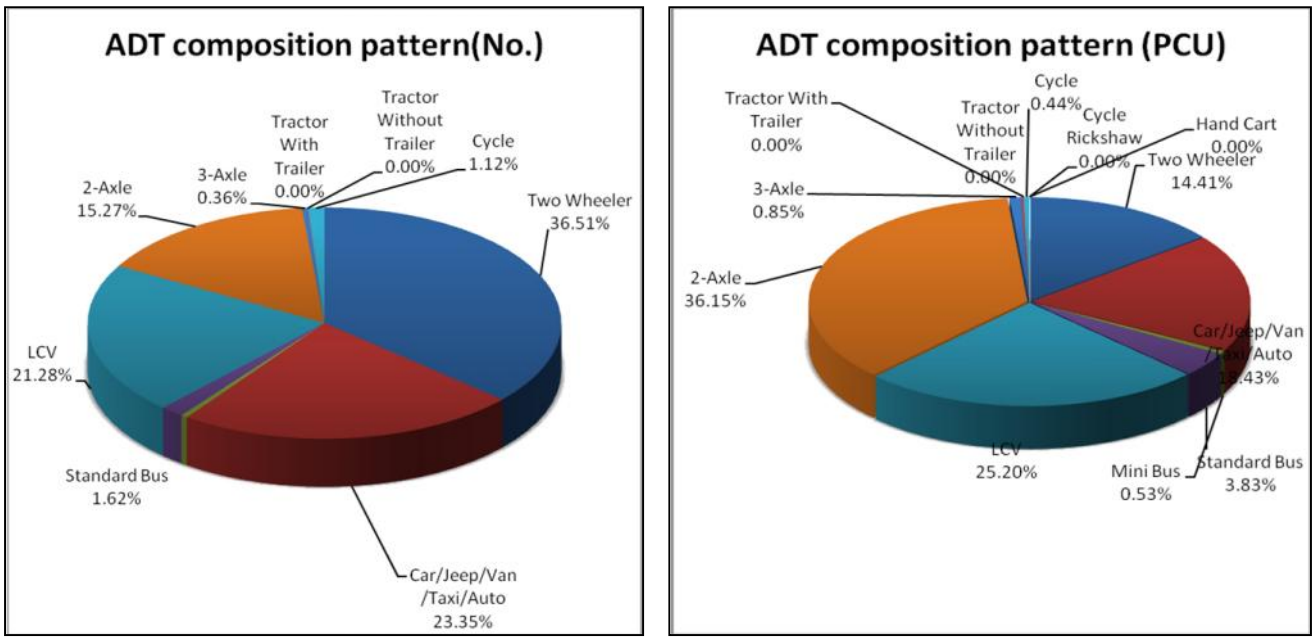


Figure 6.19: Traffic Composition (34+175 km)

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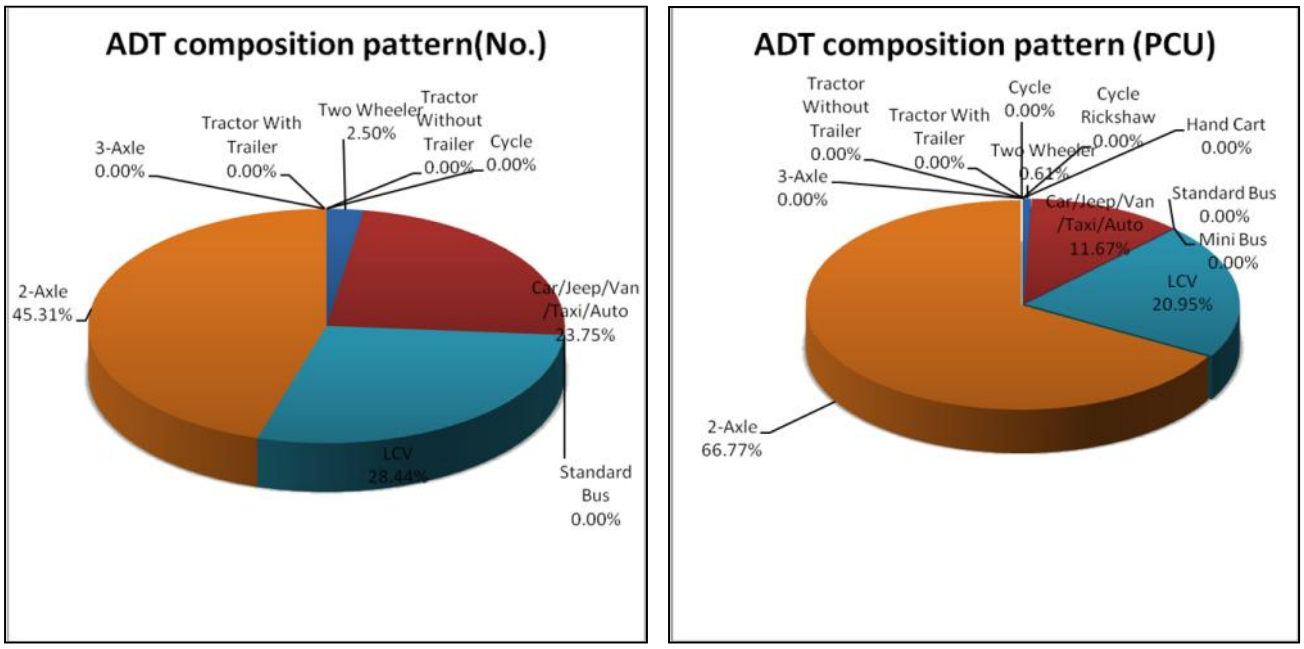


Figure 6.20: Traffic Composition (135+500 km)

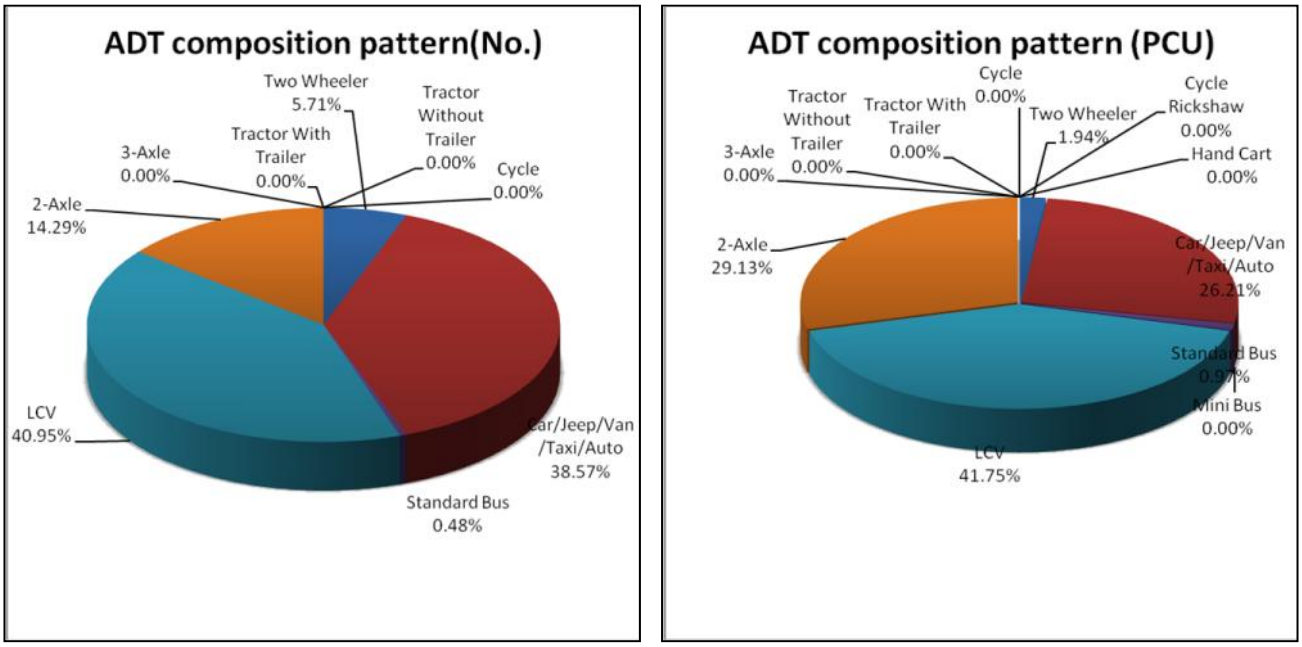


Figure 6.21: Traffic Composition (149+200 km)

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From the above figures it can be seen that car & two wheelers comprise about 39-50% of total traffic whereas 2-axle & 3-axle trucks comprise about 1-3% of total traffic on the project road.

The traffic composition shown in the above figures has been summarized in Tables 6.5(a), Tables 6.5(b), Tables 6.5(c) and Tables 6.5(d)

Table 6.5(a): Traffic Composition at km 5+500

Type of Vehicle	% of Total	ADT
Two Wheeler	33.22	166
Car/Jeep/Van/Taxi/Auto	38.17	190
Mini Bus	1.06	5
Standard Bus	1.15	6
LCV	13.09	65
2-Axle	12.17	61
3-Axle	0.20	1
Multi-Axle	0.03	0
Tractor With Trailer	0.03	0
Tractor Without Trailer	0.06	0
Cycle	0.69	3
Cycle Rickshaw	0.00	0
Hand Cart	0.14	1
Bullock Cart	0.00	0
Horse Cart	0.00	0

Table 6.5(b): Traffic Composition at km 34+175

Type of Vehicle	% of Total	ADT
Two Wheeler	36.51	116
Car/Jeep/Van/Taxi/Auto	23.35	74
Mini Bus	0.45	1
Standard Bus	1.62	5
LCV	21.28	68
2-Axle	15.27	49
3-Axle	0.36	1
Multi-Axle	0.04	0
Tractor With Trailer	0.00	0
Tractor Without Trailer	0.00	0
Cycle	1.12	4
Cycle Rickshaw	0.00	0
Hand Cart	0.00	0
Bullock Cart	0.00	0
Horse Cart	0.00	0

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Table 6.5(c): Traffic Composition at km 135+500

Type of Vehicle	% of Total	ADT
Two Wheeler	2.50	1
Car/Jeep/Van/Taxi/Auto	23.75	11
Mini Bus	0.00	0
Standard Bus	0.00	0
LCV	28.44	13
2-Axle	45.31	21
3-Axle	0.00	0
Multi-Axle	0.00	0
Tractor With Trailer	0.00	0
Tractor Without Trailer	0.00	0
Cycle	0.00	0
Cycle Rickshaw	0.00	0
Hand Cart	0.00	0
Bullock Cart	0.00	0
Horse Cart	0.00	0

Table 6.5(d): Traffic Composition at km 149+200

Type of Vehicle	% of Total	ADT
Two Wheeler	5.71	2
Car/Jeep/Van/Taxi/Auto	38.57	12
Mini Bus	0.00	0
Standard Bus	0.48	0
LCV	40.95	12
2-Axle	14.29	4
3-Axle	0.00	0
Multi-Axle	0.00	0
Tractor With Trailer	0.00	0
Tractor Without Trailer	0.00	0
Cycle	0.00	0
Cycle Rickshaw	0.00	0
Hand Cart	0.00	0
Bullock Cart	0.00	0
Horse Cart	0.00	0

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6.4.5 SEASONAL CORRECTION

The traffic plying on any road generally varies over different periods of year depending on the cycle of different socio-economic activities in the regions through which it passes. Therefore, in order to have more realistic picture of the traffic on the project road, it is required to assess seasonal variation in traffic to estimate Annual Average Daily Traffic (AADT) and Peak Season ADT. Therefore, the ADT observed during the survey duration is multiplied by a Seasonal Correction Factor (SCF) to derive AADT and Peak season ADT. The seasonal correction factor is generally derived from secondary data sources such as past month-wise traffic data on the project road, sales of fuel at different filling stations along the project highway etc. In the absence of any other data, either of the project road or in the vicinity, only the monthly figures of fuel sales collected from one petrol bunk on the project road is considered in the estimation of seasonal variation and seasonal correction factors.

SEASONAL CORRECTION FACTOR

For the present study, firstly the petrol and diesel sale figures have been used from one petrol pumps on the project road. The petrol and diesel fuel sale data for the years 2016-2017 have been collected and analyzed for estimation of Average Seasonal Correction Factor (ASCF) and Peak Seasonal Correction Factor (PSCF). As the traffic surveys were conducted in the month of February, the above factors for the month of February is considered. The fuel sales figures at the filling station in the region are presented season wise in Table 6.6 – 6.8.

TABLE 6.6: SUMMARY OF PETROL SALES DATA AT FUEL STATION

Petrol Sales Data (in Litre)			
Year	Month	Fuel Stations	
		M/S Niangchin Service Station	Avg. Sales Per Station (Lt.)
2016	Apr	12000	12,000
2016	May	12000	12,000
2016	Jun	12000	12,000
2016	Jul	12000	12,000
2016	Aug	12000	12,000
2016	Sep	12000	12,000
2016	Oct	12000	12,000
2016	Nov	12000	12,000
2016	Dec	12000	12,000
2017	Jan	12000	12,000
2017	Feb	12000	12,000
2017	Mar	12000	12,000

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TABLE 6.7: SUMMARY OF DIESEL SALES DATA AT FUEL STATION

Diesel Sales Data (in Litre)			
Year	***Month***	***Fuel Stations***	
		M/S Niangchin Service Station	***Avg. Sales Per Station (Lt.)***
2016	Apr	90000	90,000
2016	May	90000	90,000
2016	Jun	90000	90,000
2016	Jul	90000	90,000
2016	Aug	90000	90,000
2016	Sep	90000	90,000
2016	Oct	90000	90,000
2016	Nov	90000	90,000
2016	Dec	90000	90,000
2017	Jan	90000	90,000
2017	Feb	90000	90,000
2017	Mar	90000	90,000

TABLE 6.8: SUMMARY OF SEASONAL VARIATION FACTOR (PETROL AND DIESEL)

Month	***Avg. Sales (Lt.)***		***Avg. Seasonal Correction Factor***		***Peak Seasonal Correction Factor***	
	Petrol	***Diesel***	***Petrol***	***Diesel***	***Petrol***	***Diesel***
Jan	12,000	90,000	1.00	1.00	1.00	1.00
Feb	12,000	90,000	1.00	1.00	1.00	1.00
Mar	12,000	90,000	1.00	1.00	1.00	1.00
Apr	12,000	90,000	1.00	1.00	1.00	1.00
May	12,000	90,000	1.00	1.00	1.00	1.00
Jun	12,000	90,000	1.00	1.00	1.00	1.00
Jul	12,000	90,000	1.00	1.00	1.00	1.00
Aug	12,000	90,000	1.00	1.00	1.00	1.00
Sep	12,000	90,000	1.00	1.00	1.00	1.00
Oct	12,000	90,000	1.00	1.00	1.00	1.00
Nov	12,000	90,000	1.00	1.00	1.00	1.00
Dec	12,000	90,000	1.00	1.00	1.00	1.00
Avg. Sale per Month	12,000	90,000				

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Average Seasonal Correction Factor for Petrol operated vehicles =	1.00
Average Seasonal Correction Factor for Diesel operated vehicles =	1.00
Average Seasonal Correction Factor to be considered for both type of vehicles =	**1.00**
Peak Seasonal Correction Factor for Petrol operated vehicles =	1.00
Peak Seasonal Correction Factor for Diesel operated vehicle =	1.00
Peak Seasonal Correction Factor to be considered for both type of vehicles =	**1.00**

The Average Seasonal Correction Factor (ASCF) has been applied on the ADT observed at the count location to derive AADT which will be used for pavement design and Economic Analysis. On the other hand Peak Seasonal Correction Factor (PSCF) has been applied on the ADT to derive Peak Season ADT which will be used for the Capacity Assessment.
The following observation can be made from the above tables:

An average of ASCF (1.00) and average of PSCF (1.00) has been calculated based on petrol and diesel sales percentage of total fuel consumption on the project road are applied on ADT.

6.4.6 ANNUAL AVERAGE DAILY TRAFFIC (AADT)

The Average seasonal correction factors for petrol and diesel driven vehicles, described in the previous sections have been applied to ADT to derive AADT. The AADT is used for pavement design and economic analysis. AADT of project road is used for capacity assessment are given in the following Table 6.9.

TABLE 6.9: ESTIMATES OF AADT AS OBSERVED ON THE PROJECT ROAD (FEBRUARY 2018)

	AADT				
Vehicle Type	**NH 150 (On Old NH-2)**	**Buallian (Ch. 5+500 km)**	**Singngat (Ch. 34+175 km)**	**Khuanggin (Ch. 135+500 km)**	**Sinzawl (Ch. 149+200)**
Two Wheeler	10235	166	116	1	2
Car/Jeep/Van/Taxi/Auto	11173	190	74	11	12
Mini Bus	11	5	1	0	0
Standard Bus	30	6	5	0	0
LCV	383	65	68	13	12
2-Axle Truck	205	61	49	21	4
3-Axle Truck	5	1	1	0	0
Multi-Axle	0	0	0	0	0
Tractor With Trailer	1	0	0	0	0
Tractor Without Trailer	14	0	0	0	0
Cycle	211	3	4	0	0
Cycle Rickshaw	255	0	0	0	0
Hand Cart	4	1	0	0	0
Bullock Cart	0	0	0	0	0
Horse Cart	0	0	0	0	0
Total Motorized Vehicles (Number)	22059	495	315	46	30
Total Non Motorized Vehicles (Number)	469	4	4	0	0

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AADT					
Vehicle Type	**NH 150 (On Old NH-2)**	**Buallian (Ch. 5+500 km)**	**Singngat (Ch. 34+175 km)**	**Khuanggin (Ch. 135+500 km)**	**Sinzawl (Ch. 149+200)**
Total Vehicles (Number)	22528	499	318	46	
Total Motorized Vehicles (PCU)	17631	583	401	93	44
Total Non Motorized Vehicles (PCU)	627	4	2	0	0
Total Vehicles (PCU)	18258	587	403	93	44
Total Commercial Vehicle per day(Number)	636	138	124	34	17

6.4.7 TRAFFIC GROWTH RATES

As per IRC: SP 48:1998, Hill road manual, 7.5% growth of traffic is considered for hill road when past data is not available.

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6.4.8 TRAFFIC PROJECTION FOR HOMOGENEOUS SECTION – I (KM 0+000 TO KM 74+000)

Table 6.10: Traffic Projection of homogeneous section-I

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 - Axle	Multi-Axle	Agri. Tract. With Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2017	7.5%	166	190	5	6	65	61	1	0	0	0	3	0	1	0	0	498	587
2018	7.5%	178	204	5	6	70	66	1	0	0	0	3	0	1	0	0	535	630
2019	**7.5%**	**192**	**220**	**6**	**7**	**75**	**70**	**1**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**576**	**678**
2020	7.5%	206	236	6	7	81	76	1	0	0	0	4	0	1	0	0	619	729
2021	7.5%	222	254	7	8	87	81	1	0	0	0	4	0	1	0	0	665	783
2022	**7.5%**	**238**	**273**	**7**	**9**	**93**	**88**	**1**	**0**	**0**	**0**	**4**	**0**	**1**	**0**	**0**	**715**	**842**
2023	7.5%	256	293	8	9	100	94	2	0	0	0	5	0	2	0	0	769	905
2024	7.5%	275	315	8	10	108	101	2	0	0	0	5	0	2	0	0	826	973
2025	7.5%	296	339	9	11	116	109	2	0	0	0	5	0	2	0	0	888	1046
2026	7.5%	318	364	10	12	125	117	2	0	0	0	6	0	2	0	0	955	1124
2027	7.5%	342	392	10	12	134	126	2	0	0	0	6	0	2	0	0	1026	1209
2028	7.5%	368	421	11	13	144	135	2	0	0	0	7	0	2	0	0	1103	1299
2029	7.5%	395	453	12	14	155	145	2	0	0	0	7	0	2	0	0	1186	1397
2030	7.5%	425	486	13	15	166	156	3	0	0	0	8	0	3	0	0	1275	1502
2031	7.5%	457	523	14	17	179	168	3	0	0	0	8	0	3	0	0	1371	1614
2032	7.5%	491	562	15	18	192	180	3	0	0	0	9	0	3	0	0	1474	1735
2033	7.5%	528	604	16	19	207	194	3	0	0	0	10	0	3	0	0	1584	1866
2034	7.5%	568	650	17	21	222	209	3	0	0	0	10	0	3	0	0	1703	2005
2035	7.5%	610	698	18	22	239	224	4	0	0	0	11	0	4	0	0	1831	2156
2036	7.5%	656	751	20	24	257	241	4	0	0	0	12	0	4	0	0	1968	2318
2037	7.5%	705	807	21	25	276	259	4	0	0	0	13	0	4	0	0	2115	2491
2038	7.5%	758	868	23	27	297	279	5	0	0	0	14	0	5	0	0	2274	2678
2039	7.5%	815	933	25	29	319	299	5	0	0	0	15	0	5	0	0	2445	2879
2040	7.5%	876	1003	26	32	343	322	5	0	0	0	16	0	5	0	0	2628	3095
2041	7.5%	942	1078	28	34	369	346	6	0	0	0	17	0	6	0	0	2825	3327
2042	**7.5%**	**1012**	**1159**	**30**	**37**	**396**	**372**	**6**	**0**	**0**	**0**	**18**	**0**	**6**	**0**	**0**	**3037**	**3577**

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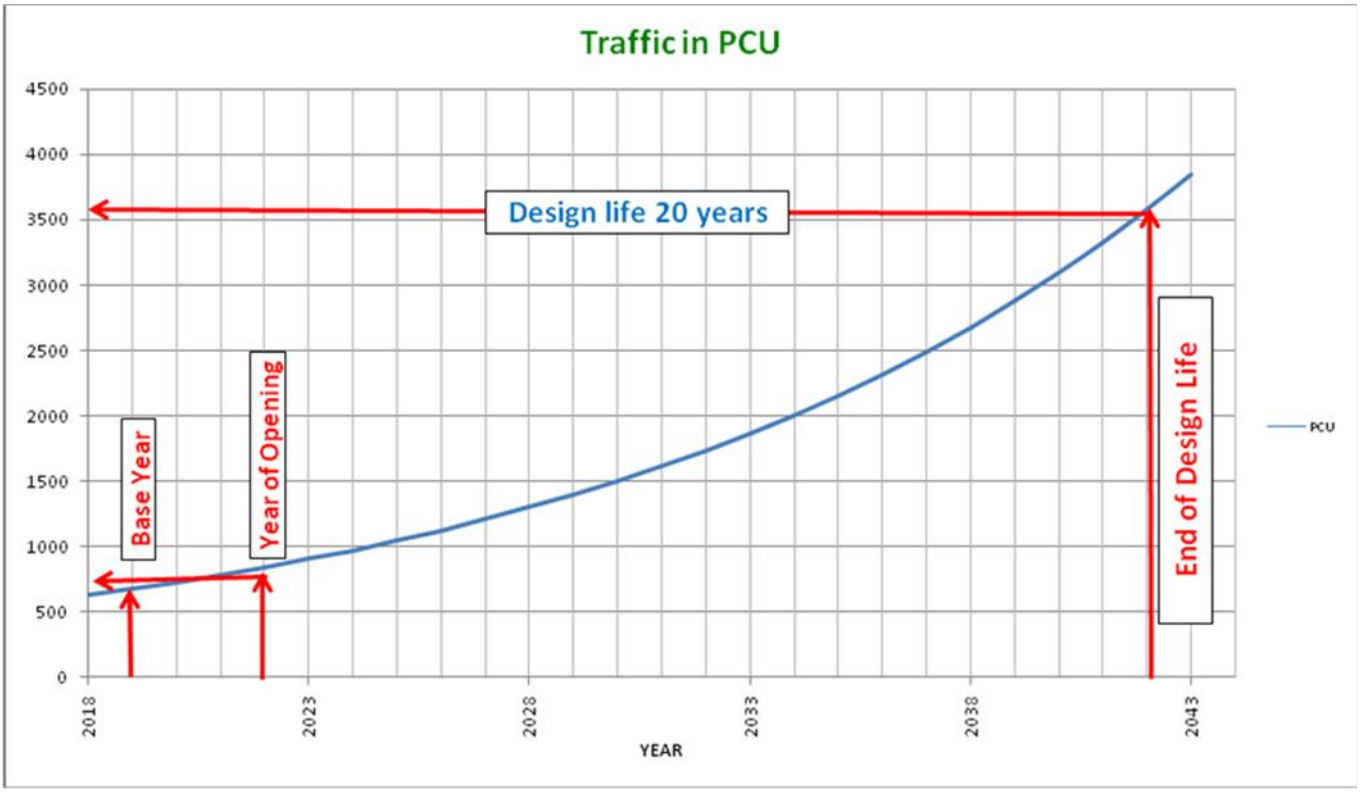


Fig: 6.22 Traffic Projection of homogeneous section-I (KM 0+000 TO KM 74+000)

From the traffic projection table 6.10, the projected traffic of homogeneous section – I considering 20 years of design life of pavement comes out as 3577 PCU. Therefore 2-lane is found adequate to cater this projected traffic with level of service B

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6.4.9 TRAFFIC PROJECTION FOR HOMOGENEOUS SECTION – II (KM 74+000 TO KM 161+665)

Table 6.11: Traffic Projection of homogeneous section-II

Year	Growth Factors	AADT															Total in Numbers	Total in PCU
		Two Wheeler	Car/Jeep/ Van/Taxi/ Auto	Mini / RTVs Bus	Stand. Bus	LCV	2-Axle	3 - Axle	Multi-Axle	Agri. Tract. With Trailer	Agri. Tract. Without Trailer	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2017	7.5%	1	11	0	0	13	21	0	0	0	0	0	0	0	0	0	46	94
2018	7.5%	1	12	0	0	14	23	0	0	0	0	0	0	0	0	0	49	101
2019	**7.5%**	**1**	**13**	**0**	**0**	**15**	**24**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**53**	**109**
2020	7.5%	1	14	0	0	16	26	0	0	0	0	0	0	0	0	0	57	117
2021	7.5%	1	15	0	0	17	28	0	0	0	0	0	0	0	0	0	61	126
2022	**7.5%**	**1**	**16**	**0**	**0**	**19**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**66**	**135**
2023	7.5%	2	17	0	0	20	32	0	0	0	0	0	0	0	0	0	71	145
2024	7.5%	2	18	0	0	22	35	0	0	0	0	0	0	0	0	0	76	156
2025	7.5%	2	20	0	0	23	37	0	0	0	0	0	0	0	0	0	82	168
2026	7.5%	2	21	0	0	25	40	0	0	0	0	0	0	0	0	0	88	180
2027	7.5%	2	23	0	0	27	43	0	0	0	0	0	0	0	0	0	95	194
2028	7.5%	2	24	0	0	29	47	0	0	0	0	0	0	0	0	0	102	208
2029	7.5%	2	26	0	0	31	50	0	0	0	0	0	0	0	0	0	110	224
2030	7.5%	3	28	0	0	33	54	0	0	0	0	0	0	0	0	0	118	241
2031	7.5%	3	30	0	0	36	58	0	0	0	0	0	0	0	0	0	127	259
2032	7.5%	3	33	0	0	38	62	0	0	0	0	0	0	0	0	0	136	278
2033	7.5%	3	35	0	0	41	67	0	0	0	0	0	0	0	0	0	146	299
2034	7.5%	3	38	0	0	44	72	0	0	0	0	0	0	0	0	0	157	321
2035	7.5%	4	40	0	0	48	77	0	0	0	0	0	0	0	0	0	169	346
2036	7.5%	4	43	0	0	51	83	0	0	0	0	0	0	0	0	0	182	371
2037	7.5%	4	47	0	0	55	89	0	0	0	0	0	0	0	0	0	195	399
2038	7.5%	5	50	0	0	59	96	0	0	0	0	0	0	0	0	0	210	429
2039	7.5%	5	54	0	0	64	103	0	0	0	0	0	0	0	0	0	226	461
2040	7.5%	5	58	0	0	69	111	0	0	0	0	0	0	0	0	0	243	496
2041	7.5%	6	62	0	0	74	119	0	0	0	0	0	0	0	0	0	261	533
2042	**7.5%**	**6**	**67**	**0**	**0**	**79**	**128**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**281**	**573**

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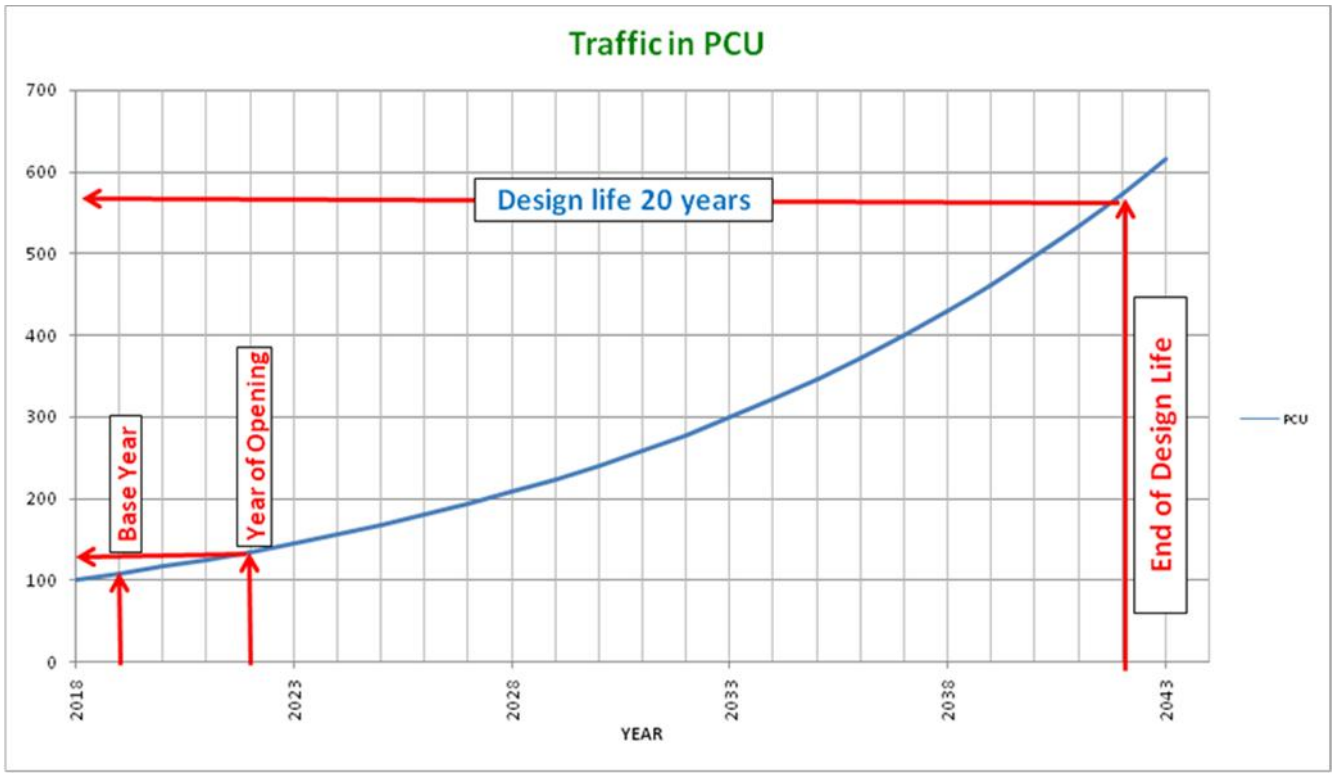


Fig: 6.23 Traffic Projection of homogeneous section-II (KM 74+000 TO KM 161+665)

From the traffic projection table 6.11, the projected traffic of homogeneous section – II considering 20 years of design life of pavement comes out as 573 PCU. Therefore 2-lane is found adequate to cater this projected traffic with level of service B.

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INTERSECTION TURNING MOVEMENT COUNTS

Intersection turning movement surveys were carried out at the identified 5 major intersections on the project road. The locations considered for intersection turning movement surveys is described earlier. However for ready reference these are listed once again:



- ✓ **3-legged intersection at Churachandpur (Ch. 0+000 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 0+526 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 1+840 Km)**
- ✓ **3-legged intersection at Singngat (Ch. 34+175 Km)**
- ✓ **3-legged intersection at Sinzawl (Ch. 149+582 Km)**

Classified directional turning movements were counted at each of the above five intersections for 1day x 12 hours. Trained enumerators have carried out these surveys under close supervision of Traffic Expert. The details on the turning movement counts are given in **Annexure-7.** The peak hour flows (in vehicles and PCUs) have been presented in Figures 6.24 to 6.33. The peak hour turning movements at various major junctions on the Project Road have been calculated. These forecasts consider the likely growth in the traffic at intersections. Forecasts of peak hour intersection turning movements are given in Annexure. As per IRC: 62-1976, grade separator should be provided at intersection of divided rural highway if the ADT (fast moving vehicles only) on the cross road within the next 5 years exceed 5000. Where these traffic figures will reach within next 20 years, the need for such facility should be kept in view for future construction.

TABLE 6.12: SUMMARY OF PEAK HOUR AND FORECAST OF INTERSECTION FLOWS

Sl. No.	Name of Intersection	Type	As per IRC 62-1976, Grade Separator should be provided at intersection of divided rural highway if ADT (fast vehicles) at the cross roads within the next 5 years exceeding 5000 nos.						Requirement of proposed improvement
			ADT crossing the through traffic						
			2018	2019	2020	2021	2022	2023	
1	Churachandpur (0.000 km)	3-Legged	845	887	932	978	1027	1078	Not Required
2	New Lamka (0.526 km)	4-Legged	1339	1406	1476	1550	1628	1709	Not Required
3	New Lamka (1.840 km)	4-Legged	277	291	305	321	337	354	Not Required
4	Singngat (34.175 km)	3-Legged	41	43	45	47	50	52	Not Required
5	Sinzawl (149.582 km)	3-Legged	2	2	2	2	2	3	Not Required

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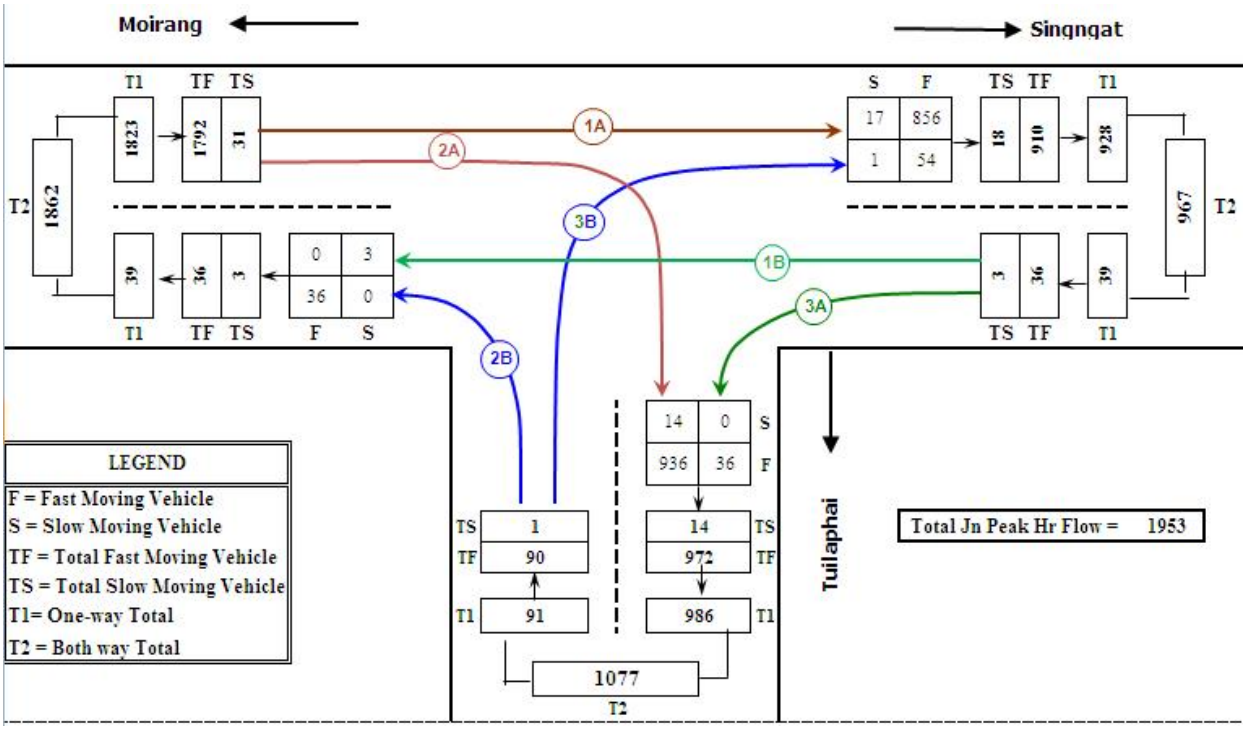


Fig 6.24: Peak hour traffic in Number at Ch. 0+000 Km at Churachandpur Junction

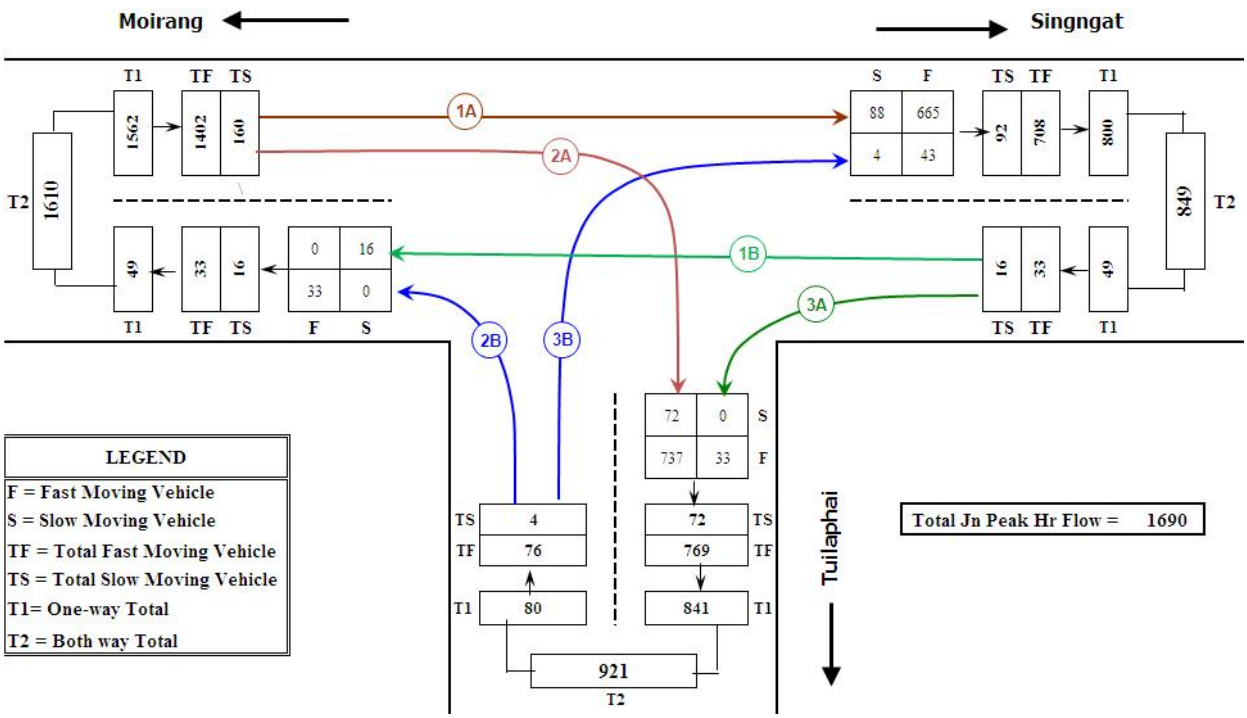


Fig 6.25: Peak hour traffic in PCU at Ch. 0+000 Km at Churachandpur Junction

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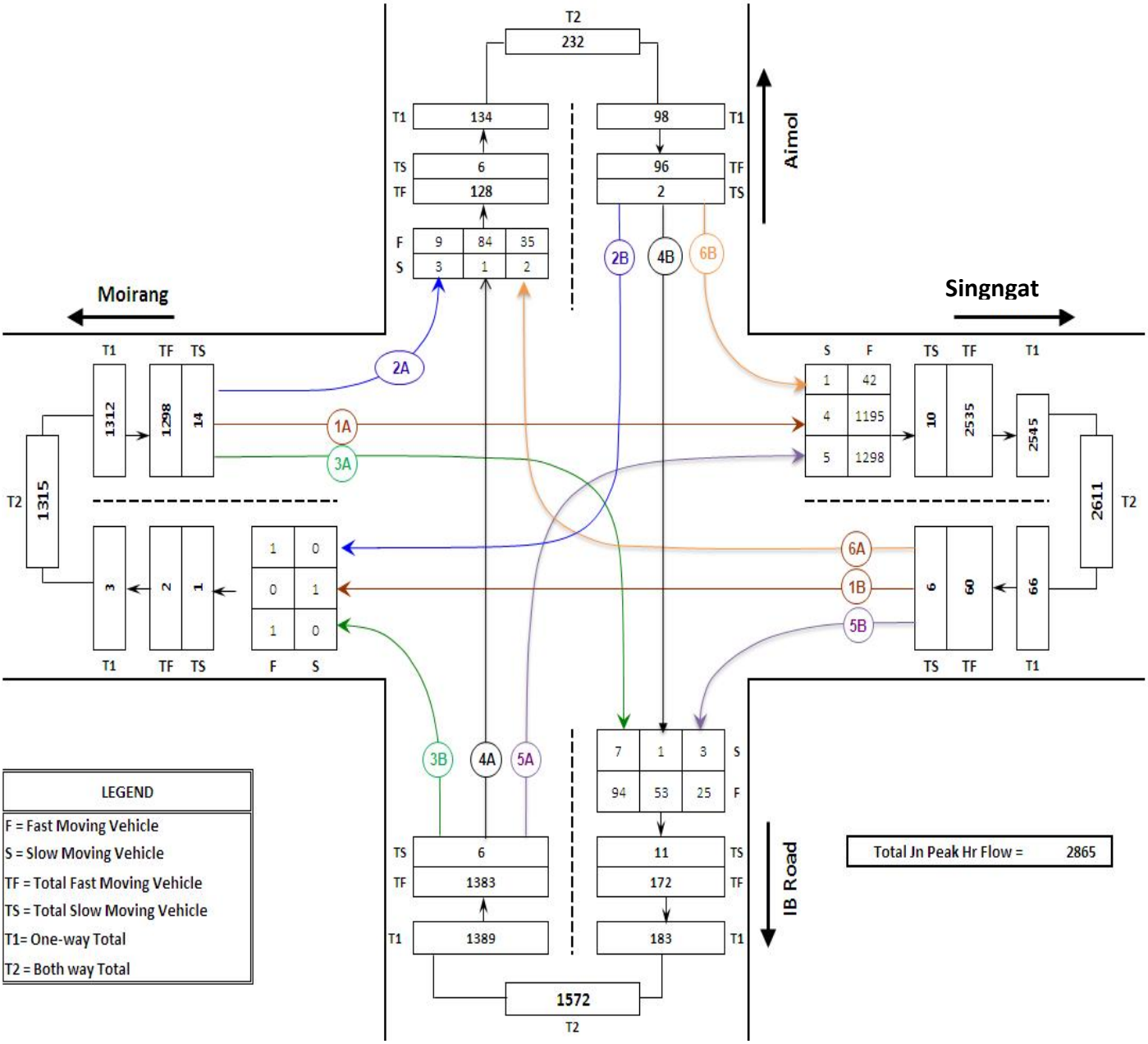


Fig 6.26: Peak hour traffic in Number at Ch. 0+526 Km New Lamka Junction

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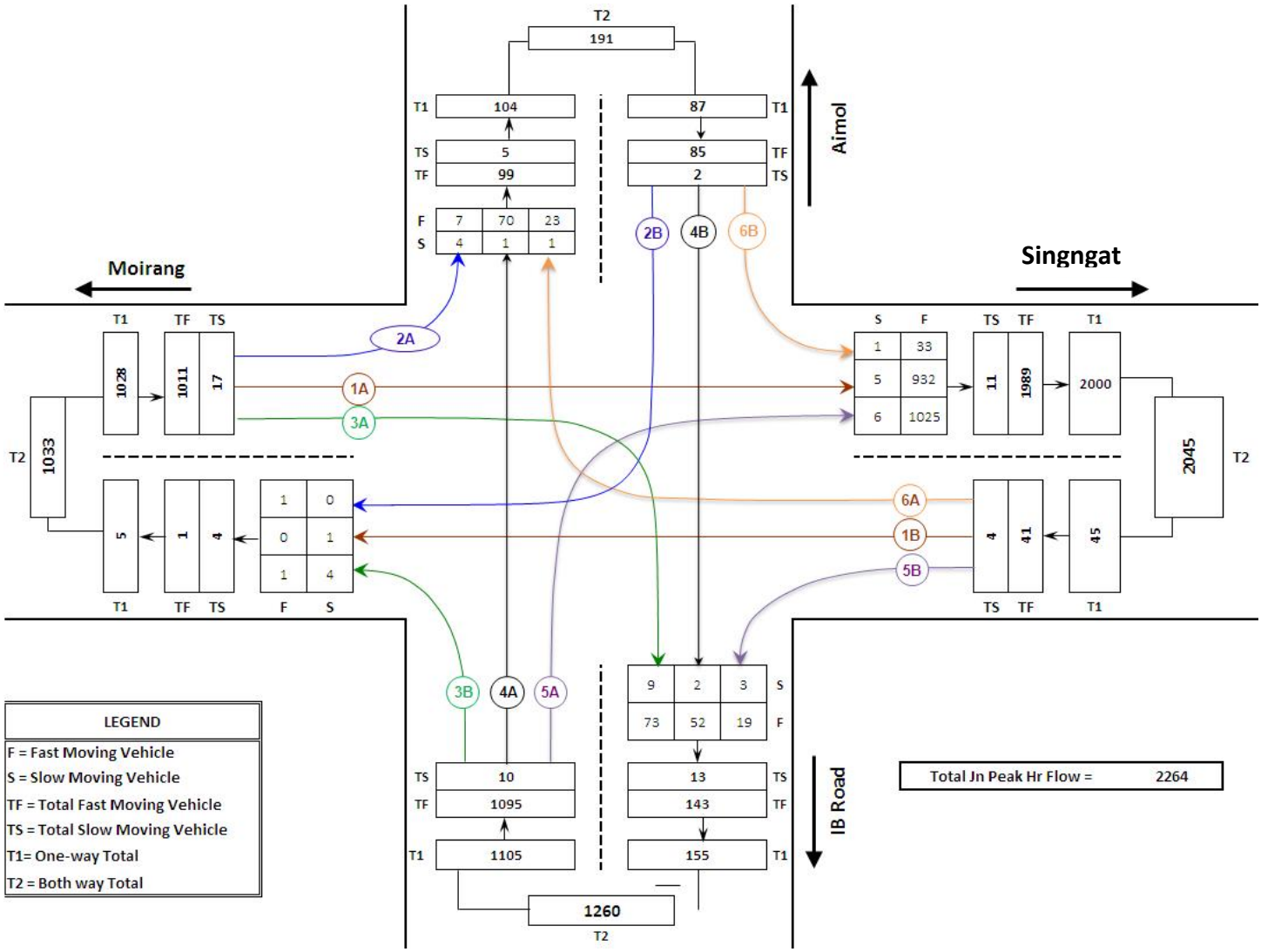


Fig 6.27: Peak hour traffic in PCU at Ch. 0+526 Km New Lamka Junction

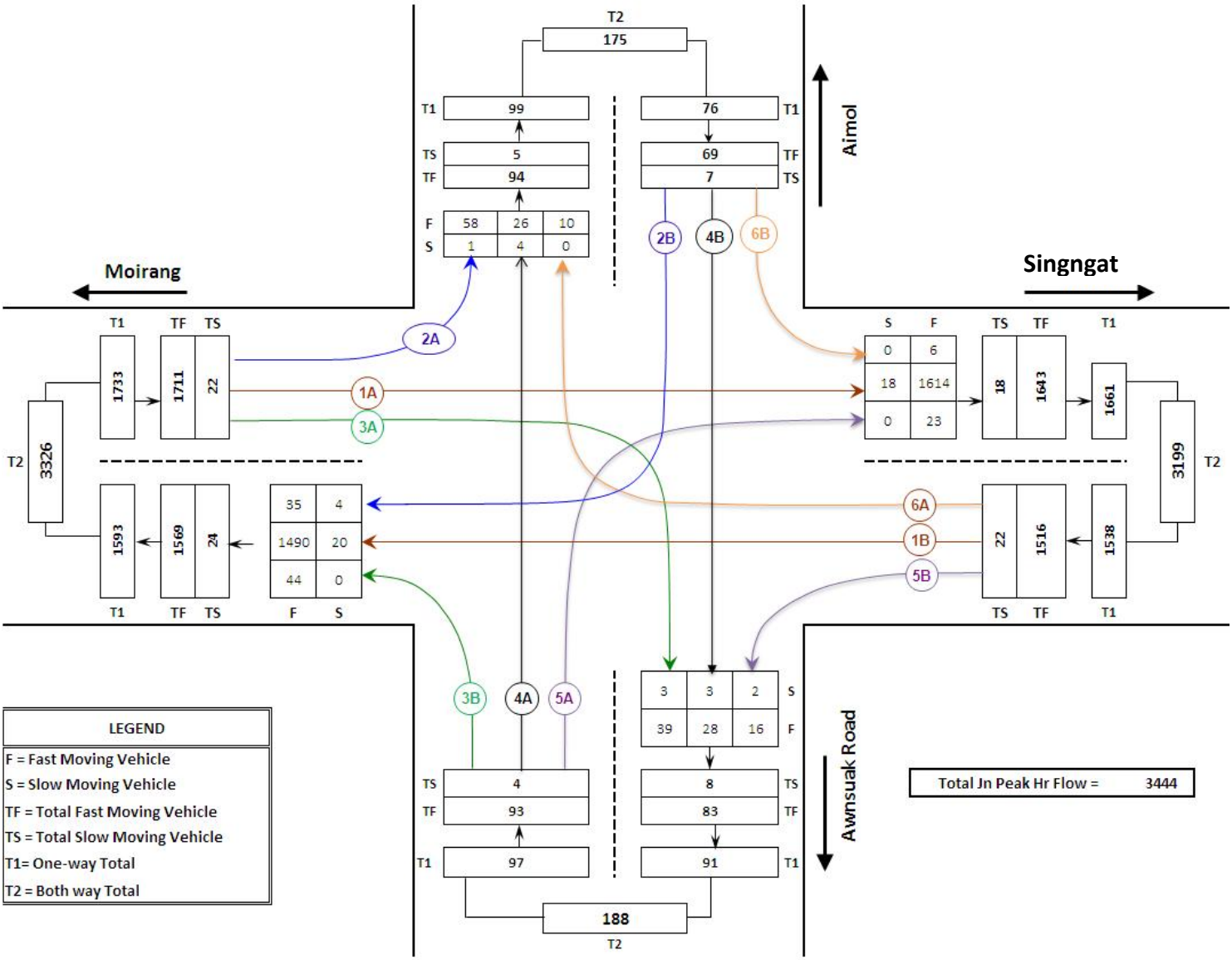


Fig 6.28: Peak hour traffic in Number at Ch. 1+840 Km New Lamka Junction

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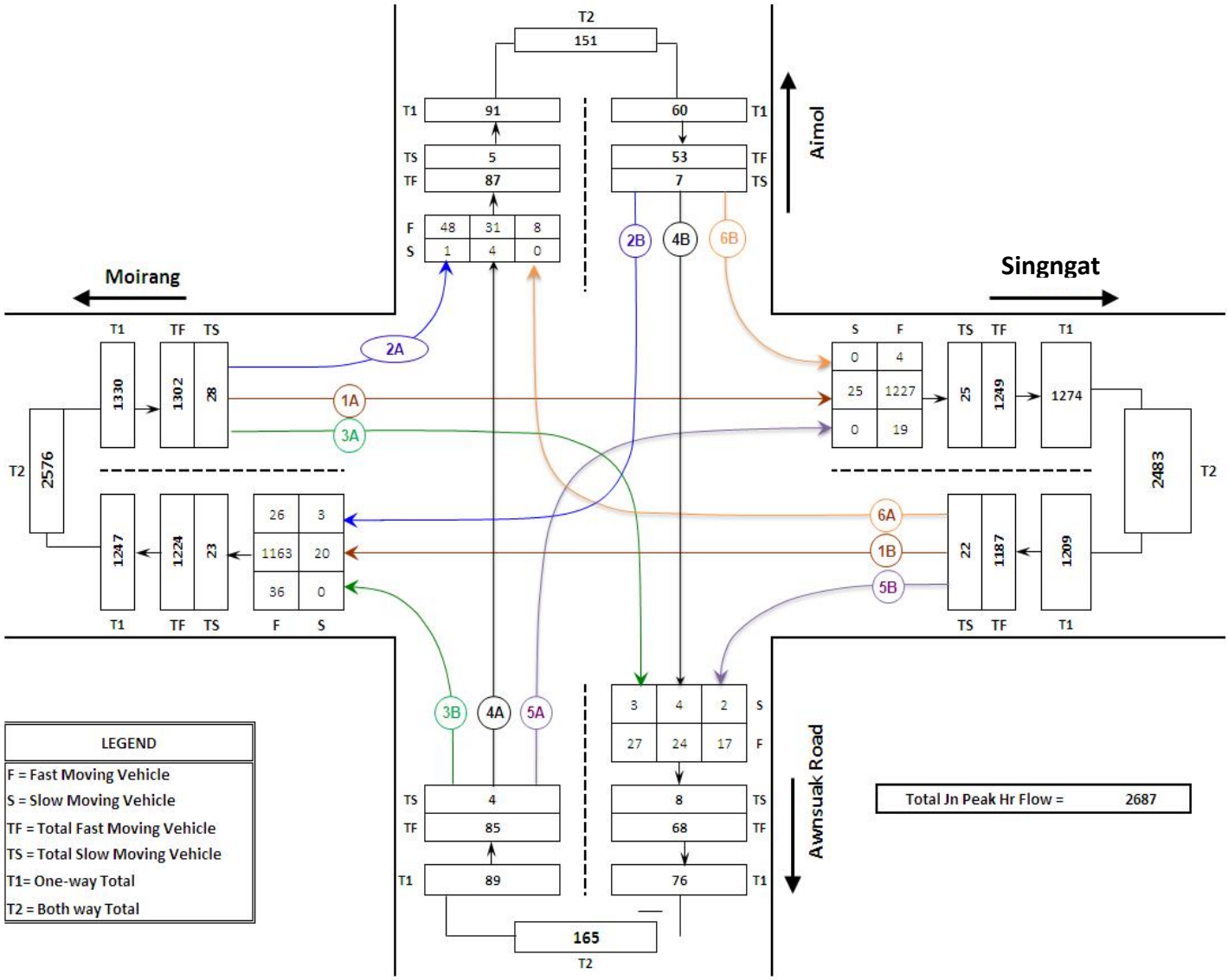


Fig 6.29: Peak hour traffic in PCU at Ch. 1+840 Km New Lamka Junction

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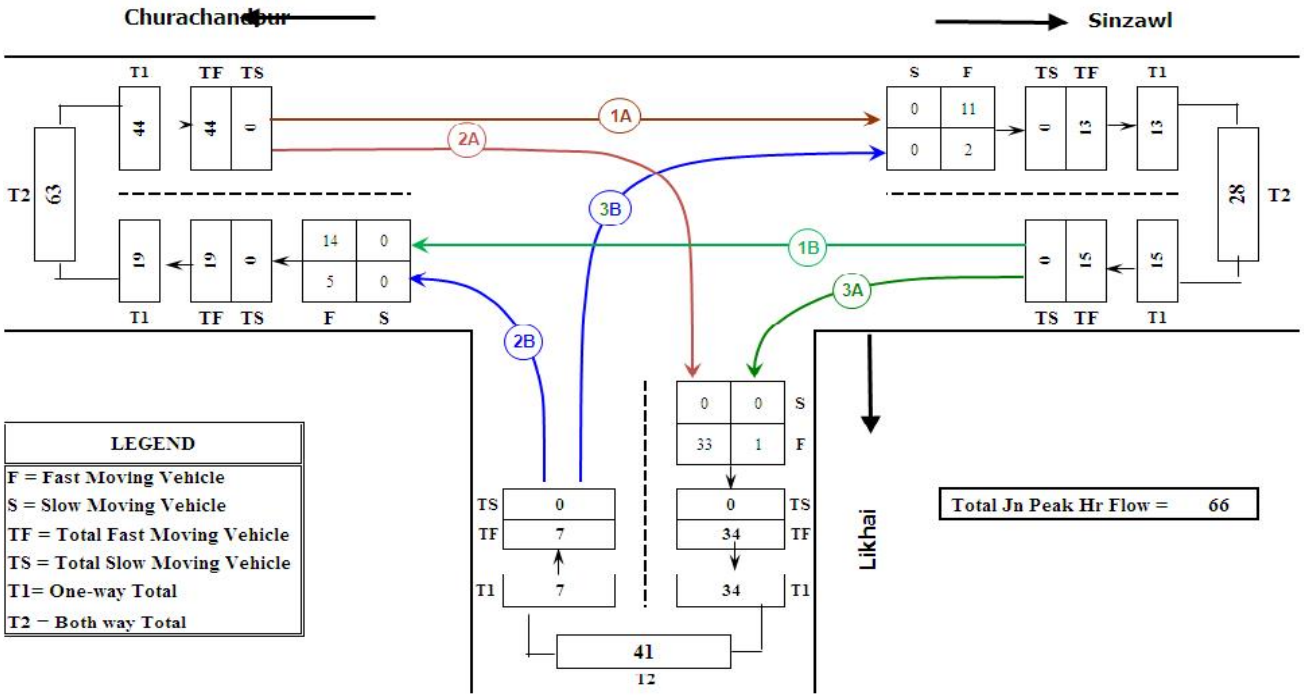


Fig 6.30: Peak hour traffic in Number at Ch. 34+175 Km Singngat Junction

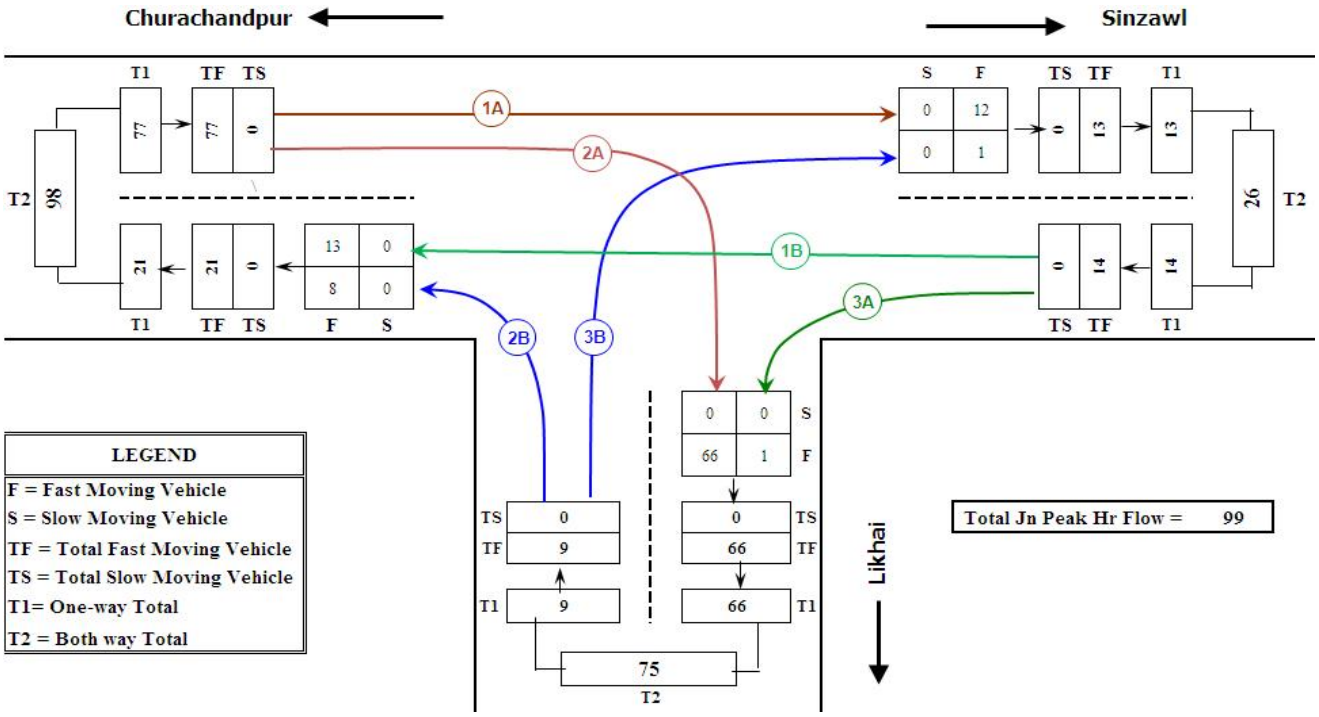


Fig 6.31: Peak hour traffic in PCU at Ch. 34+175 Km Singngat Junction

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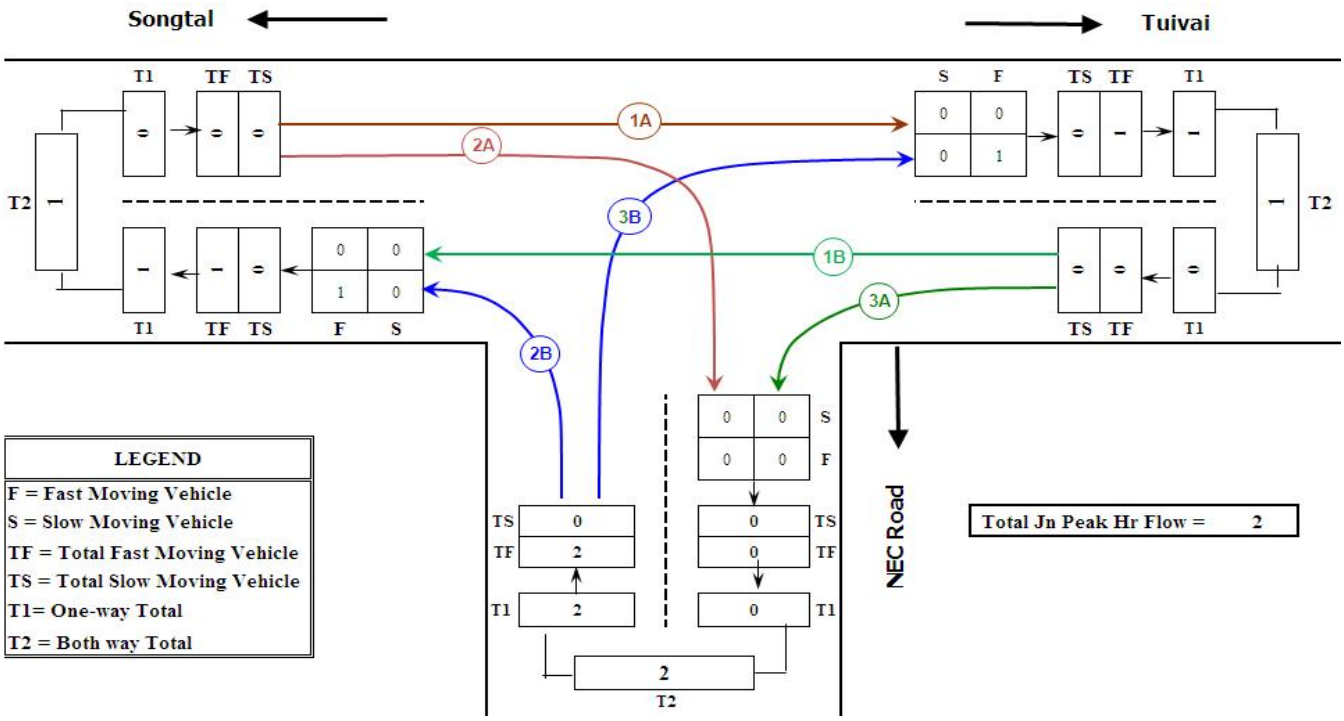


Fig 6.32: Peak hour traffic in Number at Ch. 149+582 Km Sinzawl Junction

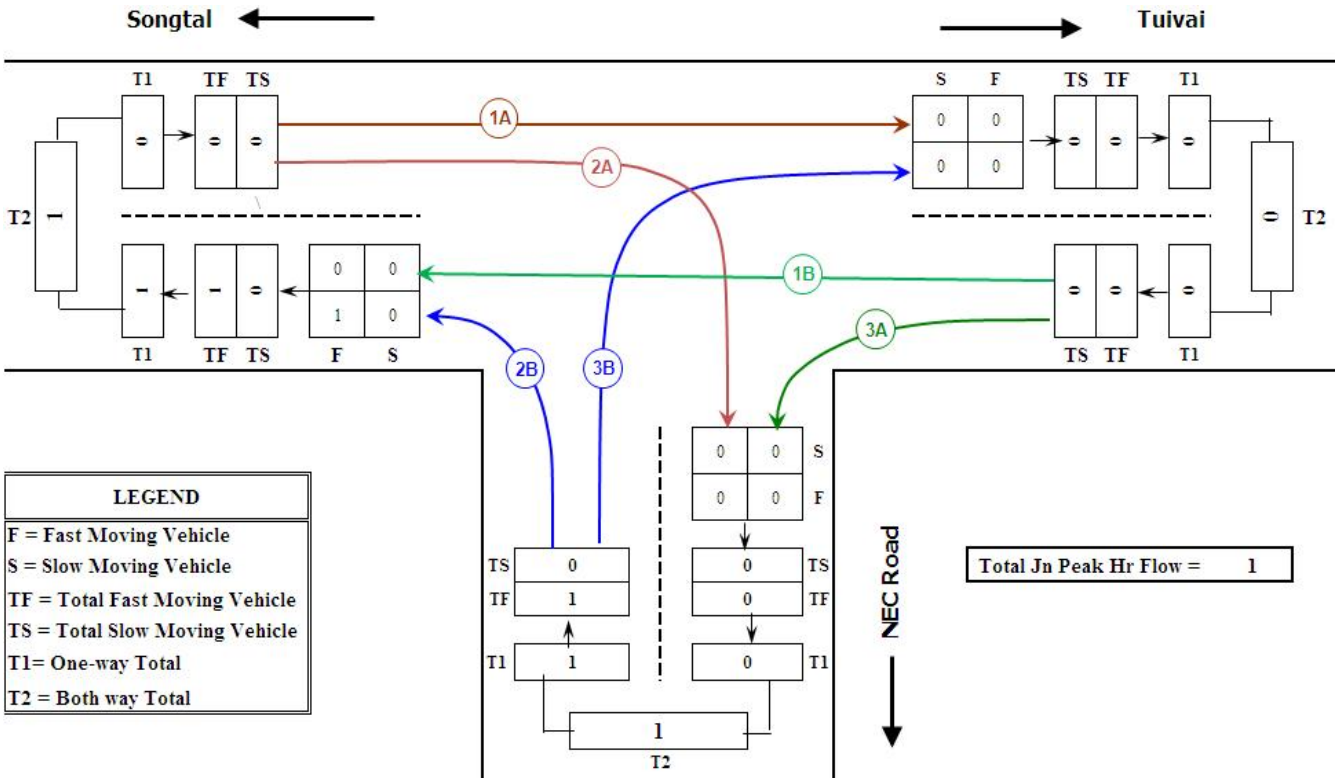


Fig 6.33: Peak hour traffic in PCU at Ch. 149+582 Km Sinzawl Junction

6.6 ORIGIN DESTINATION SURVEY

A. ROAD SIDE INTERVIEWS FOR O-D



To understand the travel demand pattern in the region, Origin and Destination (O-D) Survey was carried out for one day (24 hours) at two locations. The locations of the Origin Destination survey, as given earlier, were on near

- ✓ **At Churachandpur on NH 102B (Ch. 0+000 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

The O-D surveys on the project road were carried out based on the roadside interview method as per IRC: 102-1988. Both passenger and commercial vehicles plying on the project road were stopped on a random sampling basis and interviewed. Police assistance was arranged at the survey locations for successfully carrying out these surveys. The travel characteristics obtained by O-D survey facilitate the identification of the traffic characteristics based on its origin and destination.

Trained enumerators under the supervision of transport planners collected the trip characteristics using the survey forms designed for this purpose. The O-D survey elicited characteristics like origin, destination, frequency, length of trip, etc., both for passenger and goods vehicles. The information collected during roadside interviews was analyzed to obtain the trip distribution based on a zoning system suitably designed in the study.

Before presenting the travel pattern, the sample size considered for O-D surveys are presented first in the following section.

B. SAMPLE SIZE CONSIDERED FOR O-D SURVEYS

As described earlier, the vehicles for the OD survey were interviewed on a random sample basis.
Tables 6.13(a) and 6.13(b) show the ADT and the sample size (both in absolute numbers and in percentage terms) captured during the survey on NH 102C at CH 0+000 andat CH. 149+200 Km.

Table 6.13 (a): On NH 102B at Ch. 0+000 km

Road Name : NH 102B					**Date - 09.02.2018**
Location : Churachandpur				**Time**	**8.00am to 8.00 am**
Vehicle Type	**Sample Collected**	**Actual Volume**	**Exp. Fact.**	**Composition**	**Sample Size %**
Car	348	9652	27.74	61.48	4
LCV	141	452	3.21	24.91	31
Bus	8	46	5.75	1.41	17
2 - Axle	69	298	4.32	12.19	23
3 - Axle	1	5	5.00	0.18	20
Total	**566**	**10448**			**5%**

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Table 6.13 (b): On NH 102B at Ch. 149+200 km

Road Name : NH 102B					**Date - 19.02.2018**
Location : SINZAWL				**Time**	**8.00am to 8.00 am**
Vehicle Type	**Sample Collected**	**Actual Volume**	**Exp. Fact.**	**Composition**	**Sample Size %**
LCV	12	12	1.00	75.00	100
Bus	0	0	0.00	0.00	0
3-Axle	0	0	0.00	0.00	0
2 - Axle	4	5	1.25	25.00	80
Total	**16**	**17**			**94%**

C. ZONING SYSTEM

For understanding the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a scientifically derived zoning system was adopted. The Zoning System considered in this study has been presented in Table 6.14(a) and in Table 6.14(b)

Table 6.14(a): Zone code for OD at Churachandpur on NH 102B

Zone Code	**Name of Zone**
1	Near Project Road (Churachandpur, Mata, Singngat, Belpuan, Belpong, Bollaing, Butllar, Dragging, Ferjai, Haijai, Kanway, Laging, Melun, Mullam, Phazala, Toubong, Mualtan, Bualian)
2	North side of Project Road (Imphal, Kotline, Fuirang, Kandouvong, Moirang, Salbunu, Topanog, Tollen, Tuibong, Zenhong, Belpuna, Dhiza, Haizang, Phaila)

Table 6.14(b): Zone code for OD at Sinzawl on NH 102B

Zone Code	**Name of Zone**
1	Near Project Road (Churachandpur, Songtal, Khauggin, Singngat, Khawsei, Sinzawl, Tuima, Lungthul L, Khodgsei)
2	South side of Project Road (Aizawl, Ngopa, Malkonta)

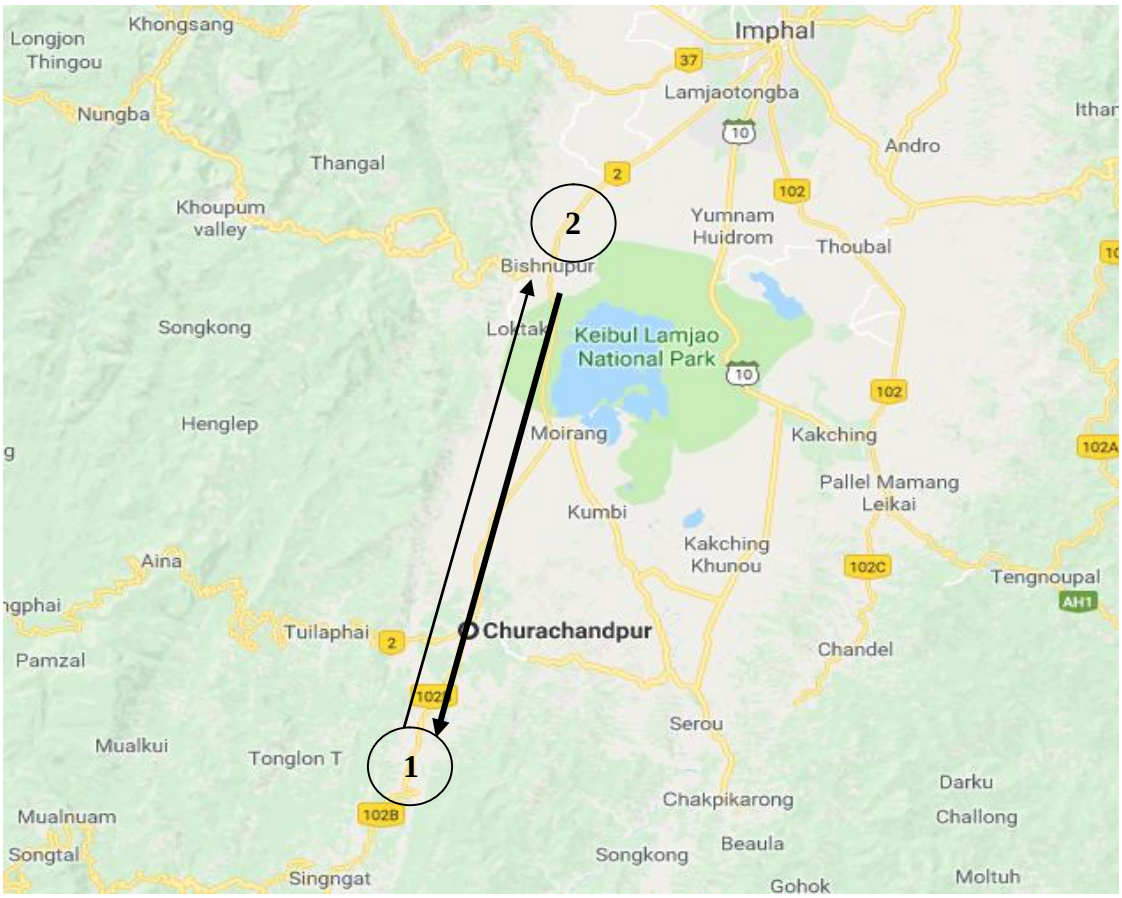
D. TRAVEL PATTERN

The origins and destinations of various types of vehicles observed at the O-D survey locations have been analyzed for O-D Matrices as per the Zoning System presented above. Details OD calculations are given in a separate Appendix.

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Table 6.15: On NH 102B at Churachandpur

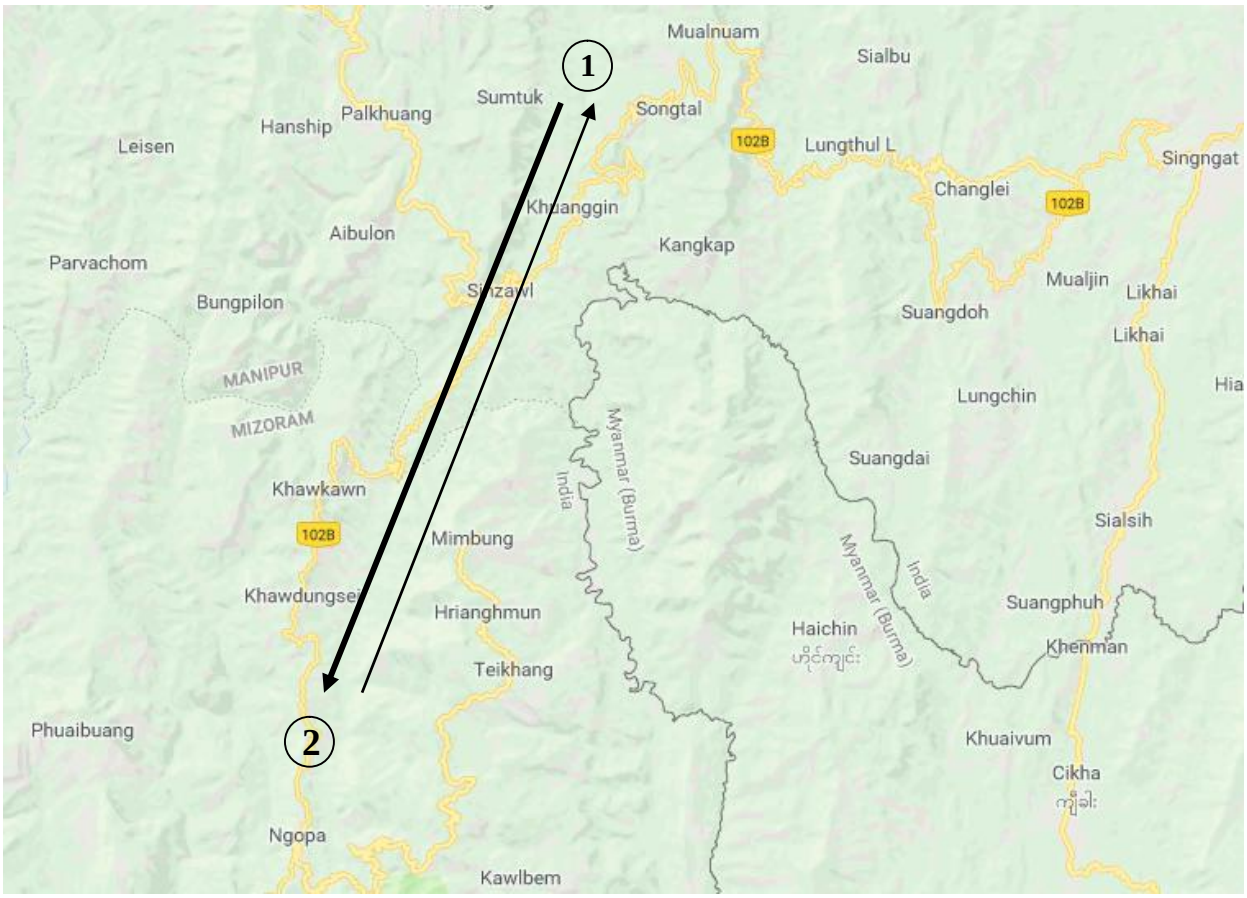
Count of All Vehicles	Destination Zone		
Origin Zone	**1**	**2**	**Grand Total**
1	62	116	178
2	189	206	395
Grand Total =	251	322	573
Local Traffic = 87%			



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Table 6.16: On NH 102C at Sinzawl

Count of All Vehicles	Destination Zone		
Origin Zone	1	2	**Grand Total**
1	9	11	20
2	9	0	9
Grand Total =	18	11	29
Local Traffic = 91%			



From the above tables, the following travel pattern on the project road can be deduced:

- For OD on NH 102B at Churachandpur, it has been seen that most of the traffic has been produced from zone 1 and zone2 & mostly are local traffic.
- For OD on NH 102B at Sinzawl, it has been seen that most of the traffic has been produced from zone 1and zone 2 & mostly are local traffic.

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6.5 PEDESTRIAN COUNT SURVEY

Pedestrian count survey was conducted at the following location to obtain the number of pedestrians crossing the Project road.

- ✓ **At Churachandpur (Ch. 0+000 Km)**
- ✓ **At Mata (Ch. 7+250 Km)**
- ✓ **At Singngat (Ch. 34+155 Km)**
- ✓ **At Maokot (Ch. 48+300 Km)**
- ✓ **At Suangdoh (Ch. 64+200 km)**
- ✓ **At Sinzawl (Ch. 148+450 km)**



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Analysis of Pedestrian count survey data is presented below in Table 6.17 to 6.22 respectively.

LOCATION OF SURVEY STATION : On NH-102B **(Churachandpur)**
DATE & DAY OF SURVEY : **06.02.2018**
ROAD NAME- NH-102B

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Churachandpur	8:00	to	9:00	41	37	22	10	78	32	110
	9:00	to	10:00	55	46	16	14	101	30	131
	10:00	to	11:00	68	54	14	17	122	31	153
	11:00	to	12:00	53	61	9	15	114	24	138
	12:00	to	13:00	42	38	15	12	80	27	107
	13:00	to	14:00	55	41	11	9	96	20	116
	14:00	to	15:00	42	57	12	12	99	24	123
	15:00	to	16:00	57	35	17	10	92	27	119
	16:00	to	17:00	39	23	11	9	62	20	82
	17:00	to	18:00	15	9	5	5	24	10	34
	18:00	to	19:00	10	5	2	6	15	8	23
	19:00	to	20:00	1	2	0	2	3	2	5
TOTAL				478	408	134	121	886	255	1141
HOURLY AVERAGE PEDESTRIAN				40	34	11	10	74	21	95
PEAK HOURLY PEDESTRIAN	8.00 AM	to	9.00 AM	114		24		138		153

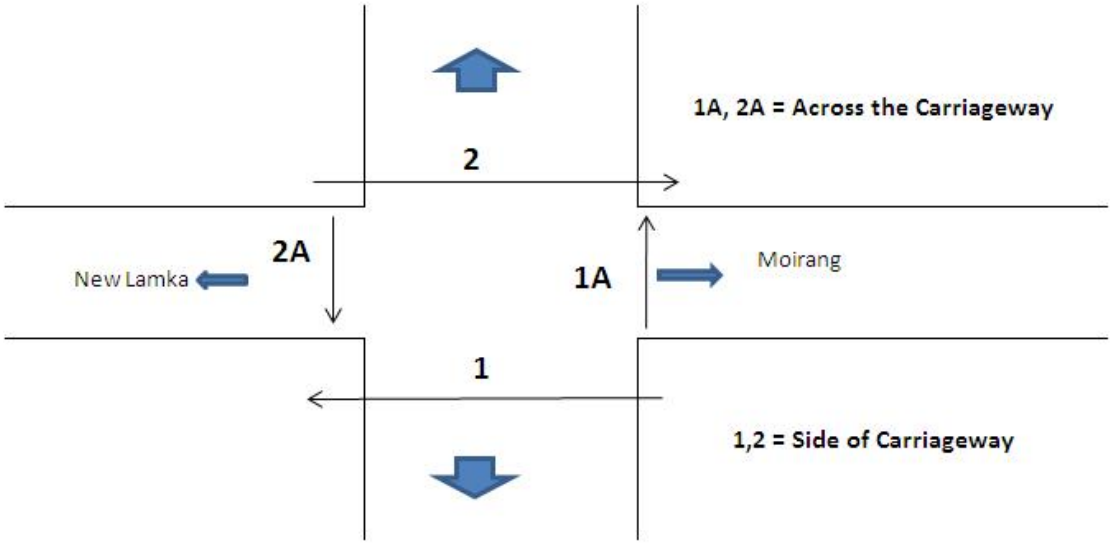


Table 6.17: Pedestrian Count Survey at 0+000 km

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LOCATION OF SURVEY STATION :	On NH-102B	(Mata Village)	
DATE & DAY OF SURVEY :	**07.02.2018**		
ROAD NAME-	NH-102B		

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Mata Village	8:00	to	9:00	6	4	4	9	10	13	23
	9:00	to	10:00	14	13	5	7	27	12	39
	10:00	to	11:00	16	10	10	4	26	14	40
	11:00	to	12:00	11	9	7	2	20	9	29
	12:00	to	13:00	11	13	2	3	24	5	29
	13:00	to	14:00	6	8	1	10	14	11	25
	14:00	to	15:00	10	11	3	2	21	5	26
	15:00	to	16:00	9	18	4	2	27	6	33
	16:00	to	17:00	11	10	2	0	21	2	23
	17:00	to	18:00	4	3	2	2	7	4	11
	18:00	to	19:00	2	4	0	0	6	0	6
	19:00	to	20:00	0	0	0	0	0	0	0
TOTAL				100	103	40	41	203	81	284
HOURLY AVERAGE PEDESTRIAN				8	9	3	3	17	7	24
PEAK HOURLY PEDESTRIAN	10.00 AM	to	11.00 AM	21		2		23		40

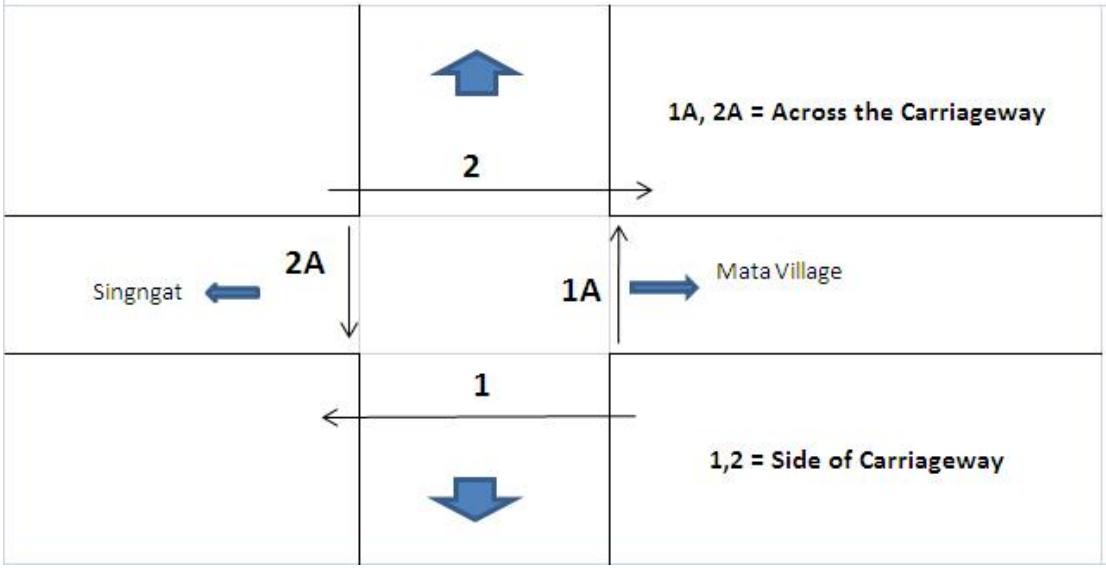


Table 6.18: Pedestrian Count Survey at 7+250 Km

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 124A, N.S.C. BOSE ROAD

LOCATION OF SURVEY STATION :	On NH-102B	(Singngat)									
DATE & DAY OF SURVEY :	08.02.2018										
ROAD NAME-	NH-102B										
PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)	
				1	2	1A	2A	1+2	1A+2A		
Singngat	8:00	to	9:00	11	13	6	12	24	18	42	
	9:00	to	10:00	13	23	12	14	36	26	62	
	10:00	to	11:00	20	18	13	11	38	24	62	
	11:00	to	12:00	11	13	17	16	24	33	57	
	12:00	to	13:00	10	9	10	9	19	19	38	
	13:00	to	14:00	15	12	13	14	27	27	54	
	14:00	to	15:00	23	10	8	10	33	18	51	
	15:00	to	16:00	12	10	8	8	22	16	38	
	16:00	to	17:00	15	11	9	13	26	22	48	
	17:00	to	18:00	10	9	6	9	19	15	34	
	18:00	to	19:00	6	9	3	6	15	9	24	
	19:00	to	20:00	3	5	0	3	8	3	11	
TOTAL				149	142	105	125	291	230	521	
HOURLY AVERAGE PEDESTRIAN				12	12	9	10	24	19	43	
PEAK HOURLY PEDESTRIAN	11:00	to	12:00	24		33		57		62	

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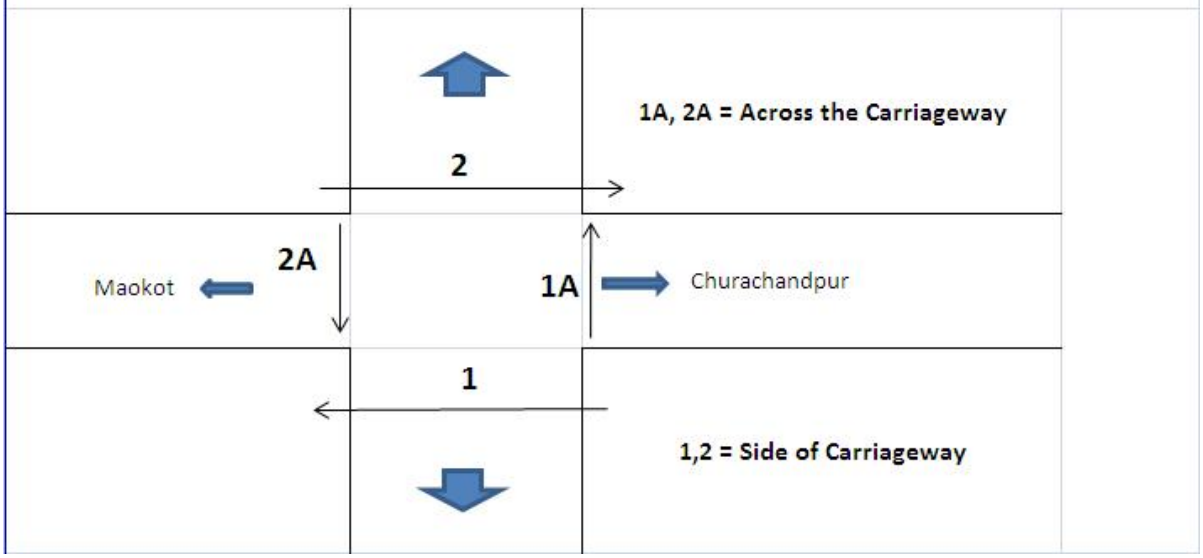


Table 6.19: Pedestrian Count Survey at 34+155 Km

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 124A, N.S.C. BOSE ROAD

LOCATION OF SURVEY STATION :	On NH-102B	(Maokot)								
DATE & DAY OF SURVEY :	10.02.2018									
ROAD NAME-	NH-102B									

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Maokot	8:00	to	9:00	6	3	5	2	9	7	16
	9:00	to	10:00	6	6	7	7	12	14	26
	10:00	to	11:00	11	7	9	9	18	18	36
	11:00	to	12:00	7	2	6	3	9	9	18
	12:00	to	13:00	6	6	2	1	12	3	15
	13:00	to	14:00	4	9	2	6	13	8	21
	14:00	to	15:00	7	4	3	2	11	5	16
	15:00	to	16:00	7	6	1	7	13	8	21
	16:00	to	17:00	8	4	2	2	12	4	16
	17:00	to	18:00	2	1	3	6	3	9	12
	18:00	to	19:00	1	4	1	0	5	1	6
	19:00	to	20:00	0	1	1	1	1	2	3
TOTAL				65	53	42	46	118	88	206
HOURLY AVERAGE PEDESTRIAN				5	4	4	4	10	7	17
PEAK HOURLY PEDESTRIAN	10.00 AM	to	11.00AM	9		9		18		36

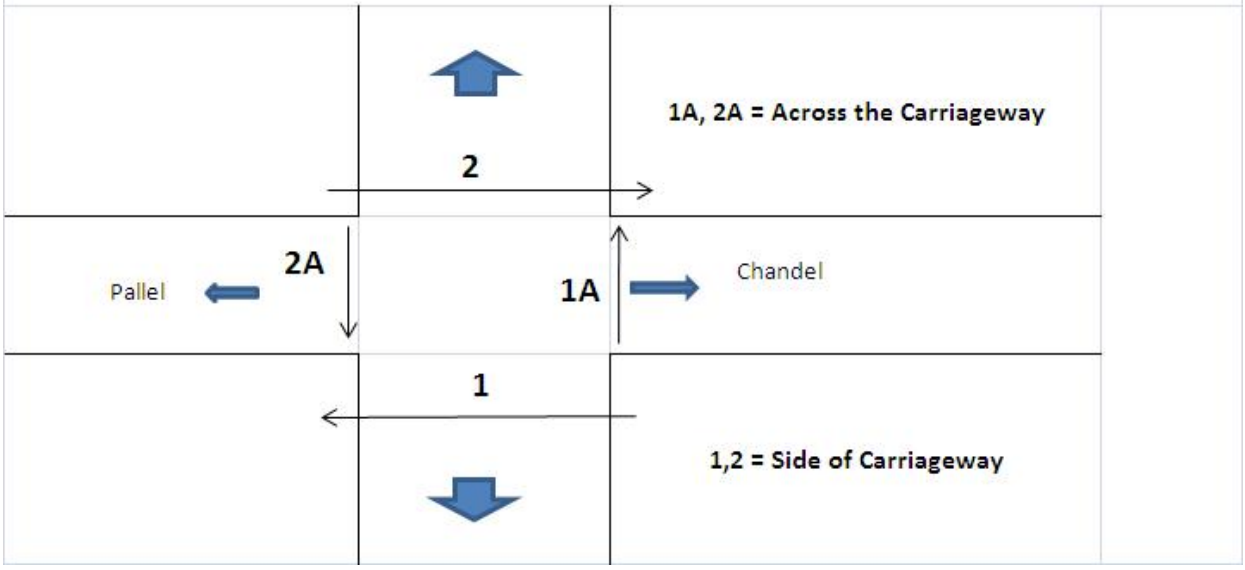


Table 6.20: Pedestrian Count Survey at 48+300 Km

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 124A, N.S.C. BOSE ROAD

LOCATION OF SURVEY STATION :	On NH-102B	(Suangdoh)	
DATE & DAY OF SURVEY :	12.02.2018		
ROAD NAME-	NH-102B		

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Suagdoh	8:00	to	9:00	7	9	3	2	16	5	21
	9:00	to	10:00	10	11	3	4	21	7	28
	10:00	to	11:00	13	13	5	7	26	12	38
	11:00	to	12:00	8	6	5	2	14	7	21
	12:00	to	13:00	9	10	1	5	19	6	25
	13:00	to	14:00	10	9	2	1	19	3	22
	14:00	to	15:00	12	10	7	5	22	12	34
	15:00	to	16:00	9	11	5	7	20	12	32
	16:00	to	17:00	6	7	1	5	13	6	19
	17:00	to	18:00	5	6	2	2	11	4	15
	18:00	to	19:00	3	5	1	2	8	3	11
	19:00	to	20:00	1	2	0	1	3	1	4
TOTAL				93	99	35	43	192	78	270
HOURLY AVERAGE PEDESTRIAN				8	8	3	4	16	7	23
PEAK HOURLY PEDESTRIAN	10.00 AM	to	11.00AM	14		7		21		38

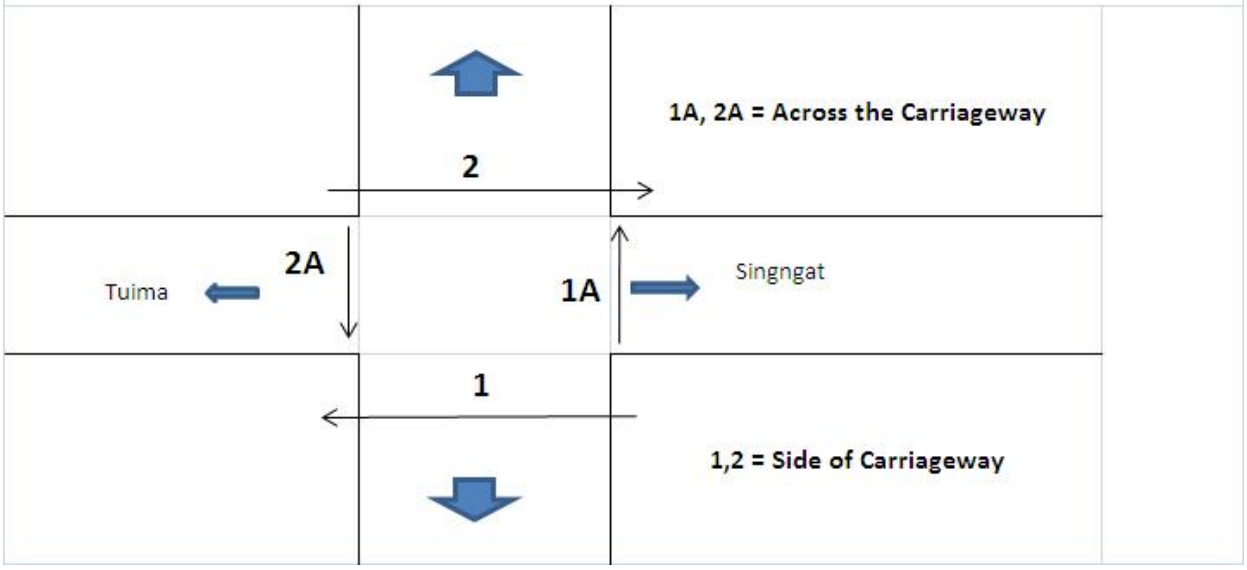


Table 6.21 : Pedestrian Count Survey at 64+200 Km

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 124A, N.S.C. BOSE ROAD

LOCATION OF SURVEY STATION :	On NH-102B	(Sinzawl)								
DATE & DAY OF SURVEY :	17.02.2018									
ROAD NAME-	NH-102B									

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Suagdoh	8:00	to	9:00	6	6	3	5	12	8	20
	9:00	to	10:00	6	8	5	7	14	12	26
	10:00	to	11:00	10	11	2	9	21	11	32
	11:00	to	12:00	3	7	3	6	10	9	19
	12:00	to	13:00	8	6	1	2	14	3	17
	13:00	to	14:00	8	4	0	2	12	2	14
	14:00	to	15:00	5	7	3	3	12	6	18
	15:00	to	16:00	7	7	7	1	14	8	22
	16:00	to	17:00	5	8	2	2	13	4	17
	17:00	to	18:00	4	2	2	3	6	5	11
	18:00	to	19:00	3	1	0	1	4	1	5
	19:00	to	20:00	0	0	1	1	0	2	2
TOTAL				65	67	29	42	132	71	203
HOURLY AVERAGE PEDESTRIAN				5	6	2	4	11	6	17
PEAK HOURLY PEDESTRIAN	9.00 AM	to	10.00AM	10		9		19		32

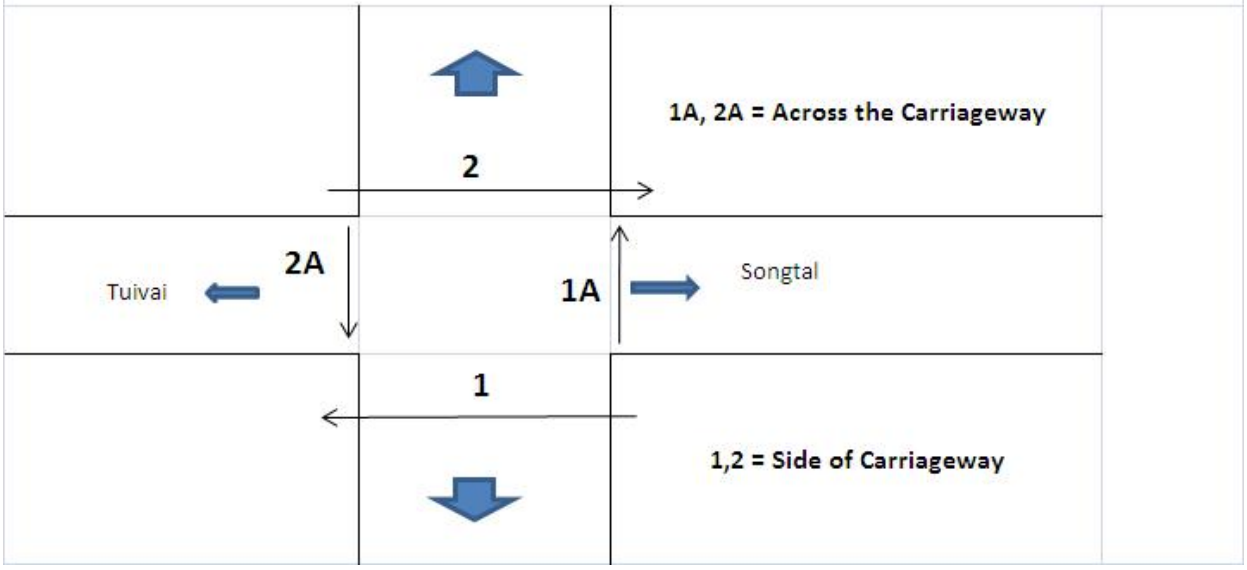


Table 6.22: Pedestrian Count Survey at 148+450 Km

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TABLE-6.23: TOTAL CROSS PEDESTRIAN AT PROJECT ROAD

Location	Total Cross Pedestrian (TCP)	Peak Hr. Pedestrian (P)	Total Motorised Traffic during Pedestrian Peak Hour (V)	$P.V^2$	Limiting value of $P.V^2$
Km 0+000	1141	110	1695	0.919336	$1X10^8$
Km 7+250	284	40	34	0.000161	$1X10^8$
Km 34+155	521	57	49	0.000792	$1X10^8$
Km 48+300	206	36	34	0.000208	$1X10^8$
Km 64+200	270	38	34	0.000138	$1X10^8$
Km 148+450	203	26	3	0.00000108	$1X10^8$

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6.6 AXLE LOAD SURVEYS AND VEHICLE DAMAGE FACTORS

For the purpose of preliminary pavement design required for the project, axle load surveys have been carried out on the project road at the following locations:



These surveys were carried for 2 day x 24 hrs on

- ✓ **At Churachandpur on NH 102B (Ch. 0+500 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

The axle load spectrum observed on the project road, along with the derivation of vehicle damage factors (VDFs) as per the relevant IRC Codes are given in Table 6.24(a) and Table 6.24(b) which summarizes the VDF observed on the Project Road. Details of VDF Calculation are produced in Appendix to Main Report.

Table 6.24(a): On NH 102B at Churachandpur (VDF Calculation)

TYPE OF VEHICLES	**VDF**			
	UP		**DOWN**	
	VDF	**Frequency**	**VDF**	**Frequency**
3 Axle truck	**3.79**	**5**	**9.15**	**3**
2 Axle truck	**1.27**	**67**	**2.18**	**73**
LCV	**0.00**	**69**	**0.00**	**62**
Bus	**0.13**	**16**	**0.17**	**11**
TOTAL		**157**		**149**
WEIGHTED VDF IN EACH DIRECTION	**0.68**		**1.27**	
Max. WEIGHTED VDF	**1.27**			
WEIGHTED VDF OF COMMERCIAL VEHICLE			**1.27**	

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Table 6.24(b): On NH 102B at Sinzawl (VDF Calculation)

TYPE OF VEHICLES	VDF			
	UP		DOWN	
	VDF	Frequency	VDF	Frequency
3 Axle truck	**0.00**	**0**	**0.00**	**0**
2 Axle truck	**2.81**	**4**	**1.68**	**8**
LCV	**0.001**	**9**	**0.000**	**7**
Bus	**0.000**	**0**	**0.000**	**0**
TOTAL		13		15
WEIGHTED VDF IN EACH DIRECTION	**0.86**		**0.89**	
Max. WEIGHTED VDF	**0.89**			
WEIGHTED VDF OF COMMERCIAL VEHICLE				**0.89**

Hence, maximum VDF value 1.27 has been adopted for calculation of design msa of the project road.

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6.7 SPEED DELAY SURVEY

Speed Delay Survey was conducted for the entire project road to determine the average journey speed on the existing road. The calculation for determination of Average Journey Speed and Delay Time is shown below:

Table 6.25: Speed Delay Survey (Churachandpur - Tuivai)

Section :	One		From :	Churachandpur			To :	Tuivai						
Direction	Journey Time		Stopped Delay		No. of Vehicles			Overtaking (-) Overtaken (ny)	Average journey Time in min. (tw)	Average Journey Time from opp. Stream (ta)	Average Volume q= (na + ny) / (ta+tw)	Average Journey Time t = tw - (ny/q)	Length of Travel in km (L)	Average Journey Speed = L/t x 60 (km/hr)
	Min	Sec	Min	Sec	Over-taking	Over - taken	From opp. Direction (na)							
C-T	460	50	6	32	6	2	85							
	470	20	6	15	10	2	106							
	459	15	7	5	10	3	85	6.33	463.46	453.58	0.11	405.9	162	24
Total	1390	25	19	52	26	7	276							
Mean	463	28	6	37	8.66	2.33	92							
T-C	446	40	7	10	3	-	92							
	452	40	6	45	14	4	76							
	461	25	8	40	8	1	67	5.67	453.58	463.46	0.1	396.88	162	24.5
Total	1360	45	22	35	25	8	235							
Mean	453	35	7	31	8.33	2.66	78.33							

The average speed of travel from Churachandpur to Tuivai is 24 Km/hr and from Tuivai to Churachandpur is 24.5 Km/hr.

Detail calculation of Speed Delay Survey is given in **Annexure– 7**.

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6.8 ESTIMATION OF DESIGN ESA

- Traffic growth rate (Both direction): 7.5 %
- Vehicle Damage Factors (F): 1.27
- Lane Distribution Factor (D): 0.50

(i) ESA Computation for Homogeneous Section-I (from Km 0+000 to Km 74+000)

N: Cumulative number of standard axle to be created for in the design in terms of msa

A: Initial traffic in the year of completion of construction in terms of the number of commercial vehicle per day=184

D: Lane distribution factor (Refers IRC: 37-2012, Clause 4.5.1(ii), page-8) = 0.5

F: Vehicle Damage Factor (Refers IRC: 37-2012, Clause 4.4.6), page-8) =1.27

n: Design life in years = 20

r: Annual growth rate of commercial vehicles in decimal =0.075

= [(365*[(1+r) ^n-1]*A*D*F)/r = 3 msa

(ii) ESA Computation for Homogeneous Section-II (from Km 74+000 to km 161+665)

N: Cumulative number of standard axle to be created for in the design in terms of msa

A: Initial traffic in the year of completion of construction in terms of the number of commercial vehicle per day = 46

D: Lane distribution factor (Refers IRC: 37-2012, Clause 4.5.1(ii), page-8) = 0.5

F: Vehicle Damage Factor (Refers IRC: 37-2012, Clause 4.4.6), page-8) =1.27

n: Design life in years = 20

r: Annual growth rate of commercial vehicles in decimal =0.075

= [(365*[(1+r) ^n-1]*A*D*F)/r = 1 msa

As per IRC: SP 73-2015 (Para-5.4.1, Page No-44), 20 msa (minimum) is adopted for pavement design.

So, Pavement design has been done considering design traffic 20 msa.

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CHAPTER - 7
INDICATIVE DESIGN STANDARDS

7.1 GEOMETRIC DESIGN STANDARDS (FOR HIGHWAYS)

PROPOSED DESIGN BASIS

The following guiding principles form the basis of all good highway design:

- A uniform application of design standards for any area is essential from the viewpoint of road safety and the smooth flow of traffic. The selection of optimum design standards reduces the possibility of early obsolescence of the facility, which can be MORT&H thought about by any inadequacy in the original standards.
- Faulty geometric standards, after construction, are frequently difficult to rectify at a later date and they are always costly. As such, both horizontal and vertical geometry should be accorded due importance at the initial design stage itself and selected standards should not be compromised without the most careful deliberation.
- The design should thus be consistent within any area and the standards proposed for the different elements should be compatible with one another. It is sometimes necessary to reduce the selected design speed for economic reasons but any abrupt changes in the design speed must be avoided.
- The selected design should minimize the total transportation cost, including initial construction costs, costs for maintenance of the facility, and the cost borne by the road users.
- Safety should be built-in into design elements.
- "Ruling" standards should be followed as a matter of routine. "Minimum" standards should be followed only where serious restrictions are imposed by technical or economic consideration.

7.2 HORIZONTAL ALIGNMENT

7.2.1 TERRAIN CLASSIFICATION

The geometric design of a highway is influenced significantly by terrain conditions. Economy dictates a sensible choice of different standards for different types of terrain but the guiding principles above will always apply. Where it is necessary to change design standards, this will be done in discrete areas and with a careful eye to consistency and road safety.

The project road lies in mountainous terrain (i.e. cross slope of the ground more than 25 percent) and the geometric standards relevant to mountainous terrain as per IRC: SP: 48-1998 & IRC: SP: 73-2015 will be adopted.

7.2.2 DESIGN STANDARD

In general the design standard follows the provisions in the Hill Road Manual (IRC: SP-48-1998) and manual of specifications & standards for two laning of highways IRC: SP -73-2015.

7.2.3 DESIGN SPEED

The project is for up-gradation of existing road has been made to raise to NH standard with 2- lane with paved shoulder having design speed of 40 kmph to 60 kmph in mountainous terrain follows the provisions in Hill Road Manual (IRC: SP-48-1998) & two lane manual (IRC:SP:73:2015). However the design speed can be reduced up to 20 Kmph in hair pin bend location.

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Nature of Terrain	Design Speed(km/h)	
	Ruling	Minimum
Mountainous	60	40

7.2.4 SIGHT DISTANCE

Stopping sight distance is the clear distance ahead needed by a driver to bring his vehicle to a stop before meeting a stationary object on his path. Intermediate sight distance is defined as twice the stopping sight distance. On hill roads, stopping sight distance is the absolute minimum from safety angle and must be ensured regardless of any consideration.

Design values for stopping sight distance and intermediate sight distance for various speeds:

Design Values (meters)		
Speed (km/h)	**Stopping sight distance**	**Intermediate sight distance**
60	90	180
50	60	120
40	45	90
30	30	60
20	20	40

Criteria for measuring sight distance:

Sl. No.	Sight Distance	Driver's eye sight	Height of object
1.	Safe stopping distance	1.2 m	0.15 m
2.	Intermediate sight distance	1.2 m	1.20 m

7.2.5 RIGHT-OF-WAY (ROW)

Desirable target width of road land (ROW) is as follows:

For Mountainous terrain:

Open Area	Built up Area
24 m	20 m

7.2.6 CROSS SECTIONAL PARAMETERS

<u>For Plain terrain</u>

(1) In Built-up Area at plain terrain

Carriageway	= 7.0 m
Hard Shoulder	= 2 x 1.5 m
Covered Drain cum Footpath	= 2 x 1.0 m
Total Road Width	= 12.0 m

(2) In Rural Area at Plain Terrain

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Earthen Shoulder	= 2 x1.0m
Total Road Width	= 12.00m

<u>For Mountainous terrain</u>

(3) In Built Up Area at Mountainous terrain

Carriageway	= 7.0 m
Hard Shoulder	= 2 x 1.5 m
Covered Drain cum Footpath	= 2 x 1.0 m
Total Road Width	= 12.0 m

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(4) In Rural Area Mountainous Terrain
(Both Side Valley)

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Earthen Shoulder in Valley Side	= 2 x1.0m
Total Road Width	= 12.00m

(5) In Rural Area Mountainous Terrain
(One Side Hill & Other Side Valley)

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Earthen Shoulder in Valley Side	= 1 x1.0m
Total Road Width	= 11.00m

(6) For Through Cutting portion

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Drain	= 2 x 1.0 m
Total Road Width	= 10.00m

WIDENING OF CARRIAGEWAY AT CURVE

On horizontal curves with radius upto 300 m, width of pavement and roadway shall be increased as per the table given below:

Radius of Curve	Extra Width
75-100 m	0.9 m
101-300 m	0.6 m

7.2.7 CROSS-SLOPE/CAMBER

Bituminous surfacing has been proposed. The pavement in the straight reaches is to be provided with a crown in middle and surface on either side is to have slope of 2.5% towards edge. In reaches with winding alignment where straight sections are few and far between, the carriage way is to be given a unidirectional cross fall of 2.5% having regard to super elevation at the flanking horizontal curves and ease of drainage.

The cross fall of hard shoulders is to be at least 0.5% more than that of carriage way subject to a minimum of 3.0% and cross slope of earthen shoulder shall be of 3.5% for proper surface runoff. Paved shoulders and shoulders on super-elevated sections is to have the same cross fall as the pavement.

7.2.8 MINIMUM RADIUS OF HORIZONTAL CURVES

As a general rule, the horizontal alignment should be fluent and should blend well with the surrounding topography. In a given section there should be consistency and no element of surprise or unexpected situation for the driver.

RADII OF HORIZONTAL CURVES

The desirable minimum and absolute minimum radii of horizontal curves for various classes of terrain are given in the table below:

Name of the terrain	Desirable minimum radius	Absolute minimum radius
Mountainous & Steep	150 m	75 m

7.2.9 TRANSITION CURVES

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Transition curves are necessary for vehicles to progress from a straight alignment into a circular curve or between curves of different radius. The transition curve also facilitates a gradual application of the super elevation and any widening of the carriageway which may be required for horizontal curves.

The minimum length of the transition curve shall be determined from the following two considerations, the larger of the two values being adopted for design:

i) $Ls = \frac{0.0215\ V^3}{CR}$

Where, Ls = length of transition in meters

V = speed in km/hr

R = radius of circular curve in meters

$C = \frac{80}{75+V}$

subject to a maximum of 0.8 and minimum of 0.5

ii) The rate of change of superelvation (i.e. the longitudinal grade developed at the pavement edge compared to through grade along the centre line) should be such as not to cause discomfort to travelers of to make the road appear unsightly. The formula for minimum length of transition on this basis for Mountainous and Plain Terrain are :

$Ls = 1.0\frac{V^2}{R}$ and $Ls = 2.7\frac{V^2}{R}$

7.2.10 SUPERELEVATION

Super elevation provided on horizontal curves is based on the following formula:

$$e = \frac{V^2}{225R}$$

Where

e = super elevation (meter/meter)

V = speed (km/hr)

R = radius (meters)

Super elevation shall be limited to 7%, if radius of curve is less than the desirable minimum. It shall limited to 5% if the radius is more than desirable minimum.

7.2.11 RADIUS OF HORIZONTAL CURVES

The radius of horizontal curve is obtained from following formula:

$$R = \frac{V^2}{127\ (e+f)}$$

Where,

V = Vehicle speed (km/hr)

e = Super elevation ratio (meter/meter)

f = Coefficient of side friction between vehicle tyre and pavement (taken as 0.15)

R = Radius in meters

7.2.12 SET-BACK DISTANCE AT HORIZONTAL CURVES

Set-back distance from the centerline of the carriageway for obtaining requisite sight distance across

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the inside of horizontal curves is calculated from following equation (vide **figure-7.1** for definitions) :

$$M = R - (R - N)\cos\theta$$

where,

θ = $S/2(R-N)$ radians

m = the minimum set-back distance from centerline of the road to sight obstruction in meters at middle of the curve

r = radius of centerline of the road in meters

n = distance between the centerline of road and the inside lane in meter (n = 1.5 may be taken considering possible widening at curve)

s = stopping sight distance (minimum), intermediate sight distance (if feasible)

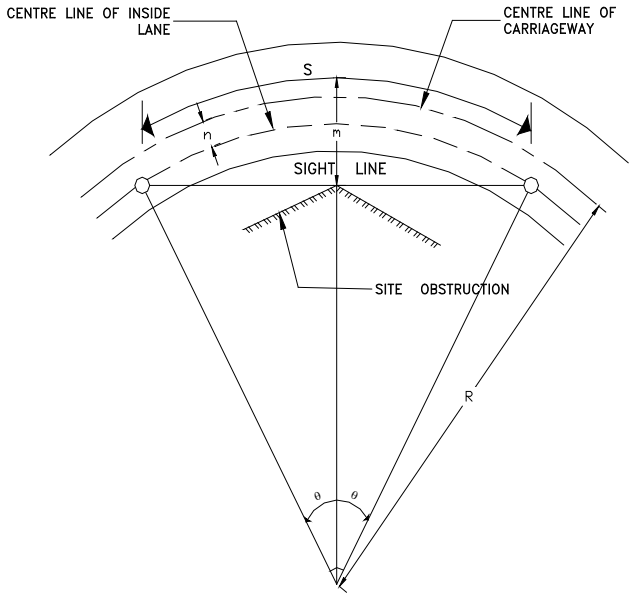
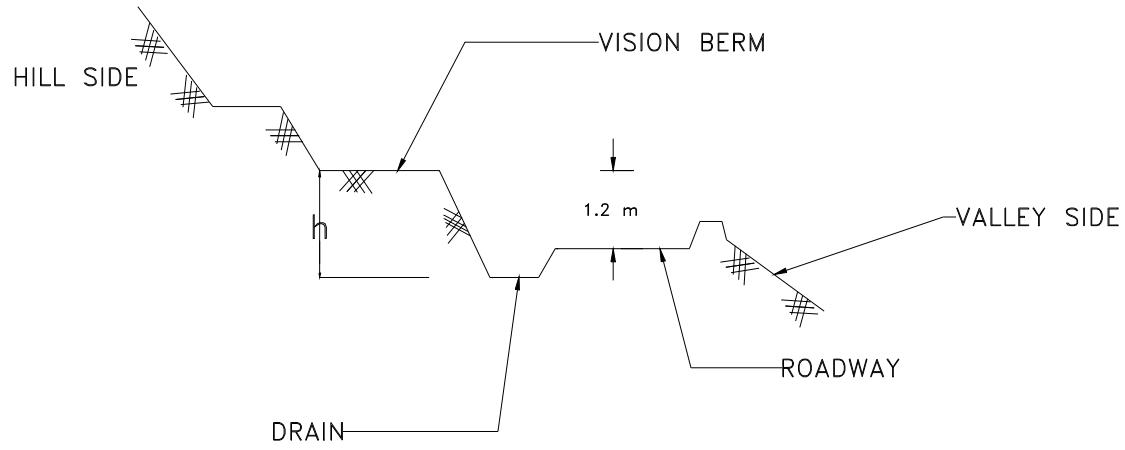


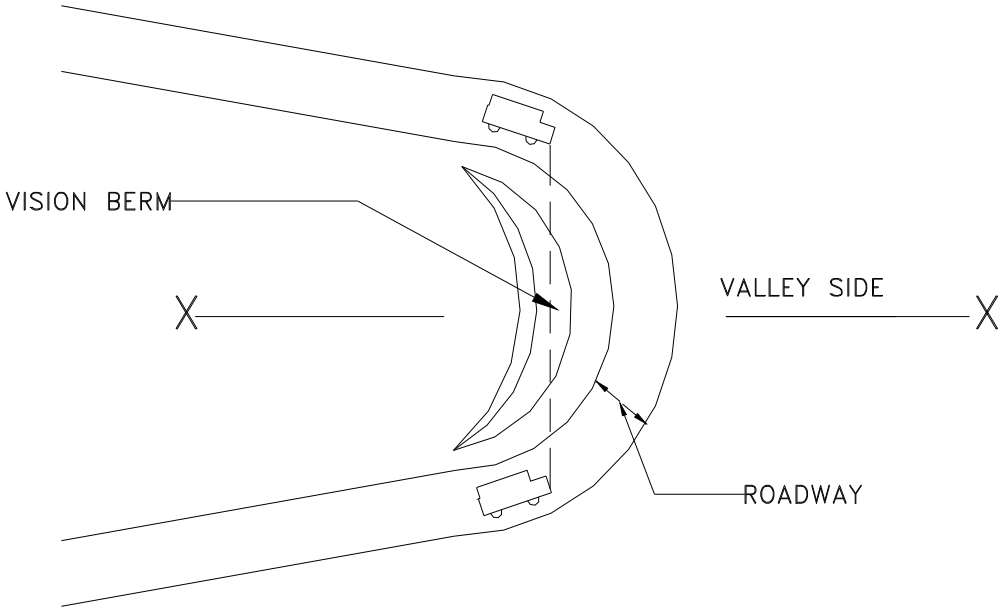
FIG. 7.1: VISIBILITY AT HORIZONTAL CURVES

Provision of lateral clearance with intermediate sight distance is often not economically feasible in hill roads. However, vision berms, as shown in **figure-7.2**, may be provided by benching on hill sides in curves to provide better sighting of vehicles wherever considered necessary.

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SECTION AT X–X



PLAN

FIG: 7.2 VISION BERMS

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7.3 VERTICAL ALIGNMENT

7.3.1 GRADIENT

The project road should provide for a smooth longitudinal profile. Grade change should not be to frequent as to cause kinks and visual discontinuities in the profile. The ruling and limiting gradients are given below:

Classification of Gradient	Mountainous terrain	Steep terrain
i) Ruling gradient	5.0 %	6.0%
ii) Limiting gradient	6.0%	7.0%

Long sweeping vertical curves shall be provided at all grade changes.

7.3.2 VERTICAL CURVES

Vertical curves should be provided at all grade changes exceeding those indicated below. The minimum lengths of curve for satisfactory appearance are shown alongside:

For Hill Road:

Design Speed (km/hr)	Maximum Grade Change (%) not requiring a vertical curve	Minimum Length of -vertical curve (m)
Up to 35	1.5	15
40	1.2	20
50	1.0	30

7.3.3 SUMMIT CURVES

The length of summit curves is governed by the choice of sight distance. For the project road length is calculated for safe stopping sight distance on the basis of following formula:

- **For Safe Stopping sight distance**

Case (i) When length of the curve exceeds the required sight distance i.e. L > S

$$L = \frac{NS^2}{4.4}$$

where,

N = Deviation angle i.e. the algebraic difference between the two grades

L = Length of parabolic vertical curve in metres

S = Sight distance in metres

Case (ii) When length of the curve is less than the required sight distance i.e. L < S

$$L = 2S - \frac{4.4}{N}$$

- **For Intermediate sight distance**

Case (i) When length of the curve exceeds the required sight distance i.e. L > S

$$L = \frac{NS^2}{9.6}$$

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Case (ii) When length of the curve is less than the required sight distance i.e. L < S

$$L = 2S - \frac{9.6}{N}$$

7.3.4 VALLEY CURVES

The length of valley curves should be such that for night travel, the head light beam distance is equal to the stopping sight distance. The length of the curve is calculated as under:

Case (i) When the length of the curve exceeds the required sight distance, i.e. L > S

$$L = \frac{NS^2}{1.50 + 0.035S}$$

Case (ii) when the length of the curve is less than the required sight distance i.e. L < S

$$L = 2S - \frac{1.5 + 0.035\,S}{N}$$

In both cases,

N = Deviation angle i.e. the algebraic difference between the two grades

L = Length of parabolic vertical curve in meters

S = Stopping sight distance in meters

7.3.5 HAIR-PIN BENDS

Hair-pin Bends are designed as a circular curve with transition curves at each end. The following design criteria are adopted for design of Hair-pin Bends:

Minimum design speed	= 20 km/hr
Minimum roadway width at apex for NH/SH	= 11.5m for Double Lane
Minimum radius for inner curves	= 14.0 m
Minimum length of transition	= 15.0 m
Minimum gradient	= 0.5 % (1 in 200)
Maximum gradient	= 2.5 % (1 in 40)
Maximum super elevation	= 7%

Inner and outer edges of the roadway should be concentric with respect to the centre line of the pavement and preferably the full roadway width should be surfaced.

7.4 FLEXIBLE PAVEMENT DESIGN STANDARD

DESIGN OF NEW FLEXIBLE PAVEMENT

Design of new pavement has been carried out based on IRC 37-2012 “Guidelines for the Design of Flexible Pavements” for design life of 15 years. Procedure for the same is given below:

Step 1: To find out initial traffic in the year of completion of construction in terms of the number of the number of commercial vehicles per day (CVPD)

Step 2: To determine traffic growth rate factor by studying the past trends of traffic growth

Step 3: Design life of Pavement

Step 4: To find out Vehicle Damage Factor to convert the number of commercial vehicles of different axle loads and axle configuration to the number of standard axle load repetition. It may be

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obtained by conducting axle load survey at site.

Step 5: To find out lane distribution factor of traffic over the carriageway

Step6: To determine design traffic in cumulative number of standard axles (msa) by the following formula mentioned below:

$$N= [365 \times \{(1+r)^n-1]/r\}] \times A \times D \times F$$

Where,
N = Cumulative number of standard axles to be catered for in the design in terms of msa
A = Initial traffic in the year of completion of construction in terms of number of commercial vehicles per day
D = Lane Distribution Factor
n = Design life in years
r = Annual growth rate of commercial vehicles
F = Vehicle damage factor
Step 7: To determine total pavement thickness and crust composition by charts/graphs with respect to CBR and cumulative number of standard axles.

Methodology flow chart for the design of new Flexible pavement has been shown in **Figure 7.3**

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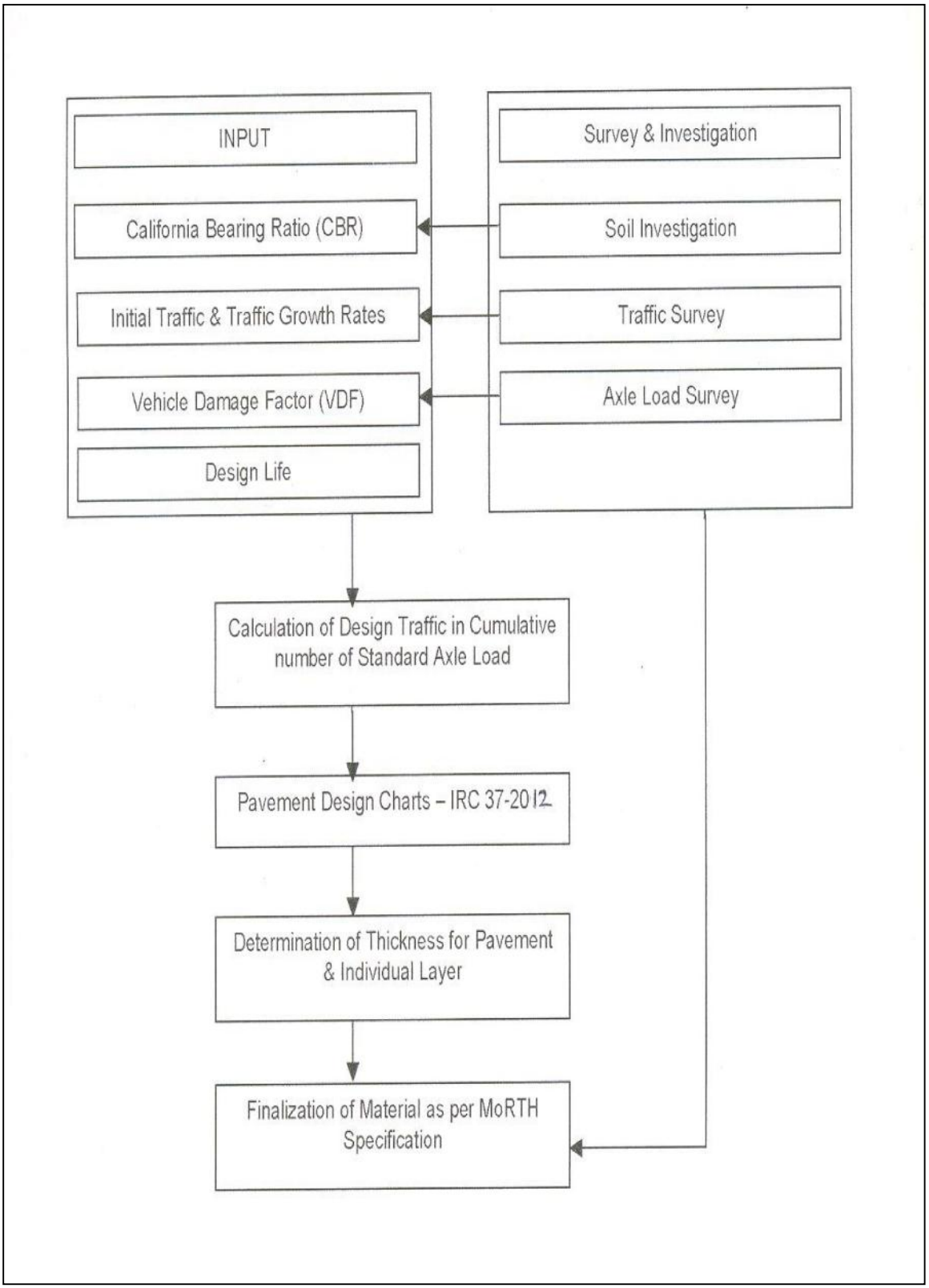


Figure 7.3: Methodology Flow Chart for Design of New Flexible Pavement

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7.5 GEOMETRIC DESIGN STANDARDS FOR BRIDGES AND CROSS-DRAINAGE STRUCTURE

7.5.1 SPECIFICATIONS

The project will use the MORT&H specifications for Road and Bridge Works (Fifth Revision). Where there are no appropriate standards within the MORT&H guidelines, AASHTO specifications may be utilized.

The following Indian standards will be incorporated wherever appropriate:

Ordinary Portland cement	IS: 269
High Strength Ordinary Portland cement	IS: 8112
Admixtures (where permitted)	IS: 6925 and IS: 9103
Thermo mechanically treated deformed	
Bars (TMT/H.Y.S.D)	IS: 1789
Prestressing Steel:	
Uncoated stress relieved low relaxation	
Strands for 19 T 13 cables	IS: 14268
Sheathing: "Drossbatch" 0.4 mm thick	IS: 18-1985, appendix: 1
Water	IRC: SP33-1989, Clause 5.1 (ii)
Bearings	IRC: 83-1987 (Part II) or BS: 5400
Foundations	IRC: 78-2000 and IRC-SP: 33-1989

7.5.2 DESIGN STANDARDS

GEOMETRIC DESIGN

i) The overall width (out to out of kerb) of the deck slab will be kept equal to the top width of the approach embankment.

ii) The span arrangement and span lengths provided will be such that piers/abutments are in line with those of the existing bridges/culverts and ensure smooth flow of water. The new spans are either equal to or a multiple of the spans of old structure.

iii) The linear water way provided will be determined from the consideration of design discharge, effective and adequate drainage.

7.5.3 LOADING STANDARD

i) All structures will be designed for 3 lanes of IRC class A with due consideration to reduction allowed for a multi-lane bridge and single lane of class 70-R +single lane of class A whichever produces worst effect. IRC Class Special vehicle will also be considered in design of structures.

ii) LL on footpath will be taken as 5 KN/m²

iii) Environmental loadings such as earth pressure, water current, seismic forces and temperature effect will be taken as per IRC/BIS Codes. 15-1893 will be followed in evaluating dynamic increment of earth pressure.

7.5.4 GUIDING STANDARDS FOR STRUCTURES

The Structural planning of new bridges or culverts will be guided by the layout of existing structures.

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The preliminary designs of proposed structures will be carried out in accordance with the provisions of the following IRC Codes/guidelines.

- IRC:5-2015 - Section I, General Features of Design
- IRC:6-2014 - Section II, loads and Stresses
- IRC:112-2011 - Code for Concrete Road Bridges
- IRC:22-2015 - Section VI, Composite Construction
- IRC:40-2002 - Section IV, Brick, stone & Block Masonry
- IRC:45-1972 - Recommendations for estimating the Resistance of soil Below Maximum scour level in the Design of Well
- IRC:SP:84-2014 - Four Lane Highway with Paved Shoulder Manual
- IRC:SP:73-2015 - Two Lane Highway with Paved Shoulder Manual
- IRC:SP:13-2004 - Guidelines for design of small bridges and culverts

Foundations of Bridges

- IRC:78-2014 - Section VII, Foundations and Structure
- IRC:83-2015 - Section IX,(Part I), Metallic Bearings
- IRC:83-2015 - Section IX,(Part II), Elastomeric Bearings
- IRC:83-2002 - Section IX,(Part III), POT Bearings
- IRC:87-2011 - Guidelines for the Design & Erection of False work for Road Bridges
- IRC:SP-33-1989 - Guidelines on Supplemental Measures for Design, Detailing and Durability of Important Bridge Structures
- IRC:89-1997 - Guidelines for design and construction of river training and control works for road bridges (1st Revision)

Where IRC Codes are silent relevant BIS Codes will be followed. And where even BIS codes are silent, international codes / MOST, MORTH guidelines will be adopted.

7.5.5 SEISMIC DESIGN

The project road falls in Seismic Zone V, as per the classification specified in IRC: 7. All bridges will be designed for Seismic forces as per clause 219 of the said code.

7.5.6 SOIL PARAMETERS

The Soil parameters used in the preliminary design of foundations for Bridges will be taken from the report of soil investigation and information obtained from local authorities / existing bridge design data.

The following soil parameters will be used for material for back fill behind abutment of bridges and culverts and the abutment structure will be designed accordingly.

ϕ = 30°

δ = 20°

γ_d = 20 KN/m³

γ_{sub} = 10 KN/m³

A 600 mm thick granular material filter behind abutment and adequate weep holes in abutment walls will be provided for proper drainage.

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7.5.7 HYDRAULIC DESIGN:

The relevant hydraulic data for fixing linear water way of bridges will be taken from the river hydraulic survey done by us and hydraulic data obtained from PWD / Flood Control and Irrigation Department.

For the cross: drainage structures, both the empirical and rational analytical approach as detailed out in IRC-SP-13-2004 will be used to check the adequacy of the waterways provided. Synthetic unit hydrograph method as developed by CWC will be used if relevant subzone flood estimation reports are available in time.

7.5.8 FOUNDATIONS:

For major bridges, either well or pile foundation and for minor bridges well, pile or open foundation will be adopted based on the soil boring data for those bridges.

7.5.9 SUBSTRUCTURE:

RC wall type piers and wall type / spill through type abutment will be provided in the bridges, matching the requirements, site conditions and constraints. Their design will be carried out in conformity with IRC-78-2000. The shape, size and alignment will be matching with the existing structure from aesthetic and hydraulic considerations.

7.5.10 SUPERSTRUCTURE:

I) MORT&H standard drawings of RC Beam and slab and PSC super-structure will be adopted wherever applicable. RC slab will form the deck for all new culverts, Multi-cell box structure may be adopted in the minor bridges and culverts, if found appropriate.

II) **BEARINGS:**

Neoprene/metallic/POT bearings will be used in the bridges as required for specific span, loads etc. and tar paper will be used in the culverts.

III) **RAILINGS:**

Reinforced concrete railings in M-30 grade concrete following MOST standard will be provided.

IV) **EXPANSION JOINTS**:

Buried type expansion/strip seal joints as per MORT&H standard will be used.

V) **WEARING COURSE**:

65mm thick asphaltic concrete wearing course will be adopted.

vi) **APPROACH SLAB:**

R.C. approach slabs, 3.50 m long and 300 mm thick in M-30 concrete will be used at either end of the bridges and culverts to ensure riding comfort and to reduce vehicular surcharge on the abutment walls. One end of the approach slab is supported on R.C. bracket projecting out, from dirt wall while the rest of the slab is placed on compacted soil as per the guidelines issued by MORT&H. A leveling course, 10 cm thick in M-20 / M-15 grade concrete will be used under the approach slab.

VI) **DRAINAGE SPOUTS**

100mm ~ drainage spout will be used for deck drainage at least one on both sides of carriageway per span.

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viii) **TMT REINFORCEMENT AND PRESTRESSING CABLES:**

Fe-500 high yield strength deformed bars conforming to IS-1786 will be used as reinforcement in all R.C. works. Uncoated stress relieved low relaxation strands conforming to IS-14268 will be used in PSC works.

7.5.11 PROTECTION WORKS

Protection works in the major bridge will be provided matching the protection work used in the existing bridges. IRC-89-1997 will be followed in detailing the protection works.

i) Return walls of appropriate length will be provided in all bridges and culverts to stop the spilling of earth into the waterway,

ii) Flooring will be provided over the base raft of culverts to guard against deterioration of the base raft

iii) Perimetral cut-off walls around the base raft of culverts and boulder apron on both upstream and downstream sides will be provided to reduce chances of scouring,

iv) The perimetral cut-off walls will also increase the effective depth of foundation in addition to their protective functions.

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CHAPTER – 8
COST ESTIMATES

8.1 GENERAL

Cost estimates is an important component of the study as it provides vital input to economic & financial evaluation and insights for proper planning of project execution. Over and above construction costs, provision has been made for social and environmental mitigation measures. Cost estimates are based on the detailed engineering designs and detailed drawings presented in drawing volume.

8.2 QUANTIFICATION

The construction items covered in cost estimates includes twelve different heads as:

- ✓ Site Clearance and Dismantling
- ✓ Earth work, Sub grade & Erosion Control
- ✓ Sub-Base & Base Courses
- ✓ Bituminous Courses
- ✓ Junction Improvement (Major & Minor)
- ✓ Traffic signs, Road marking & other road appurtenances
- ✓ Bus bay & Passenger Shelter
- ✓ Drainage and Protective Works
- ✓ Bridges & Culverts

8.3 UNIT RATES

For arriving at the unit rate, Schedule of Rate-2018 of Manipur Public Work Department with 5% escalation per annum for 2 years has been adopted. The analysis of rate based on "Standard Data Book", published by ministry of road transport and highways, Government of India (MoRTH).

On this Schedule of Rate the basic rates of materials and labours were finalized after careful consideration of data collected from the market.

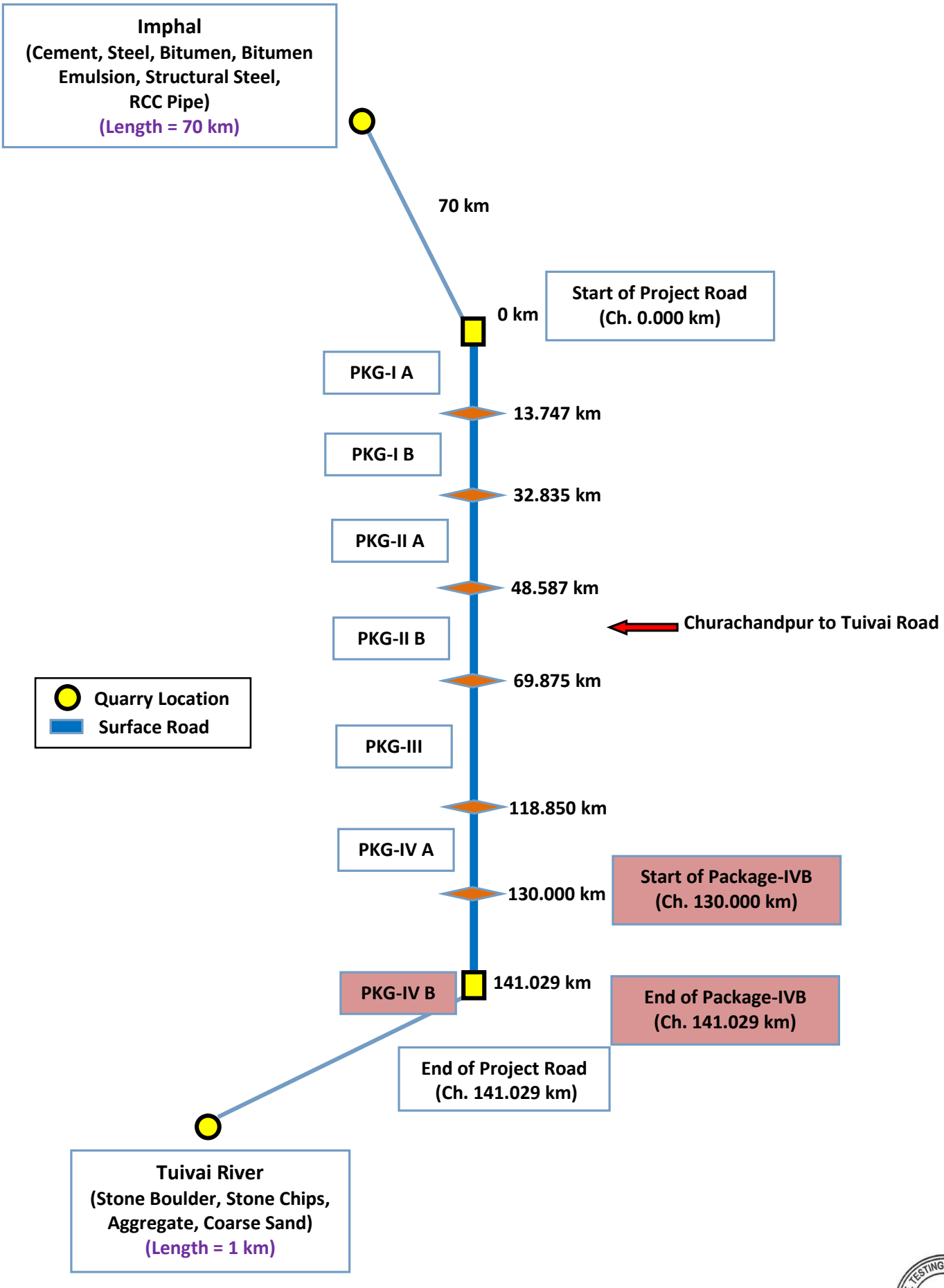
Leads for various materials for both the corridors, considered for the rate analysis, are given in Table below:

TABLE 8.1: LEADS FOR VARIOUS MATERIALS (Package – IV B)

Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	length of Project Road (Km)	Total Lead (Km)
1	Sand (Fine)	Tuivai River	1	17	18
2	Filling Material	Local	-	-	10
3	Stone Metal	Tuivai River	1	17	18
4	Stone Boulder	Tuivai River	1	17	18
5	Stone Chips, Aggregate	Tuivai River	1	17	18
6	Coarse Sand	Tuivai River	1	17	18
7	Cement	Imphal	189	17	206
8	Steel	Imphal	189	17	206
9	Bitumen	Imphal	189	17	206
10	Bitumen Emulsion	Imphal	189	17	206
11	Structural Steel	Imphal	189	17	206
12	RCC Pipe	Imphal	189	17	206

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Lead Chart for Material



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8.4 PROJECT COSTING

The cost of the road portion has been worked out based on the cross-sections, plan and profile and other drawings for widening and strengthening of the project road.

It is proposed that the excavated earth available from the cutting and reconstructed road sections would be used for the embankment construction. Adjustments have accordingly been made in the quantification of fill materials.

Locations of pavement reconstruction as identified in the pavement design and suitably quantified for dismantling and new crust composition. Extent of improvements to the cross roads at junctions has been considered up to the limits of proposed right of way. Quantification for road drainage has been in accordance with the recommendations of designs and drawings.

8.5 BRIDGES AND CULVERTS

The quantification of various items of work has been detailed out from the drawings.

8.6 ROAD INTERSECTIONS

Quantification for major intersections along the corridor has been done for each intersection based on the preliminary designs and drawings. Quantification for minor intersections and different kind of improvement option considered for each intersection has been worked out on the typical designs and drawings.

8.7 BUS BAYS AND BUS SHELTERS

No bus bays and bus shelters have been proposed in the project road. Quantification for construction of pavement at these locations has been done along with road construction and quantification for providing shelter; footpath, markings etc. have been separately made.

8.8 SAFETY BARRIERS

Crash Barriers have been provided on the outer side of carriageway on deep valley side and bridge approaches.

8.9 TRAFFIC SIGNS, MARKINGS AND OTHER APPURTENANCES

Road Signs: Traffic signs are important features of traffic control devices and transmit visually vital information to drivers and ensure increased safety and efficiency in free flow of traffic. All these signs shall be of informatory nature. All signs shall be retro-refectories type. Quantification for road signs have been done based on the locations of intersections and other features along the corridor.

Road Markings would be done with thermoplastic paints with reflective bands. It will consist of lane line and edge line. The details of Lane markings are shown Drawings volume.

The other items covered under this sub-head are road furniture like km stones, 5th km stones, Hectometer stones, delineators, and boundary stones. They are to be laid as per IRC specifications over the entire length of the road

Delineators have been proposed depending upon the proposed radii of the horizontal alignment and height of embankment or valley site. The delineator posts have been proposed near all curves of radii less than 1000 m, with spacing given as per IRC. The delineators, guard posts/pillars will be painted with alternate black and white paint bands and reflectors will be provided in each post.

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8.10 ABSTRACT OF COST

Package – IV B

Length of Road (KM) : 11.029

DESCRIPTION OF WORKS		TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	% of Cost of Civil Works (% of C)
A.	**ROAD WORKS**			
1	Site Clearance and Dismantling	0.41	0.04	0.35%
2	Earth work ,Subgrade and Erosion control	21.13	1.92	18.09%
3	Sub-Base & Base	20.53	1.86	17.57%
4	Bituminous Courses	11.82	1.07	10.12%
5	Traffic signs, Road marking & other road appurtenances	3.20	0.29	2.74%
	Drainage and Protective Works			
6	Longitudinal Drains	3.73	0.34	3.19%
7	Retaining wall	20.40	1.85	17.46%
8	Breast wall	9.30	0.84	7.96%
9	Toe Wall	0.65	0.06	0.56%
B.	**BRIDGES & CULVERTS**			
10	Culvert	11.84	1.07	10.14%
11	Major Bridges	13.81	1.25	11.82%
C.	**COST OF CIVIL WORKS IN CRORES (AS PER SOR 2018)**	**116.82**	**10.59**	
D.	Maintenance for 5 years, i.e 2.5% on civil cost (C)	2.92		
E.	GST @ 12% of (C)	14.02		
F.	Contingencies @ 2.8% over Civil Cost (C)	3.27		
G.	Supervision Charges @ 3% of (C)	3.50		
H.	Agency Charges @3% of (C)	3.50		
I.	Escalation Cost @ 10% during Construction Period	11.68		
J.	**TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J**	**155.71**	**14.12**	
K.	**DEPARTMENTAL COST ***			
a.	LA Cost	9.20		
b.	R&R Cost	0.00		
c.	Utility Shifting(Electrical +PHE)	1.17		
d.	Environmental Budget +FC Clearance	11.68		
L.	**Sub Total (K)**	**22.05**		
M.	**TOTAL CAPITAL COST (K+L)=M**	**177.76**	**16.12**	

*** Cost of LA, R&R, Utility Shifting and Forest Clearance are tentative. However, concerned Departmental Cost is awaited.**

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CHAPTER – 9
ENVIRONMENTAL SCREENING & PRELIMINARY ENVIRONMENTAL ASSESSMENT

9.1 ENVIRONMENTAL SCREENING

Environmental screening of the project is aimed to (i) recognize the applicability of relevant environmental legislations for the project (ii) identify the environmental issues that should be taken into account due to project interventions (ii) provide input to the engineering design team to consider various alternatives in the critical areas to (iv) determine the magnitude of potential environmental at planning/design stage (iii) identify need for further environmental studies like Initial Environmental Examination and Environmental Impact Assessment (EIA) and iv) suggest enhancement measures, if any.

9.2 RECONNAISSANCE SURVEY

Reconnaissance survey was done to determine the extent of environmental study, design the nature of the environmental survey to be carried out along the road alignment. This will facilitate to identify valued environment components, key stakeholders and key informants. Reconnaissance survey and initial consultations also recognized the need to conduct any additional study like bio-diversity assessment and wild-life movement etc.

9.3 APPROACH AND METHODOLOGY FOR IEE/EIA

- **Review of Country's Legal Framework:** India has a well-defined policy/legal framework for safeguard of environment. Prior to initiation of any civil work, it is essential to analyze the various permissions/clearances required for any developmental project. Same has been presented in later section of this chapter.
- **Primary Data Collection:** Environmental resource inventory will be prepared for all environmental features viz. terrain, land-use, landslide and erosion prone stretches, waterways/water bodies, road side vegetation, sensitive receptors, common property resources, utilities, drainage, flooding/water logging, industries, accident prone areas etc. within the area of interest/core zone. Information about this will be done by trained persons under the supervision of an expert team comprised of university researchers. Similarly, floral survey was also carried out. Baseline monitoring was conducted at the locations for which data was not available in environmental assessment report conducted by detailed design team.
- **Secondary Data Collection:** Secondary sources include published government reports, environmental impact assessments conducted in the similar region, government websites, recognized institutions and relevant government departments (forest, irrigation, pollution control board, fisheries, statistics, Indian Meteorological Department (IMD) and Nagaland Space Application Centre (NSAC) etc. Recent Google images has been captured to view environmental features at regional scale.
- **Public Consultation:** Meaningful consultations were organized with the PWD, local people/beneficiary population to know the level of project acceptability, understand their concerns, apprehensions, and overall opinion. Information were gathered about existing baseline environmental condition viz. ambient levels and its effects on health, water resources, water logging/flooding, flora and fauna, socio-economic standing of local people,

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impact due to loss of land other assets and common property resources, accident risk during construction and operation stage, perceived benefits and losses, etc. Information thus gathered was used to integrate it in project design and formulate mitigation measures and environmental management plan.

- **Other Tools, Surveys and Studies:** Assessment of land use/land cover map of larger area beyond the project site will be prepared for better planning and decision-making before creating any physical infrastructure in the region. Remote sensing and Geographic Information System (GIS) based land use map of the study area (10 km buffer) will be prepared through recent satellite imagery. A rapid bio-diversity assessment will be carried out to generate baseline on floral and faunal elements in the project area. The survey will also help in assessing impact on any rare threatened or endangered species of floral species in the project area. Rapid bio-diversity assessment will also recognize wild life movement along across and impact due to improvement work.
- **Assessment of Potential Impacts:** The assessment of the type, nature, direct, indirect, cumulative or induced impacts and their significance to the physical, biological, and socio-economic components of the environment will be done to ascertain whether the project is environmentally sustainable or not. Nature of impacts will be classified as significant, insignificant, short-term, long-term, reversible, irreversible etc. After identification of nature and extent of impacts, mitigation measures will be suggested.
- **Preparation of the Environment Management Plan:** The project specific Environment Management plan will be formulated with an aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. This includes
  a. Mitigation of potentially adverse impacts
  b. Monitoring of impacts and mitigation measures during project implementation and operation
  c. Institutional capacity building and training
  d. Compliance to statutory requirements
  e. Integration of EMP with Project planning, design, construction and operation.
- **Environment Monitoring Plan:** The monitoring and evaluation are critical activities in implementation of the project. Monitoring involves periodic checking to ascertain whether activities are going according to plan or not. It provides the necessary feedback for project management to ensure project objectives are met and on schedule. The reporting system is based on accountability to ensure that the environmental mitigation measures are implemented. Environmental monitoring program has the underlying objective to ensure that the intended environmental mitigations are realized and these results in desired benefits to the target population causing minimal deterioration to the environmental parameters. Such program targets proper implementation of the EMOP. The broad objectives are:

  - To evaluate the performance of mitigation measures proposed in the EMP.
  - To evaluate the adequacy of environmental assessment.
  - To suggest ongoing improvements in management plan based on the monitoring

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- To enhance environmental quality through proper implementation of mitigation measures.
- To meet existing environmental regulatory framework and community obligations.

- **Performance Indicators:** The significant physical, biological and social components affecting the environment at critical locations serve as wider/overall performance Indicators. However, the following specific environmental parameters can be quantitatively measured and compared over a period of time and are, therefore, selected as specific Performance Indicators (PIs) for monitoring because of their regulatory importance and the availability of standardized procedures and relevant expertise. Performance indicators requiring quantitative measurements are:
  - Air quality with respect to PM2.5, PM10, CO, NOx and SO2 at selected location.
  - Water quality as per CPCB prescribed Standards
  - Noise levels at sensitive receptors (schools, hospitals, community/religious places).
  - Survival rates of trees planted as compensatory plantation.
- **Assessment of EA Capacity to address the environmental concern of the project:** EIA will assess the capacity of the executing agency for effective implementation of EMP. Accordingly, if needed, a training and awareness program will be formulated to enhance the capacity of officials for implementing proposed mitigation measures and monitoring the resultant effects, as well as create awareness amongst workers and public. The institutions/agencies like regional office of MoEF, SPCB/CPCB, and Indian Institute of Technologies can be consulted for such trainings. Independent subject's experts/consultants (e.g., for the environmental awareness program, impact assessment specialist will be the resource person) can also be the resource persons to impart trainings. These experts /agencies shall be appointed based on specific need for the training. A separate budget for training will be allocated under the Construction Supervision Consultant budget.

9.4 COUNTRY'S LEGAL FRAMEWORK AND REGULATORY REQUIREMENTS

The Government of India has laid out various policy guidelines, acts and regulations for the safeguard and conservation environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Ministry of Environment and Forests (MoEF) and the Central Pollution Control Board (CPCB)/Manipur State Pollution Control Board in the present context. Table below presents all relevant policies/acts/rules and regulations and its applicability to the project.

Applicable National Laws and Regulations for the Project

Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
1	Environment Protection Act-1986	To protect and improve overall environment	Yes	It is umbrella legislation and notifications, rules and schedules are promulgated under this act.	MoEF. (Govt. of Manipur) State Gov. SPCB

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Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
2	Environmental Impact Assessment Notification,14th Sep-2006[1] and its amendments	To accord environmental clearance to new development activities listed in schedule of EIA notification.	No	Project road is >100km but does not involve additional right of way greater than 40m in existing alignment and 60 m in bypass and realignment section.	MoEF. SEIAA
3	Fly Ash Notification, 1999 as amended upto 17th August 2003:	Reuse large quantity of fly ash discharged from thermal power plant to minimize land use for disposal	No	No thermal power plants within 100 km	MoEF
4	Office memorandum dated 18.05.12,by MoEF in view of Apex Court order dated 27.2.2012	Conserve top soil, aquatic biodiversity, hydrological regime etc. by haphazard and unscientific mining of minor minerals	Yes	In case of renewal of quarries and opening of new borrow areas	SEIAA
5	National Environment Appellate Authority Act (NEAA) 1997	Address Grievances regarding the process of environmental clearance.	Yes	Grievances if any will be dealt with, within this act.	NEAA

[1]**Category A-i)** New National High ways; and ii) Expansion of National High ways greater than 100 KM, involving additional right of way greater than 40m in existing alignment and 60 m in bypass and realignment section.

Category B-i) All new state High ways; and ii) Expansion projects in hilly terrain (above 1000 m above mean sea level and/or ecologically sensitive areas.

Note: A general condition applies to both of the above category: "Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 5 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries".

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Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
6	Forest Conservation Act (1980)[2]	To check deforestation by restricting conversion of forested areas into non-forested areas	Yes	Road widening and improvement work requires diversion of significant forest land	Tree removal will be guided as per state government rules.
7	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by & Transport controlling emission of air Department. Pollutants as per the prescribed standards.	Yes	For construction; for obtaining NOC for establishment of hot mix plant, workers' camp, construction camp, etc.	SPCB
8	Water Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	This act will be applicable during construction for (establishments of hot mix plant, construction camp, workers' camp, etc.	SPCB
9	Noise Pollution (Regulation and Control Act) 1990	The standards for noise for day and night have been promulgated by the MoEF for various land uses.	Yes	This act will be applicable as vehicular noise on project routes required to assess for future years and necessary protection measure need to be considered in design.	SPCB
10	Public Liability and Insurance Act 1991	Protection form hazardous materials and accidents.	Yes	Contractor need to stock hazardous material like diesel, Bitumen, Emulsions etc.	----
11	Explosive Act 1984	Safe transportation, storage and use of explosive material	Yes	Blasting may be involved in some locations	Chief Controller of Explosives
12	Minor Mineral and concession Rules	For opening new quarry.	Yes	Regulate use of minor minerals like stone, soil, river sand etc.	District Collector

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Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
13	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	To check vehicular air and noise pollution.	Yes	These rules will be applicable to road users and construction Machinery.	Motor Vehicle Department
14	National Forest Policy1952 National Forest Policy(Revised) 1988	To maintain ecological stability through conservation and restoration of biological diversity.	Yes	This policy will be applicable as project intervention requires forest land to be acquired.	Forest Department, GoI and Govt. of Manipur
15	The Mining Act	The mining act has been notified for safe and sound mining activity.	Yes	The construction of project road will require aggregate through mining from riverbeds and quarries	Department of mining. State Govt. of Manipur
16	The Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996	To regulate the employment and conditions of construction workers and to provide for their safety, health and welfare measure and for other matter incidental thereto	Yes	A large number of construction workers skilled, semiskilled or unskilled will be employed temporarily during Construction Phase of the project	Ministry of Labor and Employment

Recent Policy Initiatives: Ministry of Environment & Forest (MoEF) vide O.M. No. L-11011/47/2011-IA.II(M) dated 18th May, 2012 in view of the Order of Hon'ble Supreme Court dated 27.2.2012 in I.A. no. 12-13 of 2011 in SLP (C) no. 19628-19629 of 2009 in the matter of : Deepak Kumar etc. Vs State of Haryana and others has informed that it has been decided in the MoEF that: (i) All mining projects of minor minerals including their renewal, irrespective of the size of the lease would henceforth require prior environment clearance. (ii) Mining projects with lease area up to less than 50 ha including projects of minor mineral with lease area less than 5 ha would be treated as category „B" as defined in the EIA Notification, 2006 and will be considered by the respective State/ UT Level Environment Impact Assessment Authority (SEIAAs). (iii) All the respective SEIAAs in dealing with the applications regarding environment clearance should be disposed within ten days from the date of receipt of the applications in accordance with law. All State Governments should take action as per the decision of the MoEF.

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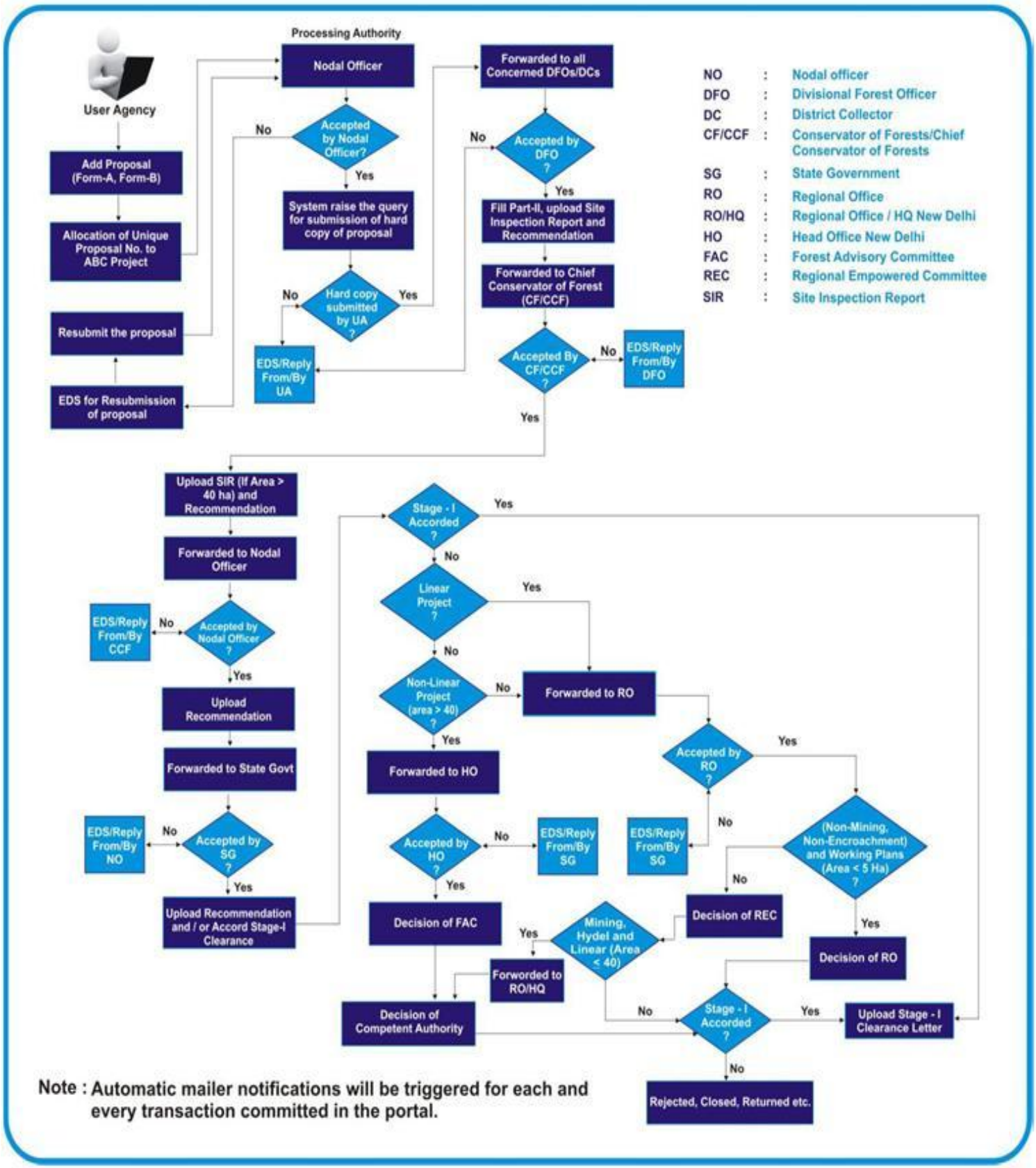
Procedure for Forest Clearance: MOEFCC has initiated online submission and disposal of forest clearance cases. The detail procedure is available on ministry website http://forestsclearance.nic.in/ However, the work-flow is unchanged which has been illustrated in Figure 2.

The proposed road from Churachandpur -Tuivai is divided into four packages. Out of four packages, Package-III is passing through Kailam Wildlife Sanctuary and its eco-sensitive zone. Hence, wildlife clearance is required for this project.

Procedure and workflow for wild life clearance is enclosed below:

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Procedure and Work Flow for Forest Clearance



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STEPS AND PROCEDURE FOR OBTAINING BORROW AREA PERMIT

Steps	Activities
1	Contractor identifies the Borrow Area (BA) quantity based on prospective BA identified in F/S/DPR
2	Contractor identifies the Borrow pits with quantity and raise Request for Inspection (RFI) to IE/CSC.
3	IE/CSC inspects borrow pit in the presence of Environmental Engineer of contractor and land owner with his lease document.
4	Contractor takes the sampling of soil in identified pit and test in lab. IE/CSC approves the pit based on the test report (Moisture contents, particle size etc.)
5	Contractor makes the agreement with land owner and get NOC from Gram Panchayat if necessary
6	If BA is more than 5Ha (B1 category), contractor submit application for clearance to State Environment Impact Assessment Authority (SEIAA) the project is treated as B1 EIA and Public Hearing needs to be carried out.
7	If BA is < 5Ha (B2 category), contractor submit application in Form 1M, Prefeasibility report and approved mine plan to District Environment Impact Assessment Authority (DEISAA). DEIAA gives clearance base on the recommendation of District Environment Appraisal Committee (DEAC).
8	Contractor pays Royalty amount to state government at the prescribed rate.
9	Contractor submit Borrow Area Redevelopment plan to IE/CSC.
10	Contractor raise RFI to IE/CSC for Borrow pit excavation
11	Contractor fulfils the compliance of EC agency observations if any.
12	Contractor will maintain haul road and ensure for fugitive dust suppression
13	Contractor does sampling of each pit at the time of excavation test and gets approval of IE/CSC.
14	Contractor raises RFI to IE/CSC before closing the pit.
15	Contract reclaims borrow pit as per owner agreement and gets clearance from him.

Key Considerations prior to selection of Borrow Areas

- Cluster shall be formed if the distance between peripheries of one lease to the other and is less than 500m in homogenous mineral area.
- Minimum distance between two clusters is 500 meters.
- Maximum depth of excavation 2000mm from existing ground level.
- In case of fertile land; 15 cm top soil is stock piled, further up to max.30 cm depth.
- Maintain 5m distance from the toe of the final section of the road/Embankment.
- BA should not be dug within 1500 m of village. If unavoidable should not exceed 30 cm in depth.
- Ridges not less than 8m width shall be left an interval of not exceeding 300m.

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8.5 MUCK DUMPING PLAN

Selection of Dumping Sites

The muck from hill cutting and construction activities will be safely disposed at suitable locations. Principle adopted for selecting muck dumping areas was to avoid sensitive areas like dense vegetation, natural water courses and areas prone to landslides. During the selection of the dumping sites preference was given on the following aspects.

- The muck does not fall/ flow into stream/river.
- Dumping sites should be at least 30 m (horizontal) away from the High Flood Level of the River/ stream.
- The sites are free from active landslides or creeps.
- The sites should not fall within pristine forest nor are these habitats of threatened species of flora and fauna.
- The sites are located close to its source in order to avoid long distance haulage.

Details of Proposed Muck disposal area has given below:

Muck Disposal Estimate										
Package	**Quantity of Muck/Debris generated in Cum**	**Quantity of Muck with 30% swell factor in Cum**	**Total Quantity of Muck/Debris including swell factor in Cum**	**Estimated Quantity of Muck/Debris proposed to be utilized for Filling in cum**	**Estimated quantity of muck/debris proposed to be dumped in cum.**	**Estimated quantity of muck/debris dumped in Valley Side within our Proposed ROW in Cum**	**Estimated quantity of muck/debris dumped in other location in Cum**	**Avg. Dumping Height in M.**	**Avg. Dumping Area (Sqm.)**	**Avg. Dumping Area (Ha.)**
IV-B	752090.64	225627.19	977717.83	79351.89	898365.94	50000	848365.94	20	42418.30	4.24

Muck Disposal Plan

The loosely held muck can lead to the rise in SPM levels, sedimentation load in the river body and phyto-retardation of the nearby vegetation. Therefore, it requires stability with appropriate methods to avoid the subsequent ecological problems. The muck disposal plan involves both engineering and biological measures that depend on the eco-climatic conditions. A considerable amount of muck can be used as filling material at various project components, area/ bench development works and also as aggregates/boulders. Rest of the muck to be dumped and rehabilitated at designated dumping sites. For retaining the dumped material along the hill slopes, crated boulder toe walls will be constructed. Excavated muck would be dumped and compacted at these dumping areas with stable slopes. Planting/grass turf should be done for additional safety of slopes. The toe walls shall be kept at least 30 m away from the high flood level.

Muck Rehabilitation Plan

The muck rehabilitation plan involves both engineering and biological measures that depend on the terrain and eco-climatic conditions. Stability of the loosely held muck requires appropriate method of consolidation and biological measures so that the muck is not easily eroded leading to subsequent ecological problems.

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Engineering measures

Crated boulder walls should be provided at the toe of each Muck Dumping Area and a minimum distance of 30m (horizontal) will be maintained from the High Flood Level (in case of Muck Dumping Yard near any water body). These toe walls will provide stability to the slope of dumped muck besides arresting spread of muck beyond the designated area.

Biological measure

Vegetation cover controls the hydrological and mechanical effects on soils and slopes. Therefore, biological measures to stabilize the loose slope are essential. However, such measures are dependent on the local environmental conditions. The stages in implementation of such measures are discussed below.

Selection of Plant Species

Different plant species may be utilized for different ecological and engineering functions. Grasses are more suited for armoring the loose soil surface and shrubs or trees hold the soil up to the deeper level. The selection of plant species used for rehabilitation of soil/muck must take into account the climatic, soil and drainage conditions of the site. The dumping sites of project road are located in the altitudinal range of 1300 to 1600 m. The area has sub-tropical climate and major part of the precipitation is received during April to September. The period from November to February is relatively dry. Considering all these factors as well as the existing natural vegetation in the area, the species recommended for plantation are Chir pine, alder, broom grass, bamboo etc.

Planting of Trees

The selected species will be planted on the slopes of muck dumping areas. The plantation can be carried out in lines across the slope, usually following the contour to prevent the development of rill and trap material moving down the slope. Brush layers, fascines and palisades can be used because of their uses *i.e.* controls erosion, catches debris and provides strong, fibrous root reinforcement. Different plant species when used together will provide increased stability. Grasses planted in a line across a slope will provide a continuous chain of support in retaining debris, reinforcing soil of the area. Plant saplings may be raised on biodegradable pots and transplanted as such. The plantation should be done during monsoon season. The pit size has been recommended as 45 x 45 x 45 cm for trees and 30 x 30 x 30 cm for shrubs with some soil rich in nutrients. Compost from the local organic waste can be used. An integrated biotechnological approach will be very useful for sustenance and growth of plants. This approach involves the following steps:

- Assessment of the nutrient status of the soil and evaluation of the physical and chemical properties of the dumped material.
- Formulation of the appropriate blend of organic waste and soil to enhance the nutrient status of the rhizosphere.
- Isolation and screening of specialized strains of mycorrhizal fungi, rhizobium, azobacter and phosphate solubilizer (bio-fertilizer inoculums) which can be best suited for the dumped material.
- Mass culture of plant specific bio-fertilizer and mycorrhizal fungi.
- Plantation of dumping sites/areas using identified blend and bio-fertilizer inoculums.

The rich soil and farmyard manure requirement for nearly 100 pits will be about 1 cubic meter with approximate weight of 200 kg. The saplings will be planted at 3 m intervals along the contour and 5 m across it. Wherever terracing shall be prescribed, the same will be done on terraces at 3m intervals leaving one-meter space from the edge of the terrace. About 1100 seedlings shall be planted per Ha depending on the space available at the site. Shrubs and herbs will be planted in the interspaces. The required saplings will be locally procured from State Forest Department/ private nurseries on the prevalent rates.

Fencing

After rehabilitation of muck the dumping areas need to be protected for some time, from grazing by domestic animals, livestock, sheep and goats. For this reason fencing over the muck deposits is required. Barbed wire

strands with two diagonal strands, clamped to wooden/concrete posts placed 3 m apart is proposed for this purpose. Both the ends of the wooden fence posts should be coated with coal tar to ensure longevity of the intervention.

Applicable Indian Road Congress (IRC) Codes to the Project Road: Key IRC guidelines have been summarized that have a direct/indirect bearing on the environmental management during design and construction stages.

Applicable Indian Road Congress (IRC) Codes

S. No	Code Title/Theme	Code
1	Guidelines on requirement of environmental clearance for road projects	IRC:SP:93-2011
2	Guidelines on Landscaping and tree plantation	IRC:SP: 21-2009
3.	Guidelines for EIA of Highway projects	IRC:104-1988
4.	Guidelines for Borrow area identification, use and its rehabilitation	IRC:10-1961
5	Guidelines for Pedestrian Facilities	IRC: 103 -1988
6.	Ribbon developments on highways and its prevention	IRC: SP: 1996
7.	Manual on Landscaping of road	IRC: SP: 21-1979
8.	Report on recommendations of IRC Regional workshops on highway safety	IRC: SP: 27-1984
9.	Road safety for Children (5-12 years old)	IRC: SP: 32-1988
10.	Guidelines on road drainage	IRC: SP: 42-1994
11	Highway safety code	IRC: SP: 44-1994
12	Guidelines for safety in construction zones	IRC: SP: 55-2001
13	Hill road manual	IRC: SP-48-1998
14	Recommended practice For treatment of embankment slopes and erosion control	IRC: 56–1974

9.6 EXISTING BASELINE ENVIRONMENTAL CONDITIONS

Manipur has a total geographical area of 22,327 Sq. Km. of which 90% are hilly regions, largely, characterised by dense forests and inaccessible terrains. The valley (Plain area) at the centre surrounded by the hills claims 10% only. The valley area is cadastrally surveyed while only some parts of the hills are surveyed. As part of peculiarity of this physical feature of the area, 61.54 of the total population is in the valley while 38.45 per cent in the hill districts. Besides the state is surrounded by equally backward states on the north and west; Nagaland and Mizoram while on the south there is Myanmar, a very less developed country. The positive "spill-over" effects of development are visibly limited. The length of international border shared by the state is 352 kms accounting for 41.21% of the total length of the border. This peculiar location has been a visible handicap on the perceptible process of development of the state.

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Rainfall: The rainfall in the state is around 1435 mm. Monsoon confers upon Manipur a very handsome rain as seen below: -

- South-West monsoon (June-Sept.) - 825 mm
- Post monsoon period (Oct. to Dec.) - 151 mm
- Winter monsoon (Jan. to Feb.) - 52 mm
- Pre monsoon (March – May) - 407 mm
- **Total - 1435 mm**

Geology: Geologically, Manipur belong to the young folded mountains of the Himalayan system. The rocks in the state vary from upper Cretaceous to the present alluvium. The oldest rocks found in the state are mainly confined in the eastern part of the state close to Indo-Myanmar border and the rocks are grouped as cretaceous rocks consisting of chromites (Epilates), serpentine etc. Availability of Asbestos, Chromite, Copper ore, Coal, Big iron, Lignite, Lime stone, Nickel ore and petroleum is reported in some parts of the state.

Soil: The soil of the state is of two major types – residual and transported, which cover both the hill and plain of the State. The residual soils are either laterized or non-laterized. The laterized red soils covering an area of 2,500 sq. km. in the Barak drainage on the Western slope of Manipur. It contains rich portion of nitrogen and phosphate, a medium acidity and lesser amount of Potash. The old alluvial is brought down by river Barak basin and Jiri river and their tributaries from their lateritic water ship hills. The compact and less permeable soils contain higher quantity of potash, fair amount of nitrogen and phosphorus with medium acidity. The transported soils are of two types – alluvial and organic. The alluvial soils cover 1600 sq. km. in the valley. This soils have general clayey warm texture and grey to pale brown colour. They contain a good proportion of potash and phosphate, a fair quantity of nitrogen and organic matter and are less acidic. The organic soils cover the low lying areas of the valley. With dark grey colour and clayey loam texture, these peaty soils have high acidity, abundance of organic matter, a good amount of nitrogen and phosphorus but are poor in potash. The hill soils are more or less rich in organic carbon (1 to 3%) in the top soil, but poor in available phosphorus and potash. They are acidic in nature.

Following figures are enclosed in GIS Environment to visualize the following features in the surrounding region of Churachanpur- Tuivai road

Fig. 9.1: Land use and Land Cover Information

Fig. 9.2: Drainage Information

Fig. 9.3: Elevation Map

Fig. 9.4: Digital Terrain Model

Fig. 9.5: Slope Map

9.7 GENERIC AND SITE-SPECIFIC KEY IMPACTS IDENTIFIED DURING SCREENING

➢ Pre-construction Impacts:

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There will be diversion of forest cover for widening the existing road. Private Land also needs to be acquired for widening since the existing road is intermediate/two lane configuration. Road design has considered all major preconstruction impacts and taken avoidance measures at an early stage of planning.

(i) **Alignment**: Final alignment has been determined to minimize land acquisition, impact on structures, archaeological/cultural sites, interference with water sources, shifting of existing utilities etc.

(ii) **Water bodies:** construction of culverts and bridges in during lean flow period. If technically not feasible toe walls/retaining walls have been proposed. Aggregate will be procured from existing licensed quarries.

(iii) **Tree Cutting:** Proposed to restrict tree cutting to formation width..

(iv) **Construction material Sourcing:** Borrow areas have been identified at non-agricultural land. Quarrying is not proposed.

(v) **Dust and air pollution:** No new borrow areas/quarry sites to be opened for the project. Aggregates will be sourced from existing licensed quarries. Waste disposal sites and asphalt mixing sites have been sited away from populated areas.

(vi) **Noise and Vibration:** Time regulation for blasting and construction near sensitive receptors and residential areas. There are two existing crusher plant in adjacent to proposed road.

(vii) **Soil Erosion, Cut and fill:** The design attempted to equalise cut and fill. Adequate erosion control measures included in design.

(viii) **Construction Camp and Waste Disposal:** No such facility is sited near any water bodies, forest area and settlements.

(ix) **Natural Hazards:** The project area is located in seismic zone V which is very high damage risk zone. Relevant IS codes shall be adopted while designing the civil structures to sustain the earthquake of highest magnitude in Seismic zone V. Retaining walls and breast walls need to be provided at all potential landslide locations.

➢ Generic impacts attributable to any road up-gradation projects are:

(i) Increase of local air pollution and noise level due to construction and site clearance activities, earthworks, borrowing and quarrying, operation of hot mix plants etc;

(ii) Deterioration of surface water quality due to silt run-off, spillage from vehicles and discharge from labour camps;

(iii) Health impacts from labour camps;

(iv) Disruption to access/traffic;

(v) Occupational health and community safety. Operation stage impacts anticipated are road accidents, accidental spillage, submergence/overtopping of CD structures, water logging due to blockade of side drains, increased air pollution and noise level, survival of compensatory afforestation and avenue plantation etc.

All these are mainly associated with maintenance and monitor of effectiveness of mitigation measures taken during design and construction stage. Executing agency is mandated to undertake regular maintenance of the road conditions and its appurtenances.

Besides above, since the project is located in a mountainous terrain, following site-specific impacts achieves greater attention need to be addressed in detail during further stages of study.

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➢ Site Specific Potential Impacts due to Road up-gradation and widening

- **Landslides:** The lithology of the project area combined with high rainfall makes the hill slopes unstable. Destabilization of slopes due to hill cutting may cause extensive erosion resulting to siltation in nearby water bodies may invite impact on properties. Hence, suitable protection measures are recommended viz.

(i) Retaining walls for stabilization of uphill, (ii) Breast walls for down slopes and (iii) Parapet walls/guard posts/railings/edge stones. Some Bio-engineering measures like bamboo terracing, bamboo crib walls, and bamboo knitting a slope, (ii) contour trenching, (iii) series of check dams on hill slopes etc. may also be recommended for slope stabilization. In addition to controlling soil erosion, this will generate employment to local people, manifold saving against masonry structures, increase productivity of hill slopes and reduce carbon emissions.

- **Soil Erosion/Silt Runoff:** Soil erosion may take place near cutting areas, at mountainous and uncompacted embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect viz. siltation, embankment damage, drainage problem etc. Loss of soil due to run off from earth stock-piles may also lead to siltation. Need for opening borrows areas and quarries are not anticipated since abundant material will be available from hill cutting. However, if requirement emerged, it may cause some adverse impacts if left un-rehabilitated. It may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution. Opening of new quarries is not envisaged due to the proposed project. Quarry material will be sourced from existing licensed quarries. The dredging and use of dredged material, if involved, may have its impact in terms of localised sedimentation level increase and dispersion of pollutants present in the dredged material in the river water.
- **Blasting:** In case if blasting is required the blasting operation may cause noise and vibration, destabilization of rock units and safety hazard and physical damage to downhill inhabitants, assets and properties. In forest areas, it may pose adverse impacts on faunal elements. Blasting, if required shall be restricted to daytime only. Blasting should be carried out as per "The Explosive Act, 1884 and the rules, 1983" pertaining to procurement, transport, storage, handling and use of explosives. Blasting schedules shall be carried out as per pre announced scheduled which shall be also displayed in advance in areas where residents may be affected by the blasting operations. Red danger flags shall be displayed prominently in all directions during the blasting operations. The flags shall be planted 200 m and 500 m from the blasting site in all directions for blasting at. People, except those who actually light the fuse, shall be prohibited from entering this area, and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning siren being sounded for the purpose. The Contractor shall notify each public utility body having services in proximity to the site of the work of his intention to use explosives. The Contractor shall adequately compensate in a timely manner for any damage to property/services and life caused by their blasting"
- **Debris Disposal**: Cutting the hillside to widen a road invariably generates debris. Disposing of this debris in the hilly areas is a challenging task as loose debris can potentially cause landsides, lead to unsightly scarring, and cause the hill slopes where it is dumped to lose their productivity.

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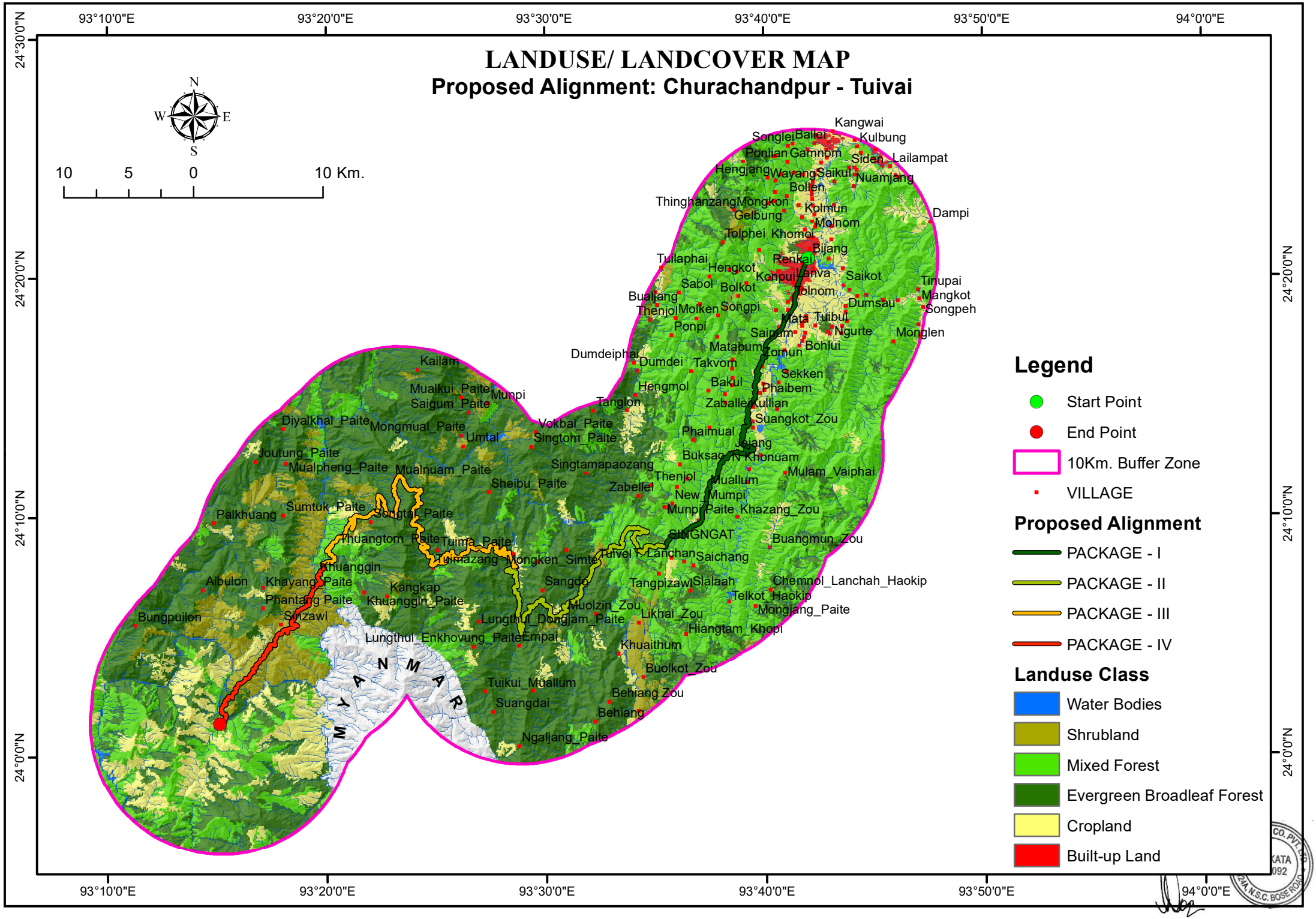
Although the road's technical design had reduced the generation of debris significantly by filling the valley portions with the debris however significant amount would still need to be disposed. Dumping sites have been tentatively identified keeping in mind requisite environmental consideration viz. distance from water body, distance from forest and vegetated areas etc. during preliminary survey which needs further examinations viz its ownership and their consent and other technical considerations.

A fairly large proportion of people use hill slopes for agriculture where they still follow the traditional practice of 'jhum', or shifting cultivation, a 'slash and burn' method of cultivation that requires large tracts of land. The productivity of these slopes would therefore need to be retained and any land acquisition for project work or the disposal of debris would need to be done in close consultation with the local people since significant part of the land is jointly owned and administered by the community.

- **Alteration of Surface Water Hydrology/Drainage:** Diversion of rivers and major streams construction is not envisaged. Reconstruction/new construction of culverts will be done during lean flow period. Diversion of some nallahs may be required for a very short period. Their courses will be brought back to original within no time once construction is finished.
- **Ecological Resources:** There are no national parks, wildlife sanctuaries or any other similar eco-sensitive areas in the project area. Major portion of the project road is passing through unclassified/open mixed jungle. Wildlife movement is not reported along/across the project road. A rapid bio-diversity assessment will be carried out to generate baseline on floral and faunal elements in the project area. The survey will also help in assessing impact on any rare threatened or endangered species of floral species in the project area. Rapid bio-diversity assessment will also recognize wild life movement along across and impact due to improvement work. Tree enumeration will be conducted to identify no of trees likely to be affected. The list will include Girth size and species of all affected trees. Risk of forest fire cannot be ruled out due to uncontrolled burning of grasses/shrubs for clearance of ROW, fuel accumulation due to accidental spillage or improper storage of explosives.

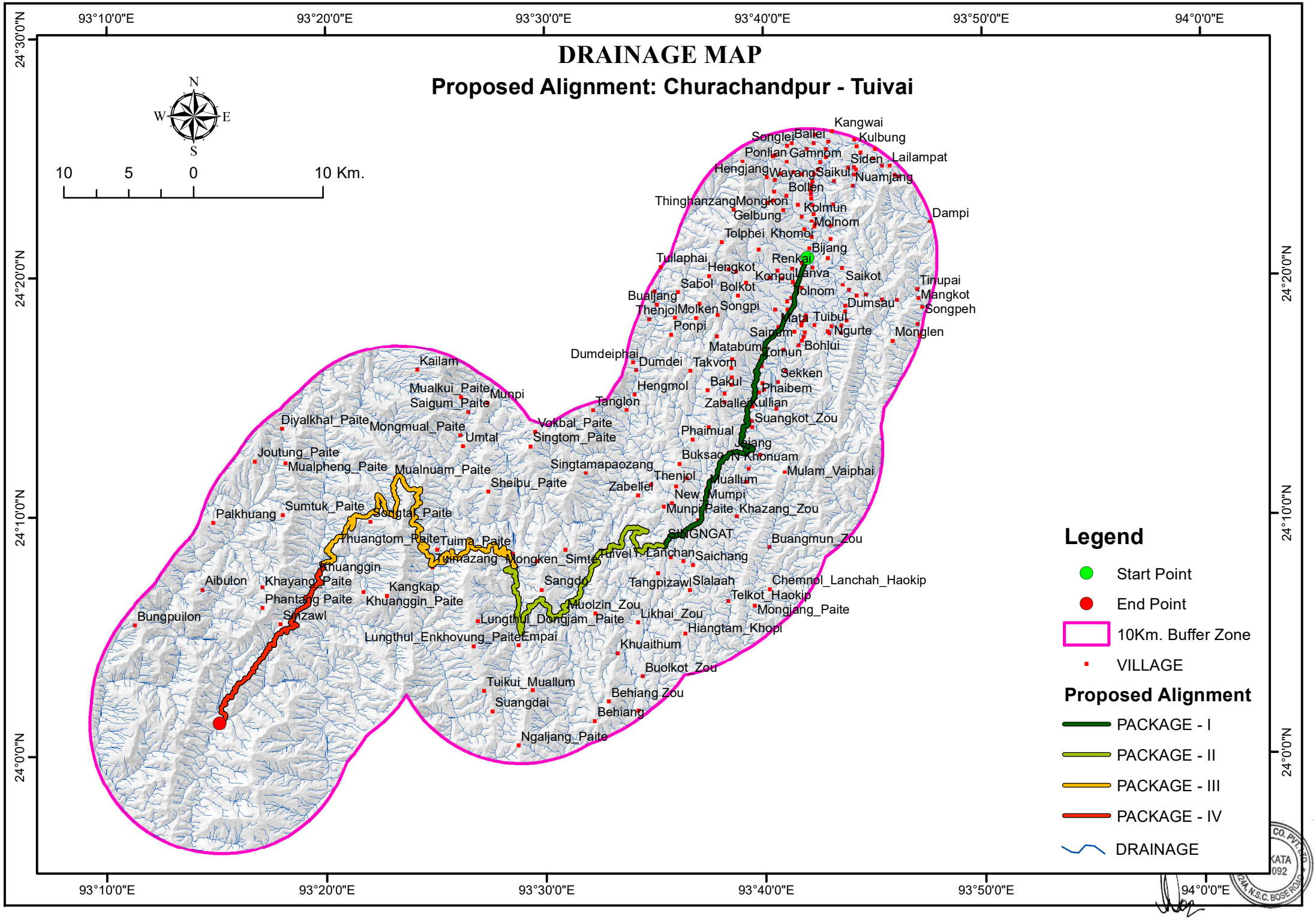
Based on the above findings and valued environmental components identified, the EIA report during later stage of submission will addressed all key concerns/issues adequately and accordingly an EMP will be formulated which may form part of the BOQ as desired by NHIDCL.

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LANDUSE/ LANDCOVER MAP
Proposed Alignment: Churachandpur - Tuivai
N
S
E
W
10 5 0 10 Km.
93°10'0"E
93°20'0"E
93°30'0"E
93°40'0"E
93°50'0"E
94°0'0"E
24°30'0"N
24°20'0"N
24°10'0"N
24°0'0"N
Kangwai
Songlei
Ballei
Kulbung
Ponlian
Gamnom
Siden
Lailampat
Hengjang
Wayang
Saikul
Nuamjang
Bollen
Thinghanzang
Mongkon
Kolmun
Gelbung
Molnom
Dampi
Tolphei
Khomol
Bijang
Tuilaphai
Renkai
Hengkot
Konpui
Lanva
Saikot
Tinupai
Sabol
Bolkot
Molnom
Mangkot
Songpeh
Bualjang
Thenjol
Molken
Songpi
Dumsau
Mata
Tuibul
Ponpi
Ngurte
Monglen
Saipum
Matabum
Bohlui
Komun
Dumdeiphai
Dumdei
Takvom
Sekken
Hengmol
Bakul
Phaibem
Tanglon
Zaballei
Kullian
Suangkot_Zou
Kailam
Mualkui_Paite
Munpi
Saigum_Paite
Diyalkhal_Paite
Mongmual_Paite
Vokbal_Paite
Singtom_Paite
Umtal
Phaimual
Joutung_Paite
Mualpheng_Paite
Mualnuam_Paite
Singtamapaozang
Buksao
N Khonuam
Mulam_Vaiphai
Sheibu_Paite
Thenjol
Muallum
Zabellel
New Mumpi
Sumtuk_Paite
Munpi Paite
Khazang_Zou
Palkhuang
Songtal_Paite
SINGNGAT
Buangmun_Zou
Thuangtom_Paite
Tuima_Paite
Tuivel
Lanchan
Saichang
Tuimazang
Mongken_Simte
Khuanggin
Sangdo
Tangpizawl
Slalaah
Chemnol_Lanchah_Haokip
Aibulon
Khayang_Paite
Kangkap
Telkot_Haokip
Phantang Paite
Khuanggin_Paite
Muolzin_Zou
Mongjang_Paite
Bungpuilon
Sinzawl
Likhai_Zou
Lungthul_Dongjam_Paite
Hiangtam_Khopi
Lungthul_Enkhovung_Paite
Empai
Khuaithum
MYANMAR
Buolkot_Zou
Tuikui_Muallum
Behiang Zou
Suangdai
Behiang
Ngaljang_Paite
Legend
Start Point
End Point
10Km. Buffer Zone
VILLAGE
Proposed Alignment
PACKAGE - I
PACKAGE - II
PACKAGE - III
PACKAGE - IV
Landuse Class
Water Bodies
Shrubland
Mixed Forest
Evergreen Broadleaf Forest
Cropland
Built-up Land

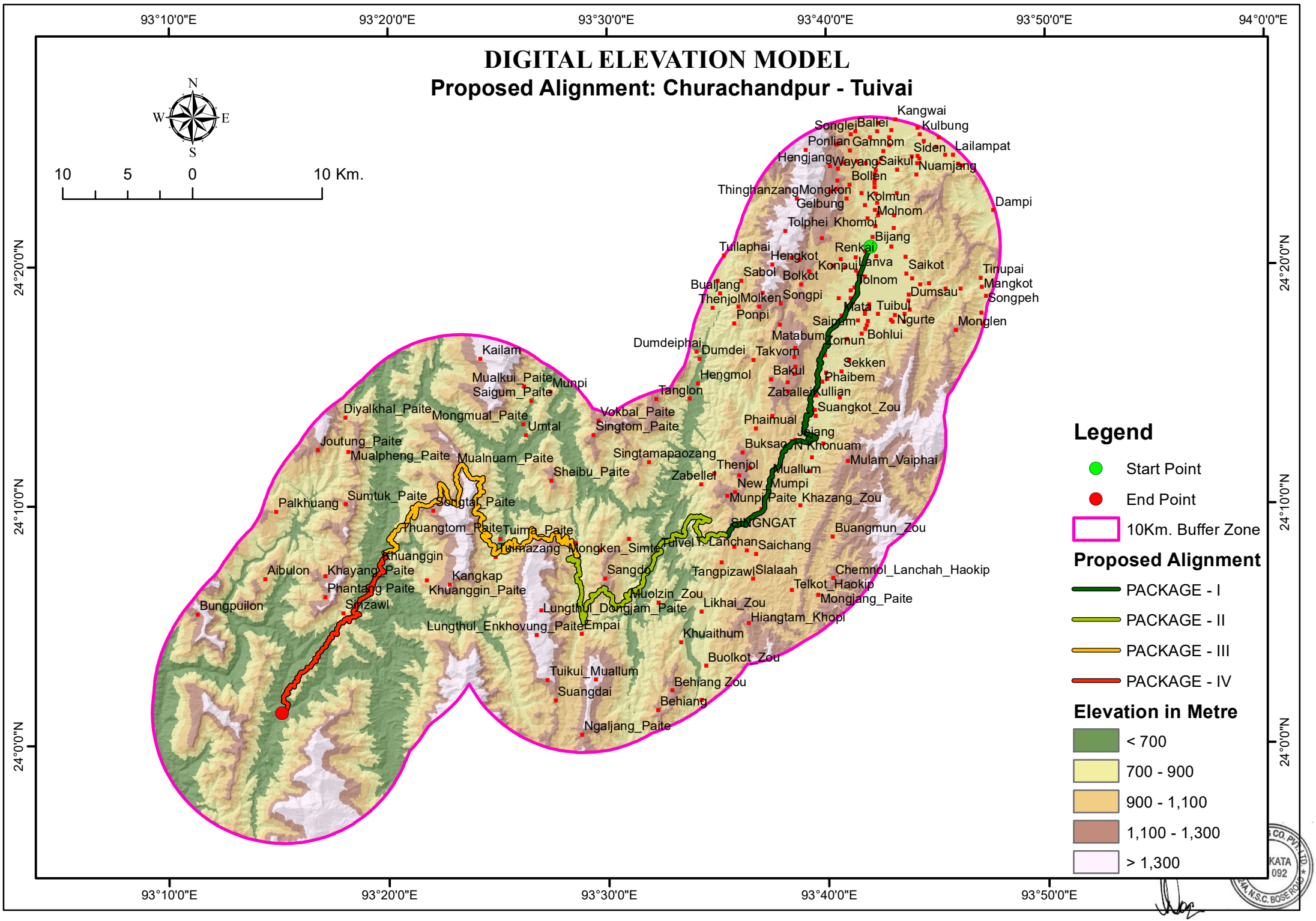
DRAINAGE MAP

Proposed Alignment: Churachandpur - Tuivai



DIGITAL ELEVATION MODEL

Proposed Alignment: Churachandpur - Tuivai



Legend

- Start Point
- End Point
- 10Km. Buffer Zone

Proposed Alignment

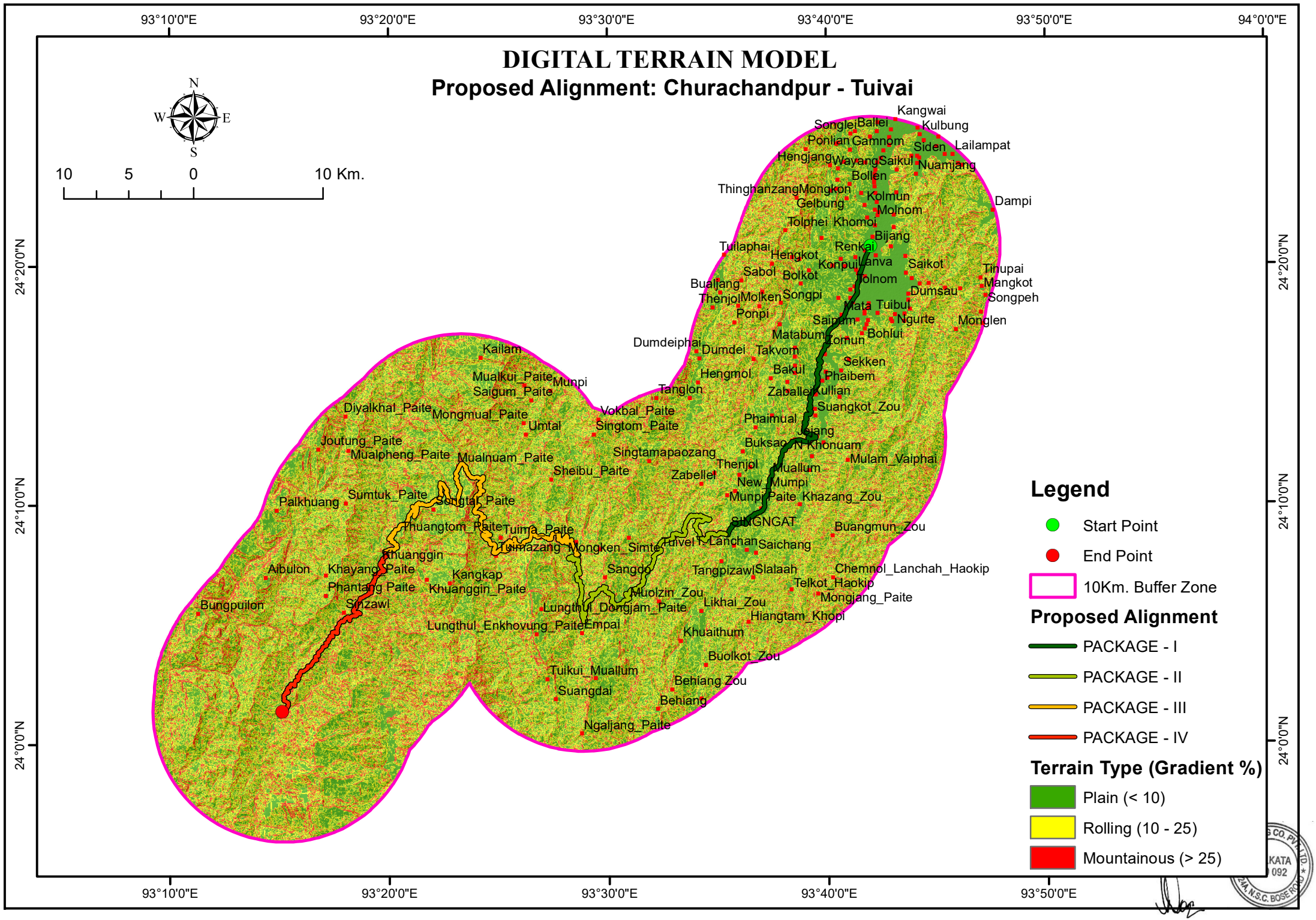
- PACKAGE - I
- PACKAGE - II
- PACKAGE - III
- PACKAGE - IV

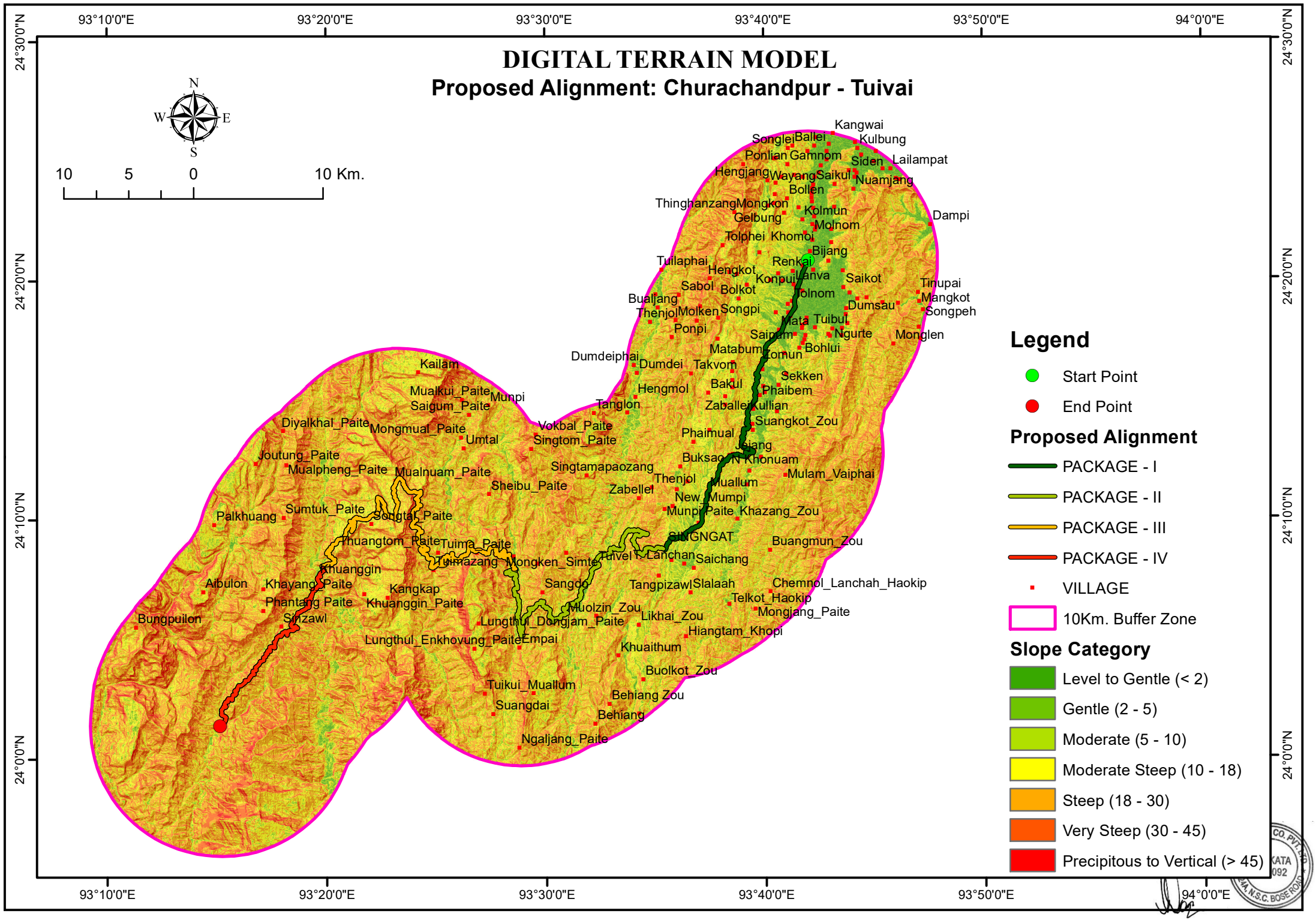
Elevation in Metre

- < 700
- 700 - 900
- 900 - 1,100
- 1,100 - 1,300
- > 1,300

DIGITAL TERRAIN MODEL

Proposed Alignment: Churachandpur - Tuivai




DIGITAL TERRAIN MODEL
Proposed Alignment: Churachandpur - Tuivai
N
S
E
W
10 5 0 10 Km.
93°10'0"E
93°20'0"E
93°30'0"E
93°40'0"E
93°50'0"E
94°0'0"E
24°30'0"N
24°20'0"N
24°10'0"N
24°0'0"N
Kangwai
Songlei
Ballei
Kulbung
Ponlian
Gamnom
Siden
Lailampat
Hengjang
Wayang
Saikul
Nuamjang
Bollen
Thinghanzang
Mongkon
Kolmun
Dampi
Gelbung
Molnom
Tolphei
Khomoi
Bijang
Tuilaphai
Renkai
Hengkot
Konpui
Lanva
Saikot
Tinupai
Sabol
Bolkot
Tolnom
Mangkot
Bualjang
Songpi
Dumsau
Songpeh
Thenjol
Molken
Mata
Tuibul
Ponpi
Saipum
Ngurte
Monglen
Matabum
Bohlui
Dumdeiphai
Tonun
Dumdei
Takvom
Sekken
Hengmol
Bakul
Phaibem
Tanglon
Zaballei
Kullian
Kailam
Suangkot_Zou
Mualkui_Paite
Munpi
Saigum_Paite
Vokbal_Paite
Diyalkhal_Paite
Mongmual_Paite
Singtom_Paite
Phaimual
Umtal
Joutung_Paite
Buksaon
Khonuam
Mualpheng_Paite
Mualnuam_Paite
Singtamapaozang
Mulam_Vaiphai
Thenjol
Sheibu_Paite
Zabellel
Muallum
New_Mumpi
Palkhuang
Sumtuk_Paite
Munpi Paite
Khazang_Zou
Songtal_Paite
Thuangtom_Paite
Tuima_Paite
Buangmun_Zou
Tuimazang
Mongken_Simte
Tuivel
Lanchan
Saichang
Khuanggin
Aibulon
Khayang_Paite
Sangdo
Tangpizawl
Slalaah
Chemnol_Lanchah_Haokip
Kangkap
Telkot_Haokip
Phantang Paite
Khuanggin_Paite
Muolzin_Zou
Mongjang_Paite
Bungpuilon
Sinzawl
Likhai_Zou
Lungthul_Dongjam_Paite
Hiangtam_Khopi
Lungthul_Enkhovung_Paite
Empai
Khuaithum
Buolkot_Zou
Tuikui_Muallum
Behiang Zou
Suangdai
Behiang
Ngaljang_Paite
Legend
Start Point
End Point
Proposed Alignment
PACKAGE - I
PACKAGE - II
PACKAGE - III
PACKAGE - IV
VILLAGE
10Km. Buffer Zone
Slope Category
Level to Gentle (< 2)
Gentle (2 - 5)
Moderate (5 - 10)
Moderate Steep (10 - 18)
Steep (18 - 30)
Very Steep (30 - 45)
Precipitous to Vertical (> 45)

CHAPTER-10
ROAD SAFETY AUDIT

10.1 INTRODUCTION

Road Safety Audit (RSA) is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for the improvement and maintenance of existing roads.

However, its systematic application can also ensure that a growing awareness about good road safety principles is achieved throughout in highway planning, design, construction and maintenance organisation. The essential elements of the definition are that it is:

a) A formal process and not an informal check,
b) Carried out by persons who are independent of the design and construction, IRC: SP: 88-2010
c) Carried out by persons with appropriate expertise, experience and training, and
d) Restricted to road safety issues.

Road engineers will apply quality assurance techniques by established procedures and regularly check the details of their own work. This regular checking includes checking safety aspects. This type of assessment, however, is not 'road safety auditing' because it is not done with a 'fresh pair of eyes' and it probably is not applying road safety engineering skills and experience required for the task. Road safety audit, on the other hand, is a 'step-by-step' process, performed at all stages. An independent road safety audit of the design is sought, to permit independent road safety engineering advice to be input, for the benefit of the future road users. Presently, it has become practice of involving safety engineers during the life of project, liaising informally with professionals of all disciplines at all stages, from feasibility/concept stage to completion. In turn, quality assurance can be applied to the providers of road safety audit services.

Road safety is now recognized as a major socio-economic concern in India. Increasing traffic volumes, the rapid growth in two and three wheeled traffic, higher speeds due to construction improvement / rehabilitation of roads has increased safety problem. A Road Safety Audit (RSA) is the safety performance examination of a road section through experienced road safety expert. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. The road safety audit investigates general safety conditions, focuses on specific concerns or users. This also includes pedestrian safety as well as safety of transport use.

10.2 ROAD SAFETY AUDIT AND QUALITY ASSURANCE

Road safety audit is an important aspect of Quality Assurance (QA), applied to the implementation of a road project. It is a management process in which the provider of goods or services assures the customer or client of the quality of those goods or services, without the customer or client having to check each time.

Quality assurance is done by the implementation, in the organization, of a set of procedures designed to ensure that agreed standards are met. Quality assurance procedures for the design and implementation

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of new road or traffic projects are to input road safety engineering expertise into the design. Often the client and the customer are the same person or organization. In case of roads, the client for whom the road is designed and built is usually the highway authority, whereas the customer is the road user. A road safety audit is undertaken for the highway authority to ensure that the customer is afforded a level of protection from unsafe design and construction.

'Getting it right the first time' is the underlying theme of quality assurance. Road safety audits seek to ensure the road operates 'right the first time' once it opens and that the road users make fewer mistakes. Quality assurance is a continuous process. So far as the safe design of roads is concerned, quality assurance starts with a safety culture in an organization. While designing a road, engineers will apply quality assurance techniques by established procedures and regularly check the details of their own work. This regular checking includes checking safety aspects. This type of assessment, however, is not 'road safety auditing' because it is not done with a 'fresh pair of eyes' and it probably is not applying road safety engineering skills and experience required for the task. Road safety audit, on the other hand, is a 'step-by-step' process, performed at all stages. An independent road safety audit of the design is sought, to permit independent road safety engineering advice to be input, for the benefit of the future road users. Presently, it has become practice of involving safety engineers during the life of project, liaising informally with professionals of all disciplines at all stages, from feasibility/concept stage to completion. In turn, quality assurance can be applied to the providers of road safety audit services.

10.3 OBJECTIVE OF ROAD SAFETY AUDIT

Road safety audit must assess projects on the basis of road user knowledge, attributes and skills, day/night and wet and dry road conditions. Safety audit is only a study of safety aspects and an auditor may indicate road safety problems inherent in designs that conform to our road standards. This is due to the fact that our road standards are an expression of a socio-economic balance between road safety, accessibility, environment and economy.

The goal of road safety audit is to ensure that all new road projects – and major operating and maintenance activities on existing roads-are assessed from the standpoint of road safety, so that any parameters of the project that are unsuitable from the standpoint of road safety are Corrected in time. The benefits of conducting road safety audit are that:

- The likelihood of accidents on the road network can be reduced,
- The severity of accidents can be reduced,
- Road safety is given greater prominence in the minds of road designers and traffic engineers,
- The need for costly remedial work is reduced, and
- The total cost of a project to the community, including accidents, disruption and trauma, is minimized.

The cost of road safety audit and the consequent cost of changing a design are significantly less than the cost of remedial treatments after works are constructed. It is easier to change the lines/alignment or so on a plan than to move concrete structures. With less remedial work included in a highway authority's work program, budgets can be kept down or the same money can be utilized more effectively.

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10.4 ROAD SAFETY AUDIT: WHAT IS DONE AND NOT DONE

ROAD SAFETY AUDIT IS:

a) Minimizing the likelihood of crashes occurring through safety-conscious planning and design;
b) Ensuring that, if a crash occurs, then the likelihood of the injury is minimized (such as provision of anti-skid surfacing and crash barriers);
c) Ensuring that safety related design criteria (e.g. critical sight distances) have been met;
d) Managing risks, such that the risk of major safety problems occurring is less than the risk of minor problems occurring;
e) Reducing the whole-life cycle costs of a design (unsatisfactory designs are expensive to correct after they are built);
f) Minimizing the risk of crashes on the adjacent road network (particularly at intersections) as well as on the new road scheme;
g) Enhancing the importance and relevance of road safety engineering in highway design work and to enhance consideration for the safety of all categories of road users in all new and existing schemes.

ROAD SAFETY AUDIT IS NOT:

a) A way of assessing or rating a project as good or poor;
b) A means of ranking or justifying one project against others in a works program;
c) A way of rating one option against another;
d) An accident investigation;
e) A redesign of a project;
f) Something to be applied only to high cost projects or only to projects involving safety problems;
g) The Name you use to describe informal checks, inspections or consultations;
h) An opportunity to raise subjective concerns.

10.5 SAFETY AUDITORS

To be effective, the safety audit needs to be carried out by specialists, who are independent of the design process. In this way auditors will be taking a fresh look at the project without the distraction of having been involved in their design. Road safety audit involves one set of professionals checking the work of other professionals. Crucial factor is that auditors should be independent and impartial. Road safety auditor must not question the justification for a project but must bring to light its consequences on road safety and endeavor to ensure that the project as presented in the brief is as safe as possible. Auditors need to be objective in their assessments, yet sensitive to the fact that no one likes criticism. Designers and clients need to consider audit recommendations objectively as brought out from the audit outcome.
Expertise and experience in road safety engineering are the essential ingredients in any road safety audit team. This should be linked to an understanding of:

- Traffic engineering and traffic management, and
- Road design and road construction techniques

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A person who has an understanding of road user behavior and human perception is also likely to be able to develop road safety audit skills. This understanding is in fact a desirable skill because of the interactive nature of road user behavior with the road environment. An audit team leader must not only have knowledge and skills in road safety engineering, but also should have received training and participated in a number of audits. It is expected that the safety auditors will apply due diligence in identifying the deficiencies and evolving audit recommendations which should be supported with reasons.

The Authority, which engage safety auditors should ensure that the team leader has:

• Adequate road safety engineering experience for the stage of the audit,

• Successfully completed a recognized audit training course,

• At least five years' experience in a relevant road design, road construction or traffic engineering field, and

• Undertaken at least three road safety audits including design stage, etc.

It is not practical or necessary to have a multi-member team conducting an audit. An audit of a low budget project, a road safety audit by more than two persons may not be justified. For large projects, three persons are needed whereas for small projects two persons will be required.

10.6 ORGANISATIONS INVOLVED IN ROAD SAFETY AUDIT

Road Safety Audit Road Safety Audit is based on the principle of an independent review. Road safety audit process reveals that three parties will be involved in this process-Client, Designer and Auditor. For the Public Private Partnership projects (PPP) the client would be both the Govt, and the Concessionaire with their respective obligations as provided in the Concession Agreement. One fundamental idea is that disagreements between the designer and the auditor are resolved not by the designer but by the client. So it is an interaction between different parties, whose roles are predefined at specific stages. In India, for large and small projects client may be National Highways Authority of India (NHAI)/Ministry of Road Transport and Highways/NHIDCL/concerned Public Works Departments (PWD). Designer may be one consultant and Auditor may be another consultant/Govt. institution approved by the Authority. Main functions of the key players in road safety audit are shown in Table 11.1.

Role of designer

Designer is responsible for planning/designing the project. Designer bears the responsibility for ensuring that a road safety audit is conducted and that the necessary measures are agreed on the basis of the auditor's recommendations and/or the client's decisions. The designer is also responsible for ensuring that the audit input information is unambiguously defined and that all circumstances are described in an easily understandable manner. For existing roads, it is the responsibility of operating organisation of the relevant highway authority which requests the auditor to prepare accident analysis of the project and which arranges for the road operator to be notified about the results of the audit. The project manager, or design engineer should be responsible for initiating the safety audit process for each scheme and for responding to the audit. The role of the designer is thus to:

• Attend commencement and completion meetings.

•Bring out the action proposed in response to the audit report and its recommendations and to document these proposed actions.

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•Implement the decisions given by the client on the proposed action by amending the original design

•Feed the experience back into the designer's organization and to avoid similar design problems recurring.

TABLE 10.1 MAIN FUNCTIONS OF THE KEY PLAYERS IN ROAD SAFETY AUDIT

Key Player	Main Functions
Project Owner (Govt. and/or Concessionaire)	• Expresses a commitment to road safety • Provides funding and resources • Considers safety audits and reviews as an essential quality control requirement • Commissions audits and reviews at appropriate times • Selects road safety audit team • Facilitates the response to the recommendations of audits and reviews and arranges implementation of recommendations that are accepted • Attends commencement and completion meetings
Design Team	• Attends commencement and completion meetings • Provides relevant information to safety team • Acts upon and documents response to recommendations of audit
Safety Audit Team	• Identifies safety issues in the proposed design • Makes constructive recommendations to enhance safety • Documents safety issues and recommendations • Holds commencement and completion meetings with the client and design team

Role of client

Client is one who allots the project to the designer and owns the project. As the party responsible for the basic conditions of the project, it is the task of the client to decide in cases where the designer and auditor disagree. Disagreements are presented to the client who conveys its decision to the designer and the auditor. Road operator assumes this responsibility in case of existing roads. The client should be responsible for ensuring that clear terms of reference are laid down to cover the whole range and scope of audit and for commissioning audits at appropriate stages. The role of the client is thus to:

- Select an appropriate auditor,
- Provide all the relevant and necessary documents, and
- Hold a commencement meeting with the auditor and the client.

Role of auditor

Auditor's responsibility is to carefully review the presented project material in its entirety, in the light of best road safety expertise and from the viewpoints of all relevant road users. Auditor also indicates all circumstances that cause misgivings concerning road safety. Persons designated as Road Safety Auditors work with, and have experience of, road accident analyses and road accident reduction. Auditors must

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be familiar with road planning, design and construction work and must undertake to keep their expertise up-to-date.

Auditors should comply with the terms of reference. They should comment only on the safety implications of schemes and provide constructive recommendations as to how any potential difficulties can be resolved. The role of the auditor is thus to:

- Review all the documents and audit the drawings and designs,
- Inspect the site (including during night time),
- Repeat these two steps,
- Prepare a report,
- Hold a completion meeting with the designer or client or both,
- Participate in the meeting organized by the client sequel to designers reactions in the Auditor's Report.

10.7 WAYS OF ORGANIZING A ROAD SAFETY AUDIT

There are many ways of organizing a road safety audit. However, the two essential attributes of road safety auditor are that the person should be skilled and independent. Practically, two options are there for conducting a road safety audit:

- Audit by specialist auditors,
- Audit by those within the original design team or by other road designers.

In case of audit by specialist auditors, team needs to be a separate entity from the normal road design functions of an organization and team members should not, except for the purpose of an audit, be involved with the design of the project. There needs to be a clear understanding, prior to commencement of an audit, about how the audit findings and recommendations will be dealt with. Someone has to consider the safety recommendations and resolve the inevitable trade-offs i.e., project cost, road capacity, likelihood of severity of accidents, etc. In every case where an audit recommendation is rejected, the reasons must be stated and documented. Other ways of dealing with audit recommendations can include:

- A requirement that each recommendation must be formally considered by the client with a view to its acceptance in a normal course and the work cannot proceed to the next stage until formal written approval has been issued by the client based on the recommendations of the audit team.
- The audit recommendations are considered by the designers, or by the project manager. This has the risk that the safety concerns may be rationalized away, in the atmosphere of keeping the project moving with minimal changes.

Instead of using specialist auditors, another designer or design team could undertake the audit. This approach may be applicable in organisations, which have sufficient road design work to have two or more separate design teams. This separation provides a level of independence. But this arrangement does not provide for the one essential ingredient in any road safety audit experience in road safety engineering. Using auditors from within the same organisation also has its limitations. It may be

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considered that the original designer can audit his or her own designs, on the basis that this is better than nothing. However, this option does not meet requirement of independence. Experience shows that no matter how concerned a designer or design team is about road safety, it is almost inevitable that they will be too close to the issues in the design to apply the 'fresh pair of eyes' needed to inquire into design policies, approaches or details. A more effective way to organize a road safety audit is to engage specialist auditor(s) who is(are) independent and possess requisite road safety engineering skills and experience. The independence of the RSA Team is vital to ensure that the design team does not influence the recommendations of the Safety Audit and, therefore, compromise safety at the expense of other issues. This, however, does not mean that there should not be any interaction between the Design Team and the Safety Auditors. A meeting between Safety Auditors at the start and at the end of the audit process would be useful and Safety Auditors could be asked to provide advice on safety issues during the design. However, the independence of the Audit Team is critical and should not be compromised.

10.8 STAGES OF ROAD SAFETY AUDIT (RSA)

As per the scope of works RSA needs to be performed in the following stages:

- During Feasibility Study Stage (planning stage)
- On completion of Preliminary Design Stage
- On completion of Detailed Design Stage

This report is related to safety audit report at feasibility study stage (planning stage). The audit team reviewed proposed design from road safety perspective and checked the following aspects. RSA related to construction stage and monitoring existing road stage is not discussed here.

10.9 ASPECTS TO BE CHECKED

Broadly following items have been checked or reviewed during the feasibility study stage based on site data, existing road and proposed designs.

- Safety and operational implications of proposed alignment and junction strategy with particular references to expected road users and vehicle types likely to use the road.
- Width options considered for various sections.
- Departures from standards, if any and accordingly actions taken.
- Provisions of pedestrians, cyclists and intermediate transport.
- Safety implications of the schemes beyond its physical limits, i.e., how the scheme fits into its environs and road hierarchy

Road Safety Audit is a formal procedure that uses extensive safety engineering knowledge to identify safety deficiencies in road sections. A broad experience in road, traffic and safety engineering needs to be acquired to ensure that a Road Safety Auditor has the knowledge and ability to refer back to the basic principles in road safety, and propose appropriate mitigation measures. Following points are generally adequately clarified during a road safety audit.

- Confusion or ambiguity due to design layout for road users that could lead to potential road traffic accidents
- Insufficient information for road users

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- Improper visibility, or an obstruction to road view s of road users
- Hazards in layout create or obstacles to road users that could contribute to an increased risk of injuries

In the above cases safety of the scheme may be compromised and remedial measures may be required to remove this potential or actual deficiency. Road users need to perceive and process vast amounts of sensory and visual information to negotiate a road layout. On the other hand role of designer is to provide a safe road environment that should:

- provide adequate information for road users of the layout and conditions ahead;
- provide adequate warning of hazards or unusual layouts ahead;
- provide positive control of road users passage through conflict points or unusual sections;
- provide a road performance that can nullify road user's errors or inappropriate behavior;
- provides clear, concise and phased release of road user information;
- provides a consistent standard of road design and traffic control;
- Provides adequate warning of hazards.

Desirable minimum Design Standards should be used wherever possible and advance information and warning should be used to inform road users of the layout ahead. However, driver overload must be avoided as it may cause road users to focus too much on the unimportant data and shed vital information. Conflicting information, an over abundance of road signs or a lack of delineation can cause overload. Therefore a "safer" road environment can be defined as a layout that:

It is important that a road improvement caters for all road users. Often the needs of the motorist are incorporated within a scheme whilst the needs of the vulnerable user are ignored. The vulnerable road users that need to be considered are: pedestrians – the old, young and those with mobility or sight impairment; cyclists – children, commuters and leisure users and motorcyclists.

Each vulnerable road user has different needs from the road network. In the habitation environment the pedestrian is likely to be the principal user and designs must incorporate safe crossing locations, adequate visibility to and from the crossings and appropriate lighting. In addition to the needs of vulnerable road users, particular attention should be paid to the needs of trucks, buses or other specialist vehicles.

Safe road design varies from the urban to the rural road network; and a number of external factors can create a situation in which a safe road in one location becomes unsafe due to external factors. These factors can include traffic volumes, population density, noise, or road user familiarity. The function of a road should be clear to all road users, and a well planned and defined road hierarchy can assist in providing a safe road network. The design speed can also be an important factor in influencing the safety of a road and should be appropriate to the location, local road users and level of private access control.

One important aspect to the safety of junctions is that layout as well as control method need to be simple and clear, with defined priorities for all road users. The assumption that 'straight on' traffic has priority is widely accepted and it needs to be remembered that alterations to this, despite reinforcement with signs and lines can still be confusing if visual clues such as fences, kerbing or lighting remain unchanged. It is important to attempt to make any minor approach perpendicular to the main road. Y-junctions with acute angles should be avoided. These angled junctions pose problem for road

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users, including restriction of forward and side visibility. Similarly, it is advisable to avoid intersections on the inside of bends as foliage often encroaches into sight lines after several years. Roundabouts used as a form of junction control have their own rules and design requirements. One of the primary requirements in good roundabout design is that the radius is tighter on the entry than the exit. This ensures a slow entry and lower circulating speed. Visibility is a key requirement for all junction types, all road users need to see and be seen by others. Care should be taken with fixing street furniture and vegetation within visibility splays. Vulnerable road users often experience difficulties during crossing at junctions. It is important that their needs are provided for and that safe crossing places are implemented where required.

The relationship between cross-sectional elements (carriageway, shoulders, etc.) and safety is affected by the type and volume of traffic, and also by the surrounding environment. Lane widths can be critical in affecting safety, where they are too narrow vehicles may collide on horizontal curves, and there may also be inadequate space for two wheeled vehicles. Where lane widths are too wide the alignment may encourage excess speed. On high speed links there is a safety benefit to be gained by the provision of a hard shoulder and central reserve gaps should be of adequate width, depending on the size of vehicles turning. Vehicles parked on the carriageway affect the road environment, layout and consequently safety. Safety problems experienced with parked vehicles are:

- Parked vehicles causing physical obstructions which are sideswiped or run into
- Parked vehicles causing sudden braking or nose-to-tail shunts
- Parked vehicles which deflect oncoming vehicles into adjacent vehicle paths
- Parked vehicles blocking visibility for any road user
- Parked vehicles between which pedestrians emerge

To reduce the risk of parked vehicles contributing to an accident it is important that designs should minimize parking in main traffic lanes. Trees and foliage can greatly enhance the environmental impact of the street scene. However, left un-maintained, they can also restrict visibility considerably. In addition to this, saplings grow into large trees, which can provide an unforgiving road hazard in the event of a road traffic accident. With the above discussions and study / analysis of the project road sections safety issues that have been conceived are presented below in Table 10.2.

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TABLE 10.2: ROAD SAFETY ISSUES

<table>
<tr><th rowspan="2">Content</th><th rowspan="2">Items</th><th colspan="2">Observation with respect to Safety</th><th rowspan="2">Remarks</th></tr>
<tr><th>Existing Situation</th><th>Proposed Situation</th></tr>
<tr><td rowspan="2">A1. General</td><td>Departure from Standards</td><td>Average journey speed of the corridor is 25kmph with presence of sharp, zigzag curves and hairpin bends.</td><td rowspan="2">Proposed alignment has been designed based on the design speed adopted for mountainous terrain as per standard specified in IRC SP 73-2015 and hill road manual
(Refer Plan & Profile Drawing CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/PP and Horizontal Alignment Report CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/HAR

<u>For Plain terrain</u>
(1) In Built Up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(2) In Rural Area
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder = 2 x1.0m
Total Roadway Width = 12.00m
<u>For Mountainous terrain</u>
(3) In Built Up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(4) In Rural Area (Both Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side = 2 x1.0m
Total Roadway Width = 12.00m
(5) In Rural Area (One Side Hill & Other Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side =1 x1.0m
Total Roadway Width = 11.00m</td><td>Considering mountainous and plain terrain in general design speed has been adopted as:-
for Plain Terrain
Design Speed
Ruling = 100 kmph,
Limiting = 80 Kmph,
For Mountainous Terrain
Design Speed
Ruling = 60 kmph, Limiting = 40 Kmph However, speed has been reduced upto 20 kmph in case of hair pin bends</td></tr>
<tr><td>Cross sectional Variation

Earthen Shoulder/Gravel Shoulder: 0.50 m – 2.0 m
Total Formation width: 4.0 m to 14 m

<table><tr><th colspan="2">Chainage</th><th rowspan="2">Avg. Crw. Width (m)</th></tr><tr><th>From (km)</th><th>To (km)</th></tr><tr><td>0</td><td>1</td><td>7</td></tr><tr><td>1</td><td>4</td><td>7</td></tr><tr><td>4</td><td>20</td><td>4.5</td></tr><tr><td>20</td><td>82</td><td>4</td></tr><tr><td>82</td><td>109</td><td>3.5</td></tr><tr><td>109</td><td>161.349</td><td>3</td></tr></table></td><td>Extra widening has been provided on the curves having radius less or equal to 300m.</td></tr>
</table>

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Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
			(6) In Through Cutting section Carriageway = 7.0m Hard Shoulder = 2 x 1.5m Drain = 2 x 1.0 m Total Roadway Width = 10.00m For cross-sectional parameters refer TCS Drawing CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/TCS	
	Drainage	Existing drainage condition is poor with improper camber and longitudinal gradient of carriageway and shoulder.	Efficient drainage system is provided along the project road including structure and outfall facility. For quick disposal of precipitations, carriageway and shoulder have the requisite camber and longitudinal gradient. The water from road and adjacent areas to be intercepted and carried through roadside drains to natural outfall. RCC Covered Drain has been provided for effective drainage in built up area. RR Masonry trapezoidal open drain has been provided in hill side for effective surface drainage. Length of covered drain and trapezoidal drain provided is given below: **Package - IVB** Length of Covered Drain = 0 m Length of Open Drain = 8117 m Length of Chute Drain = 0 m For drainage details refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/TCS And CET/4047/NHIDCL/NH-102B/CT/DDPR/PKG-IVB/MISC-07	
	Climatic Conditions	Generally Temperature varies from 5°C to 35°C. The average annual rainfall is 1036 mm.		HFL has been considered to fix road top level at bridge location.
	Landscaping	Landscaping on the existing road is not proper due to irregular spacing of	Proper Road side Plantation is being provided. Protection work shall be given on	Trees and vegetations on the site should be properly trimmed and removed if

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
		trees & absence of proper protection work in hill and valley side.	Hill as well as Valley side. The details are given below: **<u>Package - IVB</u>** Length of Retaining Wall =5347 m Length of Breast Wall = 3121 m Length of Toe Wall = 692 m Metal Beam Crash Barrier = 6139 m For details of Retaining Wall & Breast wall, refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/ MISC- 06 Application of Hydro-seeding has been calculated on cut slope of hill section and the area comes out as: • **Package – IV:** 25200 Sq m	required so that these should not interfere with the overhead services, clear view of signs and efficiency of roadway lighting. A regular program of pruning of the offending trees shall be under-taken as a part of the maintenance operation. Trees shall be selected based on the soil, temperature, rainfall, water level and should be deep rooted to avoid any damage to the pavement crust., rainfall, water level and should be deep rooted to avoid any damage to the pavement crust.
	Service Apparatus	Existing utilities like Electric poles, Transformer, High Tension Line, and Telephone Pole etc. are found along the existing road.	Existing utilities affected due to widening of road shall be relocated at proposed utility corridor within the proposed ROW. Utility corridor is shown in TCS drawing. (Refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/TCS	It will be safe during maintenance
	Lay-byes	No Bus bay and truck lay-byes have been observed along the project road.	Bus bays (42 nos.) at 21 locations are proposed near built-up location for smooth movement of traffic. For typical details of bus-bay and passenger shelter, refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/ MISC- 08 & 09 CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-II/ MISC- 08 & 09 CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-III/ MISC- 08 & 09 CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IV/ MISC- 08 & 09 respectively.	
	Footpaths	No footpaths are observed	Footpaths cum drains of width 1.0	Footpaths are provided for

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Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
		along the existing road.	m are considered in the built-up location. The length of footpath is mentioned below: **Package - IVB** Length of Covered Drain = 0 m (For details, refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/TCS	smooth and safe movement of pedestrian.
	Pedestrian Crossings	No pedestrian crossings are observed along the existing road.	Pedestrian crossings are provided at major intersections and other locations like schools, religious structure etc. where substantial conflicts exist between Vehicular and Pedestrian movement	Installation of proper traffic sign/ signal near pedestrian crossings is mandatory. Pedestrian guard rails may be required to guide people
	Access	Existing situation shows maximum access to the private property.	Private access should be minimized directly from the proposed carriageway by providing footpath at built up locations	Private access needs be minimized to maintain the design speed of the corridor as well safe passage to traffic and persons
	Emergency vehicles	Emergency vehicle have not been found along the existing corridor.	It is proposed to provide Emergency vehicles to operate within a certain time frame along the project road.	
	Public Transport	Existing traffic survey shows that 2 wheeler and car/Jeep/Van are the major public transport compare to bus and minibus along the existing road.	After improvement of road to 2-lane with hard shoulder trucks and public transport like bus and minibus etc. will ply on the proposed road along with motorized and non-motorized other vehicles.	Refer Chapter 6: Traffic Survey and Analysis
	Future Widening	Varies from 7m to 13 m	Proposed ROW required for Rural area = 18.00 to 24.00 m Built-up area = 14.00 m Therefore, land acquisition is required to accommodate future 2 lane proposal.	
	Staging of Contracts	Total project will be executed in four packages.	Design Length of the project road will be 141.029 km.	
	Adjacent Development	Major portion of the alignment consists of single lane bituminous road.	Proposed shoulder on both sides of the carriageway can be used for the movement of slow moving vehicle during emergency as well as parking for stalled vehicle.	(Refer TCS drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/TCS

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Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
A2. Local Alignment	Visibility	Visibility is not proper in many places as the existing profile of the route does not follow required sight distances (horizontal as well as vertical).	In general Intermediate Sight distance is being followed for proposed 2-lane road.	In stretches where intermediate sight distance is not available the profile shall be designed with stopping sight distance and overtaking prohibited traffic sign shall be installed in that location.
	New/Existing Road Interface	Interface with other roads are not smooth with improper horizontal and vertical profile.	New/Existing road interface shall be designed with proper geometry and vertical profile as per codal provision so that the vehicle can moved smoothly & safely.	
	Safety Aids on Steep Hills	Existing alignment shows there is no proper safety in hill and valley section along the project route.	Requirement of Retaining wall, Breast wall, Toe wall have been considered as protective structures for traffic as the proposed road is passing mostly through mountainous terrain.	
A3. Junction	Minimize potential conflicts	Existing junctions are not properly developed with insufficient turning radius and absence of road signage as well as markings.	Major and minor junctions to be developed with proper turning radius, signage and markings to minimize potential conflict between pedestrians and vehicles	Junctions should be developed with proper traffic sign and markings.
	Layout	Layout of the junctions are not proper	Layout of the proposed junctions are to be made with proper turning radius, acceleration/deceleration lane, island and median etc.	These are designed as per respective IRC guidelines and land acquisition to be kept absolute minimum.
	Visibility	Visibility of the existing junctions are not proper	To improve the visibility of the proposed junction's vertical profile of the road shall be designed with intermediate sight distance. If it is not found it should be taken care that at least stopping sight distance should be available throughout.	Traffic Sign at junctions should informative enough.

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Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
A4. Non-Motorized road users provisions	Adjacent Land	Major portion of the alignment consists of single lane road	For smooth movement of non motorized road users, pedestrians and cyclist paved shoulder has been proposed on both side of the carriageway. Also in built up stretches 1.0 m wide footpath cum drain has been proposed for less conflict between fast moving vehicle and pedestrians, cyclists etc.	Refer TCS drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/TCS
A5. Signs and Lighting	Lighting	Insufficient Lighting shall be found in built up areas.	Lighting shall be provided on major junctions, built-up stretches and bus bays locations.	
	Signs/ Markings	Insufficient signs found on existing road. Markings are not found in the existing road.	Traffic Signs and Road Markings are provided on the proposed road for safe guidance of traffic.	For typical details of road sign and marking. Refer TCS drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IVB/ MISC- 02 & 03
A6. Construction and Operation	Build-ability Operational Network Management	Guidelines for safety during construction need to be followed as per IRC: SP-55. Traffic control devices have to be provided as per requirements during construction time. Few of these are: barricading, signs and delineators.		

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CHAPTER - 9
FINANCIAL ANALYSIS

9.1 General

The financial viability analysis for the proposed road forms the basis for assessing whether the project is attractive enough for private sector participation. The analysis ascertains the viability of the investment proposal on BOT format. A provision of maximum 40% government grant is also considered if the project fails to achieve the desire result on BOT format. The financial analysis covers aspects like financing through debt and equity, loan repayment, debt servicing, taxation, depreciation, etc. The viability is evaluated in terms of the Project IRR [Financial Internal Rate of Return (FIRR) on total investment] and the Equity IRR (FIRR on equity investment), using discounted cash flow analysis, where both costs and revenues have been indexed to take account of inflation.

9.2 Tollable Traffic

All motorised vehicles (other than two and three wheelers) on the road would be tolled except certain categories of toll-exempt vehicles such as certain government vehicles, ambulances, fire brigades, etc. Leakage of vehicles from toll plaza has taken as 0% of the total traffic on the road, since the volume is low. According to the guidelines of the MCA, growth rate of traffic is considered as 5% per annum.

9.3 Capital Cost and Phasing

The capital cost of the project relates to construction cost and includes civil works cost for Road, Bridges / CD Structures & Approach roads, Junction Improvement, Project Facilities, Traffic Sign & Road Appurtenances etc. Under BOT format, the government has to provide ROW land free of cost and encumbrances to the concessionaire. The cost for environmental mitigation measures would be borne by the concessionaire. Hence, costs other than for civil works cost and environmental mitigation cost, viz. LA, R&R, afforestation and utility shifting are taken to be borne by executing authority. In order to arrive at the cost for financial analysis, various other components have to be considered, which are discussed in the following paragraphs.

Base Cost

The base cost for financial analysis comprises the cost to the BOT concessionaire and excludes the cost to executing authorities. It includes civil construction cost and pre-operative expenses. The base cost is at 2019 prices.

Other Cost

With a view to account for inflation, Financial Cost comprising processing fee, sponsor's contingency etc, Interest during construction, the base costs have been escalated at a rate of 25

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percent on Civil Cost as per MCA guidelines.

Landed Project Cost

The total landed cost of the project is the cost at the time of commissioning and includes aggregates of civil cost, financial overheads, escalation costs and interest during construction (IDC).

Project Cost Summary

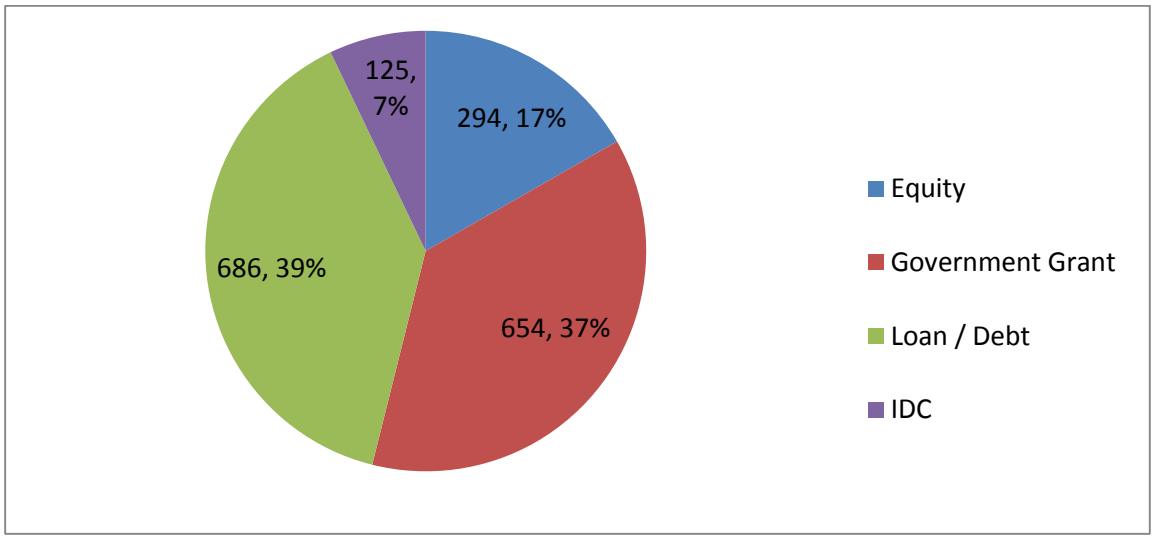
Sl.	Items		Rs. Cr.
A	Total civil cost		1407
B	25% of Civil cost for contingency, supervision, financing cost and interest during construction	Others	227
		IDC	125
C	Total Project Cost		1759

The construction is phased over three years (2020-2022). Cost Phasing would be 30%, 40% & 30% over 3 years.

Under BOT arrangement the permissible maximum limit of viability gap funding is 40% of capital investment.

Grant, Loan & Equity Requirement - during construction *(Rs Crore)*

	Total
Equity	294
Government Grant	654
Loan / Debt	686
IDC	125
Total Project Cost	1759



9.4 Operations and Maintenance Cost

Operation and maintenance cost as considered in the financial analysis is as follows:

- Annual Maintenance @ 0.5% of the Civil Cost on every year
- Periodic Maintenance @ 2% of the Civil Cost at every 5 years
- Toll Collection Expenses @ Rs 5.00 Lacs/year per Toll Plaza
- Office Expenses @ Rs 5.00 Lacs/year per Toll Plaza
- Patrolling, Electricity Expenses @ Rs. 0.40 Lacs/km/year

9.5 Basic Assumptions of Financial Model

Financial viability analysis has been done using a financial model. The model projects the key financial statements of the private investor over the concession period. A concession period of 20 years has been considered. Depreciation of capital items is calculated by using two methods, viz. the Written Down Value (WDV) Method and the Straight Line Method (SLM). The WDV method favours income shielding and is, therefore, used only to calculate taxes payable by the concessionaire. A tax holiday (i.e. 100 percent tax exemption on profits) for a block of 10 years has been assumed as per the Government's latest incentives for encouraging investments in the road sector. These tax incentives must be availed within the first 20 assessment years of operation. The corporate tax rate, at 33.23% is adopted for the analysis. Minimum Alternative Tax (MAT) rate of 19.93% on the book profit is also considered where there is no corporate tax. Summary of assumptions are as below

Operating Year to Traffic	2024 Start
Operating Period	20 Years
PPP Finishes at the end of	2044 End
Construction Start Year	2021 Start
Construction Time	3 Years
Construction End Year	2023 End
Expected Inflation	5%
Year of Accounting	2019
Corporate Tax Rate	33.23%
Minimum Alternate Tax (MAT)	19.93%
Tax Exemption Start	2022
Tax Exemption Length	10 Years
Cost of Equity	15%
No. of Lanes	2 Lane
No. of Toll Plaza	1 No.
Loan Term	20 Years
Moratorium	5 Years
Long Term Loan Rate	12%

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VGF as % of Capex	40%
Debt/Equity Ratio	70%

9.6 Project Revenue

The toll revenue has been calculated for all categories of fast moving vehicles using the project road viz. Car, Bus, LCV, HCV and MAV. The toll rates considered for the analysis are based on existing practices for National Highways.

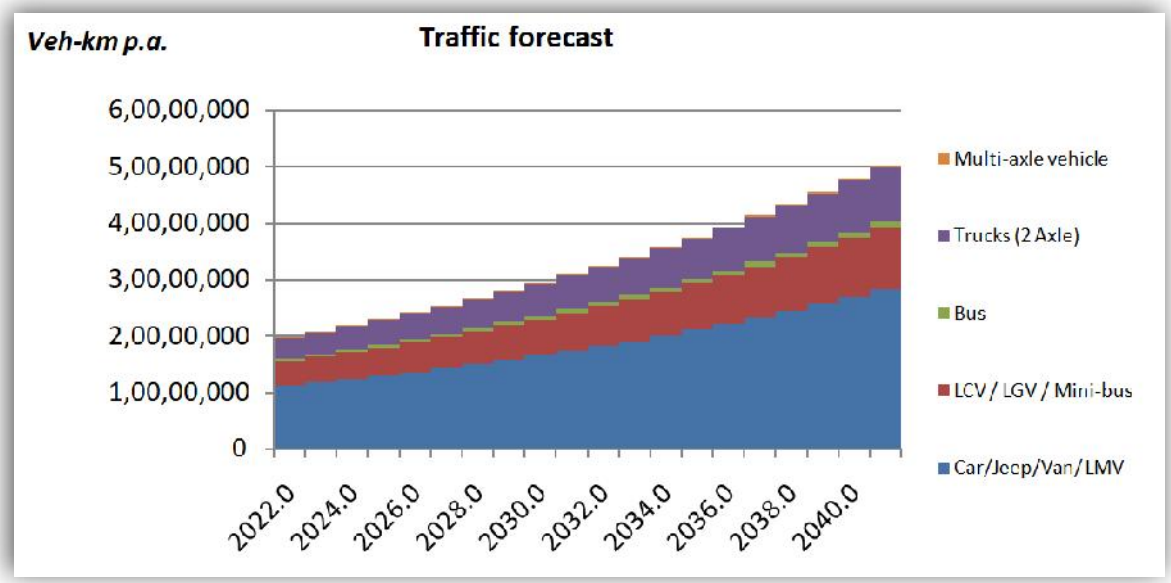
The fees structure / toll rate has been taken from National Highways Fee (Determination of Rates and Collection) Rules, 2008 and Amendment Rules, 2014 (dated 16th January 2014) –

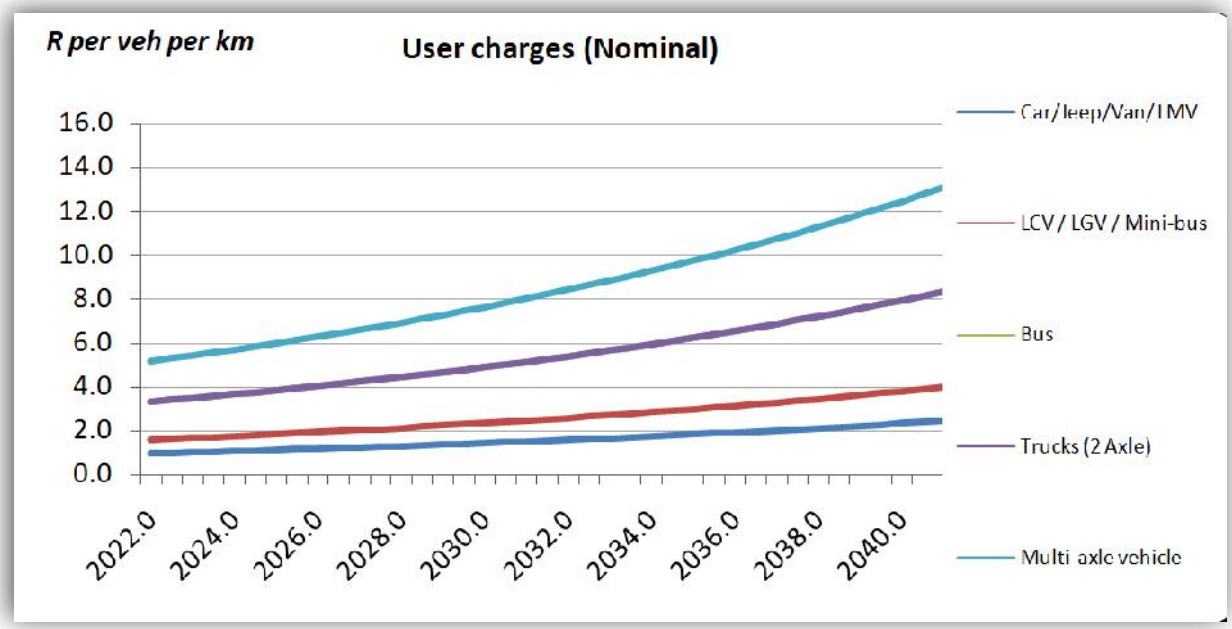
For structures more than 60m, 10 times of the length has been considered
For Bypasses, 1.5 times of the length considered

Toll Rate for 2007-08 base year for 4-Lane National Highway,

Vehicle Type	Base Rate of Fee per Km (In Rs.)
Car, Jeep, Van & LMV	0.65
LCV, LGV, Mini Bus	1.05
Bus, Truck	2.20
HCM, EME, MAV	3.45
Oversized	4.20

Toll Rate for 2-Lane National Highway is 60% of that of 4-Lane National Highway (refer sub rule 3 of Principal Rule 4)
Toll Rates are revised based on WPI as per Rule 5 of (Determination of Rates and Collection) Rules, 2008 and modified subsequently.





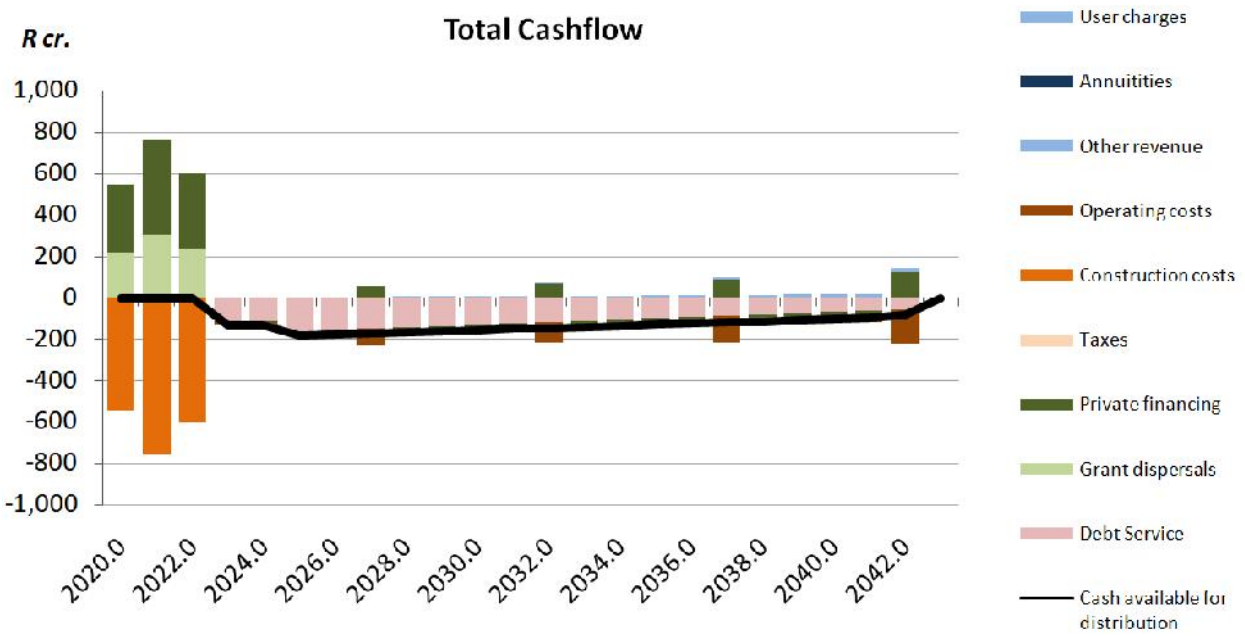
9.7 Financial Viability on BOT – Toll Mode

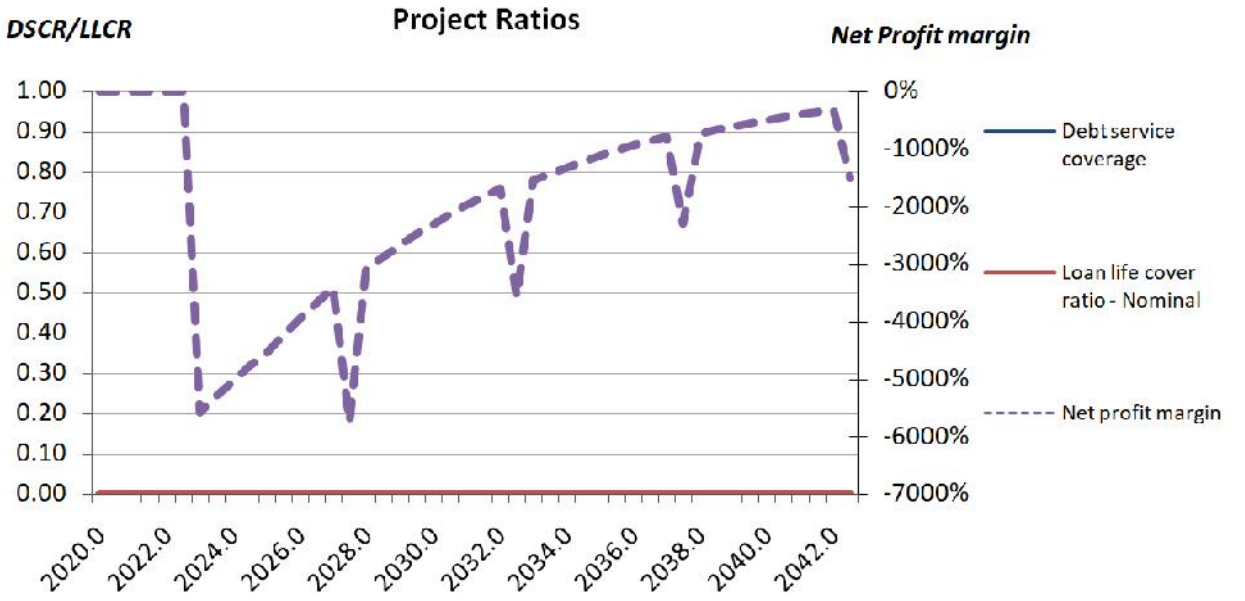
To assess whether the project is commercially viable, the returns to investors, in terms of Project IRR and the Equity IRR, are compared with the target IRRs. The target IRR for the present investment proposal is considered as 15% on equity investment. Since the investment proposal without any government proposal does not yield any result, a 40% grant is considered in the analysis. The entire grant will be provided as equity support.

Results of Financial Analysis on BOT - Toll Basis

Project NPV	Rs cr.	-953
Project IRR	%	Low (Can't be calculated)
Equity NPV	Rs cr.	-240
Equity IRR	%	Low (Can't be calculated)

The return on the proposed investment is not enough even after a VGF of 40% on the TPC as equity support. Thus the project fails on the financial viability.





9.8 Conclusion

The project fails to generate the desired level of return, even with a grant of 40% on TPC. **Thus the project does not qualify to be implemented on the BOT - Toll mode. It's recommended that the project to be implemented through EPC mode.**

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CHAPTER 12
CONCLUSION AND RECOMMENDATION

12.1 CONCLUSIONS AND RECOMMENDATIONS

The project road of Churachandpur-Tuivai Section starts from 3-Legged junction with NH 150 (Old NH 2) at New Lamka town at Churachandpur and ends near Manipur and Mizoram state border at Tuivai in the state of Manipur. The entire corridor falls under Churachandpur district in the State of Manipur. The objective of the project is to upgrade existing single lane road to 2 lanes with hard shoulder configuration. Total Design Length of Package – IVB comes out to be 11.029 km. Total 1 no. Major bridges has been proposed along the project stretch. For proper cross – drainage purpose along the road total 69 nos. culverts have been proposed. All are RCC Box Culverts. Following Flexible Pavement thickness shall be considered on the existing as well as new/ widening portion.

Design Chainage (Km)		Length (km)	MSA for 20 years design period	Design CBR	Type of Pavement	Pavement Thickness over Existing and New/Widening Portion (mm)				Sub-grade in new/widening portion (CBR=10%)
From	To					BC	DBM	WMM	GSB	
130.000	141.029	11.029	20	10%	Flexible	40	70	250	200	500

Retaining Wall of length 5347 m, Breast wall of length 3121 m, Toe wall of length 692 m shall be considered as protective works on valley and hill side. Application of hydro seeding has been considered on the cut portion of hill side slope. Provision of Traffic Guidance and Safety (like road signs, marking, metal beam crash barrier, landscaping, etc.) has been kept for improvement of the project road.

Project will be implemented in seven packages. The package details are:
Package I A: From km 0+000 to km 13+747
Package I B: From km 13+747 to km 32+835
Package II A: km 32+835 to km 48+587
Package II B: km 48+587 to km 69+875
Package III: km 69+875 to km 118+850
Package IV A: km 118+850 to km 130+000
Package IV B: km 130+000 to km 141+029

Civil Cost with per km cost is given below:

Package – IVB
Rs. 116.82 Cr. (Rs. 10.59 Cr/km)

Following charges are added over Civil Cost to derive Total cost of Construction of the project as follows:
(a) Civil Cost including 5% maintenance cost
(b) GST @ 12% of (a)
(c) Contingencies- 2.8% of (a)
(d) Supervision charges- 3% of (a)

(e) Agency Charges-3% of (a)

Therefore, total Construction Cost for various packages comes out as

Package – IVB
Rs. 155.71 Cr. (Rs. 14.12 Cr/km)

The project will be implemented in seven packages on EPC mode.

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