EXECUTIVE SUMMARY

1. INTRODUCTION

Recognizing the current inadequate transportation infrastructure facility of the country and the vital role transportation sector plays in the accelerated economic growth of the country, the Government of India has placed a high priority in this sector's development to meet the current and future highway transportation needs.

The Roads & Bridges Department, Govt. of Sikkim on behalf of the Ministry of Roads Transport and Highway, Govt. of India has prioritized to take up for up gradation and improvement of NH 717-A from Km 0/00 to Km 19/100 to 2-lane NH Standard in Sikkim. The existing road has steep gradient and sharp curves/zigs at various stretches. It is of single lane road with formation width of 6.00 m to 6.50 m without conforming any standard / specification. As a result, the heavily loaded trucks and large sized vehicles find it difficult to pass through these stretches safely.

The existing NH-717 (A) takes off at Km 80.500 on existing NH 10 at Ranipool in East Sikkim and runs towards North to South direction passing through a number of towns/villages like Ranipool - Aho – Yangtam – Panchwati – Pakyong within East District.

Pakyong is connected with State capital and other places by road. Due to the upcoming Green Field Airport road need to be upgraded from exiting Single Lane Road to Double lane road and to keep the road to and fro Pakyong in good trafficable condition is there in the overall interest and benefit of the State in general and for Socio-economic development of the people in Particular. Pakyong, one of the Sub-Division Head Quarters of the East District has been gaining its importance due to upcoming Green Field Airport. It is situated at a distance of 30Km from the Gangtok where all round development is taking place. There is several Educational Institutions like Public School, Senior Secondary School, Government Hospital and other Industrial centers. The State Government has proposed many schemes to attract tourist, the Nathula Trade in between two Giants of Asia has also some influence hence it is fast developing into a tourism centre and becoming an important business centre too. Previously Ranipool -Pakyong Road was under the custody of BRO and now it has been handed over to State PWD (Roads & Bridges).

It is imperative to upgrade the road by widening, improving curves and Bends for proper sight distance so that it can be brought into good condition to provide smooth and good riding quality, to save the time as well as to avert incident of accident during unpleasant weather. There are some vulnerable zones susceptible to landslide which required stabilizing by properly engineered retaining structure. It is equally important to upgrade and replace the old exiting steel bridge near Ranipool Crematorium and 2(two) nos. of RCC Bridges at Andhery and near Aho School.

This is an important NH and life line for the people of the East District of Sikkim & Darjeeling District in West Bangal and a number of villages which are located in the area

adjoining to this road are also heavily dependent on this road for their social and economic development. Thus, the importance of this road and hence the role it plays for the upliftment of the region needs no more emphasis. It is very essential for improvement & up-gradation of existing NH-717-A conforming to National Highway Standards.

2. PROJECT BACKGROUND

The initial stretch of existing / present NH-717 A passes through heavily built-up areas which shall involve costly Land Acquisition and serious resettlement problems for improvement. Due to these reasons, it was felt absolutely necessary to re-align the existing initial stretch of the NH 717 A between km 0/00 – 2/45 by shifting the existing take-off point at km 80/60 to a proposed new take-off point at km 78/100 (i.e. located at out skirt of Ranipool town toward Singtam) on Sevok - Gangtok section of NH-10. The proposed alignment is realigned from the existing road from Km 7/250 to Km 12/520 to bypass the Sinking & Sliding Portion. The proposed realignment take off points are very near due to which, it will not affect and deprive the connectivity with villages and hence, the villagers would be the beneficiaries with the proposed alignment. The proposed re-alignment does not pass through heavily built-up area and would involve much less L.A cost as well as resettlement problem as compared to the existing alignment. The re-alignment also passes through an area with a much better topographical as well as soil conditions. The re-alignment also passes through an area with a much better topographical as well as soil conditions. Hence, apart from the reduction in distance between Pakyong Airport and Capital City Gangtok by Km 2.5, which would greatly benefit for the public in terms of vehicle operating cost and travel time, the proposed re-alignment is technically far better and financially cost effective in the long run.

The existing NH717 (A) was constructed during the reign of Chogyal, the then King of Sikkim and has a total length of 19.10 Kms .The road alignment passes through frequently cultivated land, Forest plantation & habitation etc. The road was constructed to provide connectivity to East Districts of Sikkim. **The road was upgraded to the status of National Highway in the year 2016.** No substantial improvement of the road other than routine normal repairing works have been carried out since the road was declared a National Highway. The pavement work and the permanent works of retaining wall and cross drainage structures were done at the time of construction as per ODR standards and the width of the cross drainage structures are also only 6.0 m. Most of the retaining wall /wing wall had been collapsed and the road formation width also breaches at many stretches.

3. PROJECT ROAD

The stretches of the road under this report is between 00/00 Km to 19/10 Km of NH 717-A as per existing chainage required for up gradation & improvement to standard 2 lane. In this portion of proposed highway, about 88.80 % length of road passes through heavily built-up areas & private land which involve costly Land Acquisition and serious resettlement problems in the existing road. The existing alignment also passes through

steep terrains which are unstable and landslide prone area at many locations which could also posed serious problems in future.

Land use

As per Right of Way of proposed 2 lane standard alignment 26.80 Ha land is required out of which 14.30 Ha existing ROW is already available and 3.0 Ha of forest land at Andheri Khasmal. About 88.80% length of the road passes through land owned/developed by individual land holders under periodic patta and LSC pass, 11.20 % length of the road passes through Reserved Forest & Khasmal Forest. This land will not be available free of cost and also compensation for plantations, crops etc. within the required corridor is to be paid to each individuals.

OBJECTIVE OF THE PROJECT AND SCOPE

a) Objective of the project :

The stretches of the road under this report is between 00/00 Km to 19/100 Km of NH 717(A) as per existing chainage required for up gradation & improvement to 2 lane standard

In order to improve 19.10 Km stretch of existing road to standard 2-lanes, some stretches of the road will have to be re-aligned whereas some existing stretches can be improved to conform to National Highway Specification in respect of its gradient, curves, super elevations etc. Since the proposed Widening to 2-lane with geometric improvement and re-alignment of NH-717 (A) is passing through steep terrain, gorges, nallah etc. Many number of Retaining wall, Breast Walls, Culverts etc have to be constructed.

b) The Scope of the Project

The scope of work includes:-

I. Up-gradation of the existing road, having formation width of about 6.00m to a formation width of 12.0m.
II. Geometric improvement of existing road by short relocation
III. Realignment at the existing road from Km 0+00 to Km 2+45 at Ranipool Town.
IV. Realignment at the existing road from Km 7+250 to Km 12+520.
V. New construction, re-construction of cross-drainage works, protection works, Bridges and side drains along the whole stretch.
VI. New Construction of pavement on full stretch as flexible pavement (GSB+WMM+DBM+BC).
VII. Construction of Bridges at Km 1.20, Km 2.48 & Km 6.11.
VIII. Road signs, stones, safety measures, etc along the whole stretch.

c) Detailed project report consisting of the following:

- Conduct surveys of the existing alignment and collect inventory data.
- Conduct detailed reconnaissance survey and collect relevant data as well as the remote sensing data.
- Conduct detailed topographical, geotechnical / geological, hydrological and environmental surveys on selected alignment.
- Carry out detailed survey for construction materials

- Preparation of detail alignment drawings and geometric designs and prepare cost estimates
- Analyse the traffic census collected by the Department and conduct economic evaluation of various alternatives
- Analyse various alternatives and recommend the most appropriate for detailed design.
- Prepare Detailed Project Reports covering the following :
  - Main Report
  - Design Report & Survey Investigation report
  - Cost Estimate
  - DPR Drawing
  - Land Acquisition & Utility Shifting Details.

4. ENGINEERING SURVEYS AND INVESTIGATIONS

Detailed engineering surveys and investigation have been carried out along the selected alignment of the project road and major findings are as given below:

a) Terrain:

The alignment of the project road passes through mountainous and steep terrain exceeding 30 % ground slope across the alignment.

b) Rainfall:

The proposed road is in heavy rainfall area. Monsoon period is between May and September when construction work is practically impossible.

c) Topographical Survey:

The topographical survey was conducted with Total Station and Auto Level Bench Marks were established at every kilometer and cross-section levels were recorded at 20m intervals in straight portions in general and at closer intervals at curves and where required. The topo-survey information was then translated into digitized topographical map using suitable mapping software.

d) Alignment & Road Design:

The general alignment of the road under this project is as:

NH 717 (A) Highway from Km 0 /000 to 16/539		Km as per design Chainage
Existing alignment	:	12.989 Km
Re-alignment	:	3.55 Km
Total length of proposed road	:	16.539 Km
Total Length of project road	:	

Road is designed for 2-Lane (12.00 m roadway with 7.00 m carriageway).

Gradient, being the most important parameter, has been the guiding factor. Ruling gradient less than 6.7% has been achieved in most point of the road and the maximum gradient being 8.70 % from Km 15+ 860 to Km 16+270 (420.0 m) due Airport portion built-up stretch.

e) Realignment of existing road:

For improvement of existing road at some stretches relocation and re-grading are proposed due to which traffic movement on existing road would be disturbed. Permanent diversion will be included in the design as to minimizing the structure damage, reducing cost of resettlement and easy and faster movement of vehicles. Details of re-alignment is as follows

Sr. No.	Name of Town	Design Chainage		Existing Chainage		Length in Km
		From	To	From	To	
1	Ranipool	0+00	1+400	0+00	2+450	1.40
2	Andheri Khola	5+800	7+950	7+250	12+520	2.15
					Total	**3.55**

f) Soil:

The soil along the alignment of the project is fairly homogenous in nature and character. Soil types vary from silty clay to sandy clay of medium plasticity, plasticity index varying from 7 to 18.The soaked CBR value ranges from 5 to 7.

g) Construction Material and Stones:

The rock deposits are available along or the vicinity of the project road alignment. Besides, cobbles, pebbles and sand deposits are available in the rivers or streams crossing the main alignment. Construction materials for GSB, Cross drainage & Masonry R/Wall etc. works, will be available at local quarry within the project corridor and WMM, DBM & BC material from Teesta River & LANCO Tunnel excavated mug within the project corridor .Water Absorption and AIV of these quarries are within the limit of the Ministry's Specifications. Bitumen, steel and cement will have to be taken from Siliguri.

5. TRAFFIC SURVEY, ANALYSIS & FORECAST

This is to assess the capacity requirements, pavement design, identify present and likely future traffic conditions and to have provisions for future improvements.

From traffic volume counts the following observations are made,

Location	Average daily traffic intensity (PCU)	Average daily traffic intensity (CVD)	peak Hour Traffic Nos/PCU	Peak Hour Traffic ratio in %	Time of Peak Traffic
Ranipool – Pakyong	1385	464	543/768	7.84	11AM -12 AM

(i) There are large numbers of Cars, bus and two wheelers using the road (69.57%).

(ii) Traffic is dominated by the passenger vehicles (cars and two wheelers).

(iii) The heavy vehicle traffic (29.91%) as compared to the passenger traffic (69.57%).

Capacity analysis is fundamental to the planning, design and operation of roads and provides among other things the basis for determining the carriageway width to be provided at any point in a road network with respect to the volume and composition of traffic. It is also a valuable tool for evaluation of the investments needed for future road construction and improvements and for working out priorities between competing Projects. The NH road has been considered for two lanes.

- Therefore, No of commercial vehicles per day for design taking into consideration 7.5% per annum growth rate and a pavement life of 15 years
- After 15 years design life PCU per day : 5885
- Design road capacity (Service volume) for hill road for high curvature (above 200 degrees per Km) for 2 lane ,greater than 4500 PCU
- Hence existing road need to be upgrade for 2 lane standard

6. SALIENT FEATURES OF THE PROJECT

Salient Features

Salient features based on design are as below:

- Length of Project Road Sector 16.539 Km
- The road has a ROW of 24.00 m at open area & 20.00 m at built up area
- The formation width is 12.0m (Km 0.0 to Km 15.50) & 6.0 (Km 15.50 to Km 16.539)
- The Highway is designed for 2-lane carriageway of 7.0 m width.
- The Highway is designed with flexible pavement
- Paved shoulders of 1.50 m are provided both sides.
- All structures are matching to 2 lane NH roadway standard.
- Route Alignment: The Project Corridor takes off from Km 80.500 on existing NH 10 at Ranipool in East Sikkim then passes through the 3 Nos of villages & 2 Nos Towns and terminate at Km 16/539 at Paykong Airport in East District.
- Drains: Lined Drain.
- Landslide: 2 Nos. Major land slide locations.
- Sinking Portion: 3 Locations.
- Damaged road: 2 locations.
- Junctions – 08 Nos., Major Junctions – 3 & Minor Junctions – 5 Nos
- Bridges – 3 Nos. 2 Major bridge over Ranikhola at Ranipool and over the Aho Khola & 1 Nos of Minor bridge over Andheri Khola
- Items for Road Safety, Roadside Amenities and Road Furniture are provided.

a) Cross Section Elements:

The design standards of relevant Indian Roads Congress for Roads and Bridges are adopted for cross section designs of the project road. The earlier items of construction may involve construction of the road formation, cross-drainage works including construction of major bridges for 2-lane standard and protection works. The later stage of the construction will cover the construction of Pavement for double lane (7.00 m wide) NH standard. The proposed cross section element with dimensions is shown in table below:

Sl.No.	Design elements	Dimensions
1	Roadway width	
	At roads and culverts*	12.00 m & 10.80m
	At bridges**	10.50m
2	Carriageway width	7.00 m
3	Cross slopes/Camber at straight reaches	2.5%

**Roadway width is inclusive of side drain and parapet wall/crash barrier (IRC SP: 48)*
***Roadway width is exclusive of kerbs*

b) Road Geometry:

The project corridor passes through steep and mountainous terrain. The design speed adopted is 30km/hour (IRC SP: 48). Along the proposed alignment, there will be no hair-pin bend. However minimum design speed has been considered on technical grounds. The vertical and horizontal alignments of the proposed road can be summarized as shown in table below:

Project Road length	No. of Curves with Design Speed in km/h				No. of Curves with Radius (m)		
	<30	30-40	40-50	>50	<30	30-50	>50
16.539 Km	51	181	0	10	30	92	120

Project road length	Length Distribution (km) and Gradient Class				
	<4%	4%-5%	5%-6%	6%-7%	7%-8%
16.539 Km	5.94 Km	2.53 Km	4.14 Km	3.509 Km	0.420 Km

c) Design of Embankment/Hill Cutting

Considering the physical features, particularly the terrain, soil classification and hill slope line, typical cross-section (Type 1F to Type 21F) have been developed for hill road cutting /embankment building.

Concept Plan of the design of the embankment / hill cutting (stretch-wise) has been developed with specific mention of the formation building methodology / type to be adopted.

d) Land Slide Prone & Sinking Area

Land slide and sinking prone location noticed and subsequence measures are proposed.

Sr.No.	Landslide Location		Disaster Type	Soil/Rock Condition	Landslide Size	
	Start	End			Length	Width
1	6300	6340	Sinking Portion	Soil	40	30
2	7250	7300	Sinking Portion	Soft rock	50	30
3	18550	18650	Sliding Portion	Soft rock	100	30
5	18920	18980	Sinking Portion	Soft rock	60	30

Landslide Countermeasure Work: Gabion toe wall, Vegetation Mat (Steep Slope), Crib Work, Groundwater Drainage Work, Anchor Work & Rock-bolt Work.

e) Dumping area identified on the Proposed Road

It has been estimated that about 8.59 Lakhs cum of spoil will be generated due to widening of this road. Only 6.00% of the spoil will be reused during construction of the road rest will be disposed off in an environmental friendly manner. Consultant has identified 2 disposal sites but which are not sufficient to accommodate the spoil. More sites need to be identified based on consultation with communities.

This remaining earth shall be disposed off in an environmentally suitable manner. Certain guidelines for debris disposal are given below.

- The debris generated shall be disposed of within designated areas only.
- The filled up area shall be used for designated purposes such as: Play ground, Truck Lay-by, short relocation & realignment portion.

There are 3 No. of dumping areas on the Proposed Road

Sr.No.	Chainage		Side	Remarks
	From	To		
1	**6400**	**6500**	**LHS**	**Gabion toe wall & compaction of disposal material**
2	**Topkhani on NH-10**		**RHS**	

f) Pavement Design

It is based upon CVD-464, CBR-5%, Traffic msa -8.3, Design period – 15 years, VDF-1.5, Annual Growth of traffic rate 7.5% and Design speed 30.00 Km/h. However the proposed pavement composition is based on CBR-5% and msa -10.

Pavement composition is designed as under:

Proposed pavement.

BC	:	40 mm
DBM	:	60 mm
WMM in 2-layers	:	250mm
GSB in 2-layers	:	250 mm
Total	:	600 mm

h) Shoulder Design

The carriageway width of 7m and paved shoulder width of 1.5 m on each side shall have the same pavement as the carriageway. The remaining 1.0m on each side shall be used to accommodate side drain on hill side or parapet/soft shoulder on valley side. In the hill side, depending on the total width of side drain, there is a small width remaining

between the wall of side drain and paved shoulder, therefore it is also paved to avoid erosion by surface water

i) Culverts:

The project road traverses through mountainous and steep terrains with several natural drainages such as deep gorges, depressions, etc., where perennial water and rain water runoff are collected. Sometimes the storm runoff is accompanied by large quantities of debris from upstream side of the nallahs. Cross-drainage structures/culverts are required at these locations. From the field survey and investigations and geometric design of alignment the requirement of culverts for the whole length of the project have been identified.

Sr.No.	Type of culvert	Description	Span X Depth	Km 0 to Km 16.539
1	Type -1	Pipe Culvert	1.2 D	7
2	Type - 2	Pipe Culvert	1.2 D	24
3	Type – 1	Box Culvert	2.0 X 2.0	31
4	Type – 2	Box Culvert	3.0 x 3.0	4
			Total	66

h) Slope Protection works:

Adequate Protective structures are proposed for retaining of cut/fill slopes to ensure stability of the road formation at locations where required. The proposed type and length of each structure are shown in the table below:

Sr.No.	Description of Item	Unit	Quantity
1	Retaining Wall 3.00m high	Rm	440.00
2	Retaining Wall 4.00m high	Rm	490.00
3	RCC Retaining Wall 5.00m high	Rm	320.00
4	RCC Retaining Wall 7.00m high	Rm	240.00
5	RCC Retaining Wall 9.00m high	Rm	20.00
6	Breast Wall 2.00m high	Rm	4065.00
7	Breast Wall 3.00m high	Rm	1440.00
8	Gabion Wall 2.00 m high	Rm	1040.00
9	Gabion Wall 3.00 m high	Rm	1070.00
10	Toe Wall 2.00 m high	Rm	530.00
11	Toe Wall 3.00 m high	Rm	490.00
12	Cut Slope Wall	Rm	3000
13	Seeding and Mulching (Soil Cut Slope)	sqm	30000
14	Vegetation Mat (Steep Slope)	sqm	1400
15	Crib Work (F300)	sqm	300
16	Crib Work (F500)	sqm	400

Sr.No.	Description of Item	Unit	Quantity
17	Groundwater Drainage Work	Rm	1500
18	Anchor Work	Rm	200
19	Rock-bolt Work	Rm	150

k) Bridge

S/N	From	To	Super structure	Foundation	Remarks	Length in m	Remarks	
1	1000.0	1380.0	PSC	Pile	Ranikhola	380.0	Proposed	Alignment
2	2440.00	2500.00	RCC	Open	Aho Khola	60.0	Existing	Ex.Road
3	6100.00	6120.00	RCC	Open	Andheri Khola	20.0	Existing	Ex.Road

l) Drainage Design

Pavement Drainage includes camber / cross fall of 2.50%.
Slope 3.5 % has been considered for drainage of shoulders.
Roadside drains are designed: Lined drains in case of soils

Sr.No.	Type	Package-1	Remarks
1	Type-1	10396	Ordinary Soil stretch Rocky & Steep Stretch & Catch water drain at box cutting portion
2	Type-2	8989	Built up area

Chutes of the culverts form part of the culvert structure to lead the discharge to the catch-pit or to natural drainage channel.

m) Road Sign, Markings and Furniture

The project design includes (a) Mandatory / Regulatory Signs, (b) Cautionary / Warning Signs and (c) Information Signs.

Route Marker Signs are provided.

KM Stones are included as per type design.

n) Street Furniture

Traffic Safety Posts and Parapet Walls are included.
Traffic Signs Marking & other Road Appurtenances

o) Roadside Amenities

The continuous long distance travel on highways at speed is liable to cause fatigue as also mental tension to the road users. Moreover, the monotony of driving over long sections in the rural areas with no likelihood of any cross traffic brings sense of complacency in many drivers and such distractions could result in serious accidents.

Sr.No.	Description	Nos.	Location
1	Public Toilet	2	Near Ranikhola & Paykong
2	Bus Shed	2	
3	Bazar Shed	2	

7. HYDROLOGICAL & DRAINAGE STUDY

The proposed road alignment is located in hilly terrain wherein the water drains to Rani khoola. The shape and size of the catchment with respect to Major River Rani khoola is defined on the ground. The hydrological investigations shall be carried out to collect the data in respect of catchment characteristics, rainfall, stream channel characteristics, design discharge; water way etc. for all bridges and cross drainage works. Topography of hill generates numerous water courses. Uncontrolled water is the primary cause of problems and even failures of complete sections of roadway structures. The proposed road is widening & up-gradation of existing road formation. The requirement of drains has been identified.

8. GEOLOGY OF THE AREA

The soils in the project area are primarily silty sands with gravel and rock fragments. They have been derived from parent rocks such as quartzite, phyllite, schist, phyllitic quartzite and collumial materials. Soils are generally acidic to very acidic.

The area exposes predominantly low grade metamorphite rocks comprising phyllitic rock with minor quartzites. Based on the field observations and microscopic study, rock of this area can be classified into the following (i) Phyllites (ii) Phyllitic quartzite (iii) Fine grained quartzite interbedded within phyllite bands. The rocks are highly jointed with diversity in their orientations.

9. SEISMICITY OF THE AREA

Sikkim is located in Zone-IV according to seismic zoning map. The state of Sikkim is spread on the Himalayan mountain range with two main thrust faults; Main Boundary Thrust (MBT) and Main Central Trust (MCT) crossing the state. Due to continuous thrusting of Indo-Australian plate against Eurasian plate, Sikkim has been a moderately active seismic region in the historical times.

10. DIVERSION OF EXISTING ROAD DURING CONSTRUCTION

For improvement of existing road some stretches localized, relocation and re-grading are proposed. Due to which traffic movement on existing road will be hamper .Therefore temporary diversion of existing road is very much necessary during construction period.

11. MAINTENANCE OF EXISTING ROAD:

The existing road is the main route to provide connectivity between Sub-Division Head Quarters of the East District and Green Field Airport to rest of Sikkim. The minimum construction time provided for completion of the project is 4(four) years during which maintenance by the PIU will be no longer convenient as the site possession is resorted to hand over to the contractor till completion of the project. Under this circumstance, it is inevitable to keep provision for yearly maintenance of the existing road during

construction and hence a provision of Rs.59.54 lakhs per year is made to make the road playable for all type of vehicles without serious interruption of the traffic flow throughout the year.

Scope of Maintenance:

1) Maintenance of Earthen Shoulder (filling with fresh soil).
2) Filling Pot- holes and Patch Repairs with open - graded Premix surfacing, 20mm.
3) Hill Side Drain Clearance.
4) Land Slide Clearance in soil/ rock
5) Clearing Grass and Removal of Rubbish.
6) Maintenance/repair of culvert/Retaining wall.
7) Clearance of culvert before monsoon
8) Removal of land slide

12. ENVIRONMENTAL IMPACT ASSESSMENT

The proposed up-gradation of NH 717 A from Km 0+00 to Km 16+539 in Sikkim will serve Eastern belt of Sikkim state. The preliminary Environmental Impact Assessment does not envisage any Negative Impact. The preliminary study suggests numerous beneficial impacts on the environment.

As there is no new alignment that passes through forest areas, there are no endanger species both in plants and animals, the project will not attract the provision of Forest (Conservation) Act 1980 vide Govt. of India. Ministry of Environment & Forest No. 4-1/97-FC Dt. 18.2.1998.

Nevertheless, all possible measures will be taken to mitigate any adverse environmental impact the project may cause to the environment.

The air pollution due to emission/effluents from the construction machineries will also be negligible. The stream pollution due to spillage from the construction machineries will also be negligible. As the construction work involves widening of existing road formation, no adverse effect will occur on aquatic life system.

The alignment has been adjoined by private land and households, there will be damage to private crops and plantation, further private house will be affected, and hence relief and rehabilitation scheme shall be required and included in the project.

13. LAND ACQUISITION PLANS AND FOREST CLEARANCE

a) Land Acquisition Plans

The alignment passes through private lands, households, gardens and other properties. Up-gradation of this road by widening the formation width and diversion of the alignment, improving the geometry (including gradient) is going to occupy private properties, crops, plantation, houses, etc. Hence, compensation will be provided for the above properties, as well as relief and rehabilitation wherever the local populations are displaced due to dismantling of their houses. For this matter, required fund shall be required for compensation or relief & rehabilitation.

- The alignment plan was submitted to DC, East vide Letter No. 374/PDS/R&P/973 dated 23/06/2015 and Sub sequential Letter No 161/SDO/P dated 16/07/2015 valuation of house along the project corridor submitted an amount of Rs.4,24,28,045.00 for 31 nos houses.
- Shifting of utilities of along project corridor is already carried out for an amount of Rs.28,461,367.00 via letter No 1 (6) Gen /PSD-I/04/1959 ,dated 20/01/2016 by Energy & Power Department.

b) Forest Clearance

The Sikkim State Forest authorities conducted a detailed survey of the alignment and the following is the findings of that survey:

1) That the proposed road alignment does not form part of National Park, wild life sanctuary, biosphere reserve, tiger reserve, elephant corridor, etc.
(2) No rare/endangered/unique species of flora and fauna are found in the area.
(3) No protected archeological/heritage site /defense establishment or any other important monument is located in the area.
(4) The requirement of forest land as proposed by the user agency is unavoidable and barest minimum for the project. No alternative for the project exists.
(5) No work in violation of the Forest Act has been carried out.

As per Right of Way of proposed 2 lane standard alignment 26.80 Ha land is required out of which 14.30 Ha existing ROW is already available and 3.0 Ha of forest land at Andheri Khasmal. About 88.80% length of the road passes through land owned/developed by individual land holders under periodic patta and LSC pass, 11.20 % length of the road passes through Reserved Forest & Khasmal Forest. This land will not be available free of cost and also compensation for plantations, crops etc. within the required corridor is to be paid to each individuals.

After due verification and assessment, the Estimate for Net Present Value and Compensatory Afforestation was already duly framed by the concerned Environment and Forest Department. Process for obtaining forest clearance is in the hand of the concerned authority of Government of Sikkim which was submitted to the Ministry of Environment and Forests, Government of India under clause 2.5 of forest clearance 1980.

Tentative estimate of the amount Rs.1,87,34,424.00 is already given by the office of the Divisional Forest Office via letter No 1142 dated 20-08-2015

14. MATERIALS, LABOURS AND CONSTRUCTION EQUIPMENTS:

a) Materials:

The rock deposits are available along or the vicinity of the project road alignment. Besides, cobbles, pebbles and sand deposits are available in the rivers or streams crossing the main alignment. Construction materials for GSB, Cross drainage & Masonry R/Wall etc. works, will be available at local quarry within the project corridor and WMM, DBM & BC material from Teesta River & LANCO Tunnel excavated mug within the project corridor .Water Absorption and AIV of these quarries are within the limit of the Ministry's Specifications. Bitumen, steel and cement will have to be taken from Siliguri.

b) Labour:

Local labourers skilled & unskilled are available in plenty. However, where required, imported labourers will also be engaged for road construction works. Since the area is malaria infested, medical assistance with qualified practitioners will be required during the execution of the project. Comparatively higher wages (from the National average) and incentives have to be paid to labourers for the work. It is envisaged that equipment / machine-intensive method would be adopted for proposed construction works.

c) Equipment:

Heavy Machineries like Bull dozers, Excavators, Loaders, Air compressors, Vibratory / Static Road Rollers, Wet-mix plants, Electric generator sets, Motor Graders, Tractor–Rotavators, Hot/batch-mix plants, Paver-finishers, etc. as required for the execution of the work will be arranged by the contractor executing the project.

15. UNIT RATES AND COST ESTIMATES:

The cost estimate for the proposed construction work has been based on the quantities worked out from the design drawings.

a) Unit Rate:

The unit rates for arriving at cost of different components of works are based on Sikkim PWD Schedule of Rates 2012 (for National Highways). For those items of works which are not available in the SOR, separate Analysis of Rates have been carried out and incorporated in this DPR.

- Bitumen (60-70 grade) (Ex-Singtam) (Basic rate = Rs 23976/ MT + 2% CST, Rs 479.5+4% SKVAT, Rs 959.0 + 1% Env Cess (Cost +VAT) Rs. 249.4 +transportation from Barauni to Singtam (462Km xRs.11) Rs.5082.0= Rs 30745.9)

- Emulsion (Ex-Singtam) (Basic rate = Rs 19636.0/ MT + 2% CST, Rs 392.7+4% SKVAT, Rs 785.40 + 1% Env Cess (Cost +VAT) Rs. 204.2 +transportation from Haldia to Singtam (740Km xRs.11) Rs.8140.0= Rs 29158.3)

- Cement (43 grade) (Ex-Singtam) (Basic rate = Rs 4200.00/ MT + 2% CST, Rs 84.0+14.5% SKVAT, Rs 609.0 + 12.5 Rs. ED 525.00 + 1% Env Cess (Cost +VAT) Rs. 48.1 +transportation from Murshidbad to Singtam (467Km xRs.5.6) Rs.2615.2= Rs 8081.3)

- Cold twisted bars (HYSD Fe 500 Bars)(Basic rate = Rs 32000.00/ MT + 2% CST, Rs 640.0+4% SKVAT, Rs 1280.0 + 1% Env Cess (Cost +VAT) Rs. 332.8 +transportation from Siliguri to Singtam (90Km xRs.5.6) Rs.504.0= Rs 34756.8)

- Sand & Aggregate from Teesta River.

b) Project Cost:

The total Project cost for civil construction works and other allied charges and the detail of cost breakup is given in the general abstract of cost in the DPR.

ABSTRACT OF COST ESTIMATE					
Sr. No.	**Items of work**	**Total quantity**	**Unit**	**Amount (Rs)**	**Share**
A.	**CONSTRUCTION COST**				
A1	Formation Cutting	16.54	Km		
a.	Jungle Clearance etc			699,969.50	0.06%
b.	Formation Works	859589.91	Cum	185,291,717.80	16.53%
A2	Protection Works	13145.00	Rm	200,656,606.60	17.90%
A3	Cross Drainage Works	66.00	Nos	88,133,086.69	7.86%
A4	Pavement Works	16.54	Km	348,896,189.59	31.12%
A5	Km Stones & Road Signs	83.00	Nos	7,363,005.00	0.66%
A6	Road Safety Measures	1500.00	Rm	5,454,000.00	0.49%
A7	Diversion of Existing Road During Construction & Development of Link Road and Junction		LS	19,991,864.00	1.78%
A8	Bridge Work		LS	252,300,000.00	22.50%
A9	General Items		LS	12,318,483.55	1.10%
	TOTAL OF (A1 to A8)		**Rs**	**1,121,104,922.73**	100.0%
	CONSTRUCTION COST PER KM		**Rs.**	**67,781,434**	
A10	Escalation for 4 years @ 5%		Rs.	224,220,985	
A11	Contingency (2.8%)		Rs.	37,669,125	
	TOTAL CIVIL WORK COST (A-2)		**Rs.**	**1,382,995,033**	
	CONSTRUCTION COST PER KM		**Rs.**	**83,615,177**	
B	**OTHER COST**				
B1	Construction Supervision Charge (3 %)		Rs.	41,489,851	
B2	Quality Control Charge (0.25%)		Rs.	3,457,488	
B3	Road Safety Audit Charge (0.25%)		Rs.	3,457,488	
B4	Maintenance for 4 Years (0.5% + 1.5% x 3 = 5%)		Rs.	69,149,752	
B5	Escalation (15%)		Rs.	207,449,255	
B6	Agency Charge (3 %)		Rs.	41,489,851	
	TOTAL OF (B)		**Rs.**	**366,493,685**	
	TOTAL PROJECT COST (A) + (B) + (C)		**Rs.**	**1,749,488,718**	
	Say		**Rs.**	**1,749,000,000**	
	COST PER KM		**Rs.**	**105,743,652**	

16. IMPLEMENTATION SCHEDULE

(a) Contract packaging :
The whole project is divided into single packages as given below.

Package No	Package description		Length (km)	Cost (Rs in cr.)	Remarks
	From	To			
Package-1	0.00	16.539	16.539	174.90	Including 1.4 Km length of Ranipool Bye Pass & Bridge over Ranikhola

b) Procurement / Implementation Strategies:

The general conditions of Contract will be as per Standard Bidding Document of Ministry of Shipping, Road Transport and Highways, Government of India, works.

c) Phasing of Construction:

The total cost of the project is Rs 174.90 Cr. which covers costs for formation work, Slope protection and cross drainage works, construction of bridges and pavement works. Construction period of 42 months has been proposed, considering the quantum of activities to be performed including mobilization period needed and four intervening rainy seasons in between.

The project is proposed for commencement during the financial year 2016-2017 with target completion by the year end of 2019-2020. Since the project will be executed through a period of four years there will be cost escalation during the period of construction. Considering the rate of price escalation at an average rate of 5% per annum compounded annually after the initial year, the cost of construction and physical and financial phasing of the project is given in the table below:

Sr.No	Year	Cumulative Physical Target (%)	Cumulative Cost (Rs in crores)
1	2016 -17	15	26.24
2	2017 -18	45	78.71
3	2018 -19	80	148.69
4	2019 - 20	100	174.90

12. TENDER DOCUMENTS:

a) General Conditions of Contract:

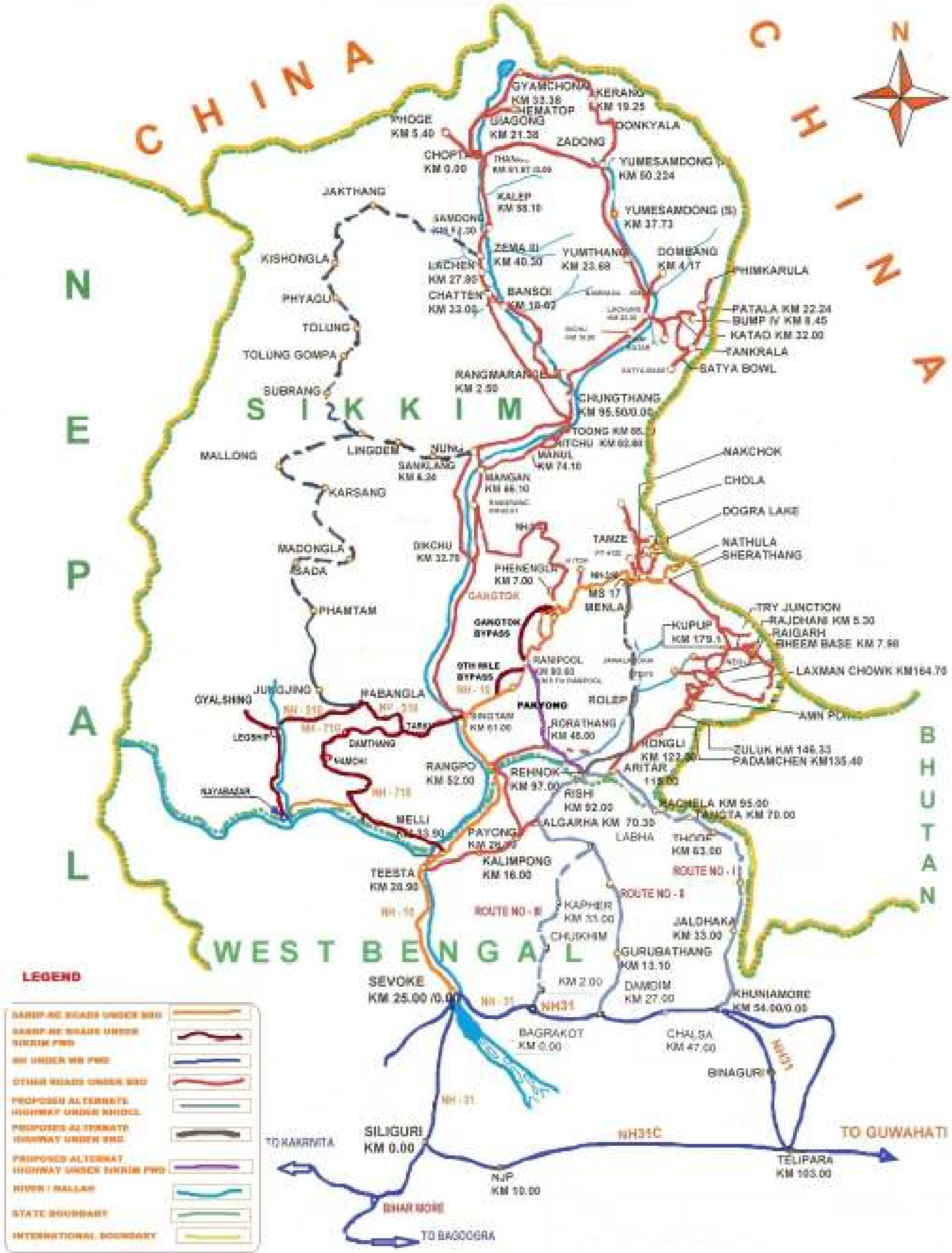
The general conditions of Contract will be as per Standard Bidding Document of Ministry of Shipping, Road Transport and Highways, Government of India, works.

b) Technical Specifications:

The Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" FIFTH REVISION 2013, of the Ministry of Road Transport and Highways, Government of India.

c) Project Drawings:

The Project Drawings as produced in Volume –IV of this Detailed Project Report.


CHINA
NEPAL
SIKKIM
BHUTAN
WEST BENGAL
N
GYAMCHONA KM 33.38
KERANG KM 10.25
CHEMATOP
GIAGONG KM 21.38
DONKYALA
PHOGE KM 5.40
ZADONG
CHOPTA KM 0.00
YUMESAMDONG
KM 50.224
JAKTHANG
KALEP KM 58.10
YUMESAMDONG (S) KM 37.73
SAMDONG
ZEMA II KM 40.30
YUMTHANG KM 23.68
DOMBANG KM 4.17
KISHONGLA
LACHEN KM 27.80
PHIMKARULA
PHYAGU
CHATTEN KM 33.05
BANSOI KM 18.62
PATALA KM 22.24
BUMP IV KM 8.45
TOLUNG
KATAO KM 32.00
TOLUNG GOMPA
TANKRALA
SATYA BOWL
RANGMARANG KM 2.50
SUBRANG
CHUNGTHANG KM 95.50/0.00
MALLONG
LINGDEM
NUNU
SANKLANG KM 6.26
MANUL KM 74.10
NAKCHOK
MANGAN KM 66.10
KARSANG
CHOLA
DOGRA LAKE
TANZE
MADONGLA
SADA
SIKCHU KM 32.75
NATHULA
SHERATHANG
PHENENGLA KM 7.00
GANGTOK
MS 17
MENLA
PHAMTAM
GANGTOK BYPASS
TRY JUNCTION
KUPUP KM 179.1
RAJDHANI KM 5.30
RAIGARH
BHEEM BASE KM 7.96
RANIPOOL
LAXMAN CHOWK KM164.70
JUNGJING
RABANGLA
GYALSHING
NH-10
NH-710
ROLEP
PAKYONG
RORATHANG KM 45.00
AMN POINT
LEGSHIP
DAMTHANG
NAMCHI
RANGPO KM 52.00
REHNOK KM 97.00
RONGLI KM 122.00
ARITAR 118.00
ZULUK KM 146.33
PADAMCHEN KM135.40
RISHI KM 92.00
NAYABAZAR
NH-710
MELLI
ALGARHA KM 70.30
RACHELA KM 95.00
TANGTA KM 70.00
PAYONG
LABHA
THODP KM 63.00
KALIMPONG KM 16.00
TEESTA KM 20.90
ROUTE NO - I
ROUTE NO - II
ROUTE NO - III
NH - 10
KAPHER KM 33.00
CHUKHIM
JALDHAKA KM 33.00
GURUBATHANG KM 13.10
SEVOKE KM 25.00 /0.00
KM 2.00
DAMDIM KM 27.00
NH-31
NH31
KHUNIAMORE KM 54.00/0.00
BAGRAKOT KM 0.00
CHALSA KM 47.00
BINAGURI
NH-31
SILIGURI KM 0.00
NH31C
TO GUWAHATI
TO KAKRNITA
NJP KM 10.00
TELIPARA KM 103.00
BIHAR MORE
TO BAGDOGRA
LEGEND