EXECUTIVE SUMMARY

1.1 Background

Ministry of Road Transport and Highways (Govt. of India) has embarked upon massive up gradation of its road network through National Highway Infrastructure Development Corporation Ltd (NHIDCL) with the purpose of development of highways and any structures thereon and other infrastructure projects entrusted to it . As part of this endeavor, the NHIDCL has been mandated to undertake improvement and up-gradation of various National, State Highways and Major District Roads at different locations in Arunachal Pradesh.

In view of the above work NHIDCL has entrusted **K& J Projects Pvt. Ltd. and Alliance Engineers & Consultants (JV)** to carry out Consultancy Services for preparation of Project Report for 2- laning of Joram-Koloriang Road from km.70/000 to 138/000 (Length :68 km) in the state of Arunachal Pradesh under SARDP-NE on EPC Mode.

The LOA for consultancy services is issued by the authorities vide letter No. NHIDCL/Ar.Pr/Joram-Koloriang/2015/01 dt. 12.08.2015.

The Agreement between authority and consultant was signed on dt. 12.08.2015 and effective commencement date of services is considered as 17.08.2015.The project preparation studies are proposed to carryout accordingly.

The project preparation and investigation studies are proposed to carryout accordingly.

1.2 Project Location

Project Corridor under study is a part of National Highway No.713 This NH is from Joram to Koloriang & about 158 km of length. Study stretch starts from km. 70 to km. 138 of NH-713: The start point of the project road is at New Palinafter crossing the Palin River bridge at(Existing Km 70+000). The end point of study corridor is located at Dangba Village (Existing Km 138+000). Length of about 68km .The Project Road is running South-North between latitudes 27 ^{O}42' 3" N / 93 ^{O} 38' 3" E and 27 ^{O} 51' 51" N / 93 ^{O} 28'5"E. The stretch passed through KraDaadi and KurungKumey Districts of Arunachal Pradesh.

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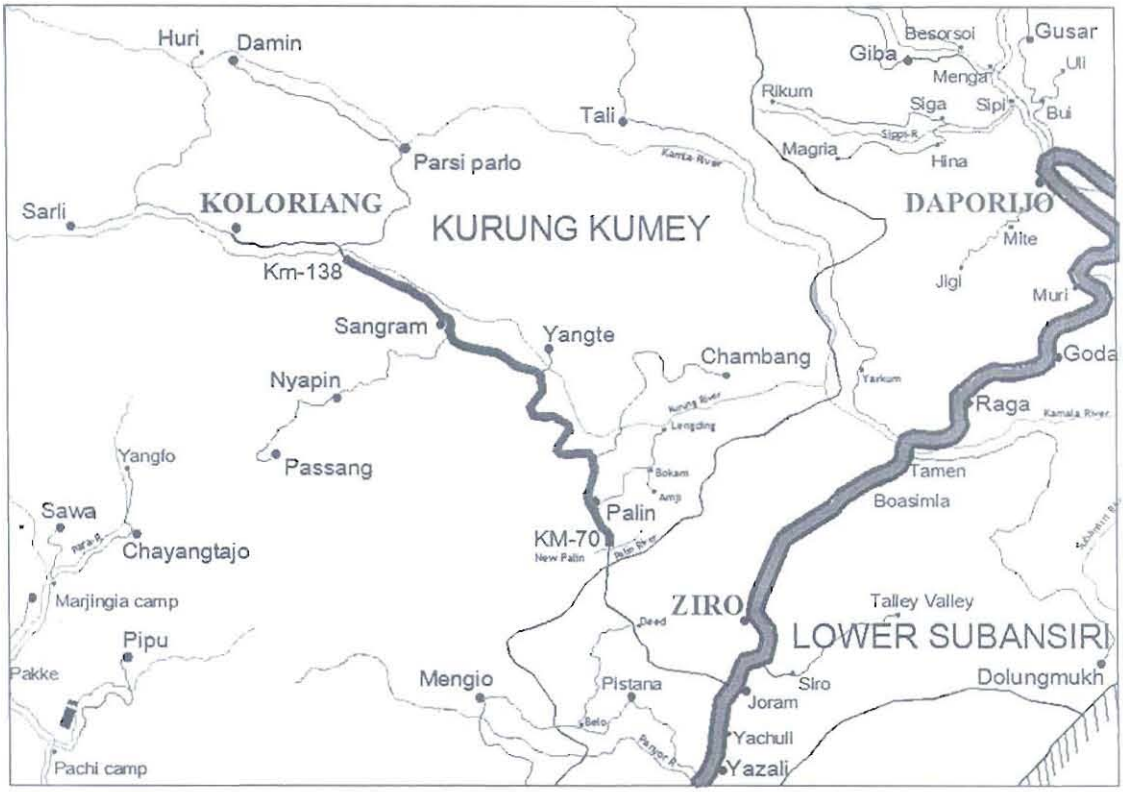
The location plan of project road NH 713 is shown below



Location Plan

1.3 Project Appreciation

The project road is located in the State of Arunachal Pradesh. Arunachal Pradesh is located in North-East Part of India and is surrounded by Assam, Nagaland and Bhutan, Myanmar and China other countries. Most of the traffic on the project road is moving from North Lakhimpur of Assam ,Itanagar capital of Arunachal and district headquarters of Ziro , Daporijo etc. The project road gives connectivity to the thickly populated area of Palin ,SangramKolloriang etc. to the Trans Arunachal Highway. The Project Stretch starts at km.70/000 (New Palin River) and ends at km.138/000. The total length of Project Road under study is 68.00km. There is no existing bypass to any town in entire length of Project Road.Project corridor under study is a part of National Highway No. 713 from Joram to Koloriang. China border is about 20 km from Koloriang. The entire Project Road passes through Hilly terrain. At very many locationsexposedHard Rock strata is found and in the other portions the road passes through Ordinary rock or Soil Strata.

The existing features of the project road is listed below

Sr. No.	Item	Description
1	Terminal Points	Start Point : km 70.000 (New Palin) End Point : km 88.700(at Meer Village)
2	Connectivity	Through start point :Ziro, Potin Through end point :Koloriang, Sarli.
3	Important Settlements	New Palin, Old Palin,LungbaVillage,PaguVillage,Meer Village,Poungung Village, Zero Point Village,Sangram Village,Gante Village ,Yarte Village,Tagum village ,Lill Village and Dangba Village.
4	Terrain	The entire Project Road passes through Hilly terrain in general with some stretch passing through rolling terrain.
5	Land use pattern	In general, Barren Hill/ Agriculture or a mixture of agricultural, open land use pattern is observed. Built-up area with Residential/Commercial activities is seen near the villages.
6	Horizontal Geometry	Poor in general with many sharp curve locations where geometric improvement is required.
7	Vertical Geometry	Good in general at few locations but steep gradient is observed along with roller coaster profile in the project stretches.
8	Pavement Condition	The pavement in the whole road is in deteriorated consdition and requires reconstruction.
9	Existing Carriageway	Surface Type: Bituminous; Width: 3.00m to 4.10m.
10	Existing Shoulder	Type: Earthen; Width: 0.5m-1.5m (Both side)
11	Existing ROW	ROW observed on the Project road varies from 6.0m to 7.0m in the village portions and from 7.00m to 8.0m on open stretches.
12	Bridges	02 nos.
13	Culverts	64 nos.
14	ROB	Nil
15	Existing Bypass	Nil
16	Submergence Stretch	Nil
17	Major Intersections	Nil
18	Minor intersections	08 nos.
19	Existing Utilities	HT line, Electric poles, Transformer, OFC and Water Pipe Lines etc.

1.4 Benefits of the Project

The Project Road serves the traffic coming from North Lakhimpur, Itanagar, Ziro, Raga, Daporizo, Dumporizo etc. moving upto Koloriang. The road is of strategic importance as the international Border with China is only 20 KM

away. Defence vehicles mainly ply in this road. Up gradation of this road is very important not only from the point of connectivity but also from the strategic defence point of view. The construction of the road will also ensure development to the otherwise remote areas in this region.

The proposed project is an up-gradation of existing NH-713 to 2-lane with paved shoulder configuration. In built up areas footpaths were provided on both sides to accommodate the pedestrian activities and ensure safety near the road. The project achieves its significance due to a large number of reasons.

More specifically, the project will:-

a. Enhance the road condition and uses ability of the Trans Arunnachal Highway.
b. Increase travel speeds, and reduce travel time, accidents, and vehicle emissions.
c. Ensure more efficient road asset development and management, and higher quality of construction and maintenance, resulting in decreased recurrent costs over the medium and long term.
d. Accelerate the social and economic development in the state through improves access to socioeconomic services, increase employment opportunities, and improve transport services.
e. Reduction in accidents and pollution
f. Better approach to Medical & Educational services and quick transportation of perishable goods like fruits, vegetables and dairy products.

1.5 Traffic Analysis

To establish the traffic characteristics along the project road, Consultants have carried out 7 days Classified Traffic Volume Counts, Pedestrian/ animal cross count survey etc.

The Average Annual Daily Traffic (AADT) in the base year 2015 on the three (3) locations is presented below

The AADT in the Year 2015

Homogeneous Traffic Section	AADT (Nos)	AADT (PCU)
At 70th Km	621	649
At 95th Km	530	531
At 118th Km	398	410

The traffic growth rates are considered as 5% as per Clause 4.2.2 of IRC:37-2012.

The projected traffic for 20 years considering the above growth rate are given below.

Projected Traffic

Year	At Km 70 (New Palin)		At Km 95 (Meer)		At Km 118 (Sangram)	
	Nos.	PCU	Nos.	PCU	Nos.	PCU
2015	621	649	530	531	398	410
2016	652	681	557	558	418	431
2017	685	716	584	585	439	452
2018	719	751	614	615	461	475
2019	755	789	644	645	484	498
2020	793	828	676	678	508	523
2021	832	870	710	712	533	549
2022	874	913	746	747	560	577
2023	917	959	783	785	588	606
2024	963	1007	822	824	617	636
2025	1012	1057	863	865	648	668
2026	1062	1110	906	908	681	701
2027	1115	1166	952	954	715	736
2028	1171	1224	999	1001	750	773
2029	1230	1285	1049	1051	788	812
2030	1291	1349	1102	1104	827	852
2031	1356	1417	1157	1159	869	895
2032	1423	1488	1215	1217	912	940
2033	1495	1562	1276	1278	958	987
2034	1569	1640	1339	1342	1006	1036
2035	1648	1722	1406	1409	1056	1088

1.6 Improvement Proposal

Improvement Proposal of the project road are:

i) Horizontal sharp curves and bends are duly modified by adopting the radius of curvature as per IRC Specifications. The road is designed for a speed of 40kmph. At obligatory sharp horizontal curves, the design speed has to be restricted to 30 kmph making the radius of curvature as 30m.

ii) The width of the carriageway is widened to 7.0m throughout the entire length with 1.50m paved shoulder on both sides in open country locations and 1.0 m earthen shoulder on valley side where retaining wall is not provided. In built-up zones the 7.0m carriageway is provided with 1.5 m raised footpath on both the sides.

iii) Road side CC drains are provided on the hill sides of the alignment.

iv) At steep hill cutting locations, catch water drains were provided to arrest the rainwater for destabilising the hill slopes.

v) 02 Minor Bridges are proposed to be constructed.

vi) 82 Nos. of Box Culverts are proposed to be constructed.

vii) The entire road is designed as Flexible Pavement.

viii)11 minor junctions are proposed to be developed.

ix) Retaining Wall, PCC/Stone crated Breast wall are provided for a length of 927 m and 4620 m.

x) Road furniture like Road Signs, Markings, Metal Beam Crash Barrier, Guard posts, KM Stones, Hectometre and 5th KM stones etc. are proposed for the road stretch.

xi) Rumble strips are proposed to be provided before and on valley side of sharp curves.

xii) The provisions of vetiver grass in the hill slopes for stabilisation are also provided.

xiii)Pick-up Bus stop are provided at 04 locations (Both Sides)

1.7 Pavement Design

The existing pavement is proposed to be reconstructed. Flexible pavement is proposed is proposed in the project road, Flexible pavement is designed for a design period of 15 (Fifteen) years.

Design Traffic

The cumulative standard axels calculated from the traffic survey is found to 4.44msa which is lower than the minimum design traffic of 20 msa as per clause 5.4.1 (i) of IRC SP 73 2015. Therefore, for pavement design a design traffic of 20 msa is considered.

Requirement of CBR for Subgrade

The minimum CBR of subgrade for pavement design is should to be8% as per IRC 37 clause 5.1.

Pavement Composition

As per pavement Design the composition of the pavement works out to be

BC	=	40	mm
DBM	=	85	mm
WMM	=	250	mm
GSB	=	200	mm
	Total =	**575**	**mm**

1.8 Cross Drainage works

All CD structures constructed are proposed for reconstruction. Reconstruction/ widening / new construction of the Box Culverts are proposed to meet the latest National Highway standards. The Geometric Standards of culverts has been adopted in accordance with IRC:SP:73:2015.

The proposals for cross drainage structures are as follows:

ABSTRACT OF CD STRUCTURES

No.	Culvert Type	Size	Number
1	Box	1x2x2	24
2	Box	1x3x3	38
3	Box	1x3x4	1
4	Box	1x4x3	5
5	Box	1x4x4	8
6	Box	1x5x3	1
7	Box	1x6x3	-
8	Box	1x6x4	-
9	Box	1x6x6/3	5
		Total =	82

1.9 Minor/Major Bridges

All single lane Baily bridges present at site are proposed for reconstruction. Geometric standard of all Minor and Major Bridges/ Box culverts/ROBs for two lane + paved shoulder section has been adopted in accordance with IRC-SP-73:2015.

7 No. of minor bridges are proposed to be constructed. The proposals for Bridges are as follows:

Abstract of Bridge

Sl. No.	Chainage at Centre of Bridge (Km)	Bridge Details				
		Type	Span Arrangement (m)		Type of Superstructure	Type of Foundation
			C-C Exp. Jt.	C-C Brg.		
1	71.383	RCC	22000	20800	*RCC Girder*	*Open Foundation*
2	73.453	RCC	52000	49500	PSC Box Girder	Open Foundation

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1.10 Junctions

The project road does not have any major Junctions. 22 No. of minor Junctions are required to be developed. The Details of the Junctions are as below:

Sl.No.	Chainage	Type	Side	Location	Remarks
1	60.463	T	RHS	New Palin	
2	61.333	T	LHS	New Palin	
3	61.843	Y	RHS	New Palin	
4	62.373	T	RHS	New Palin	
5	62.663	T	RHS	Old Palin	
6	65.363	Y	RHS	Old Palin	
7	66.163	Y	RHS	Old Palin	
8	66.643	Y	RHS	Old Palin	
10	66.888	Y	LHS	Old Palin	
11	75.963	Y	LHS	Meer	

1.11 Road side Furniture

Road side Furniture are proposed to be provided as follows: -

(i) Traffic Signs and Pavement Markings

Traffic signs and pavement markings includes road side signs, overhead signs, curve mounted signs and road marking along the project highway.

(ii) Metal beam crash barrier, Separators (MS railings)

(iii) The minimum length of 1446 m Metal beam crash barrier along built up area is proposed for safety of traffic & users.

(iv) Hectometre, Kilometre Stones are proposed as per requirement.

1.12 Pedestrian Facilities

The additional pedestrians' facilities in the form of guard rails, footpath, lighting etc. are proposed in built-up area.

1.13 Landscaping and Tree Plantation

Landscaping of the highway is proposed

1.14 Others

1. Highway Lighting
   i) Street Lights are provided in built-up areas.

ii) Solar lights blinkers are proposed at major & minor junctions and bus shelters.

2. Slope protection

The hill slope protections are proposed in the form of vetiver plantations.

3. Road Safety Measures

Rumble strips are provided on the sharp curves in the valley side approach, crash barriers were provided in accident prone areas

1.15 Flyover / Underpasses

There is no provision of Flyover/Underpass .

1.16 Land Acquisition (in Hect.) :

Land acquisition is under process.

1.17 Project Clearance

The status of various clearances from respective Government Departments is as under.

(i) Shifting of utilities such as, Electrical poles, Telephone poles relevant documents are to be submitted to respective departments by the consultants only after proposed development of project road finalization.

(ii) Forest and Environmental clearance of the project is under process.

1.18Project Cost

Bill No	Item of works and Sub-Heads	Unit	Quantity	Cost (Rs. lakhs)
1	SITE CLEARANCE AND DISMANTLING	Km	18.000	47.932
2	EARTH WORK	Cum	3389691	5169.339
3	Granular work (sub- base, base, shoulders)	Km	18.00	2379.18
4	BITUMINOUS COURSES (125 mm)	Km	18.00	2977.62
5	CULVERTS (82 Nos.)			
	a) RCC Box Culverts (2x2)	Nos.	24	3503.25
	b) RCC Box Culverts (3x3)	Nos.	38	
	c) RCC Box Culverts (3x4)	Nos.	1	
	d) RCC Box Culverts (4x3)	Nos.	5	
	e) RCC Box Culverts (4x4)	Nos.	8	
	f) RCC Box Culverts (5x3)	Nos.	1	
	g) RCC Box Culverts (1/6x6/3)	Nos.	5	
6	DRAINAGE AND PROTECTIVE WORKS			
	a) Road Side Drain	Mtr.	26973	1854.87
	b) Breast wall	Mtr.	4620	536.50
	c) Retaining wall	Mtr.	927	3084.90
	d) Catch water drain	Mtr.	4620	117.90
	e) Vetiver Plantation for slope Protection work	sqm	256163	520.01
	f) Solid Footpath	Mtr.	3462	486.54
	g) Pickup Bus Stop	Nos.	4	81.71
	h) Cross Road	Nos.	11	40.10
7	TRAFFIC SIGNS, MARKINGS AND OTHER ROAD APPURTENANCES	Km	18.00	181.99
8	BRIDGE	Nos.	2	689.572
A	Civil cost (inc. labour cess) (in Lakhs) =		:	**21671.41**
B	Contingency Charges@ 2.8% of Civil Cost =		:	606.80
C	Sub Total (A+B) =		:	**22278.21**
D	Supervision Charges @ 3% on C =		:	668.35
E	Agency Charges @ 3% on C =		:	668.35
F	Quality Control @ 0.25% on C =		:	55.70
G	Road Safety Cell Audit Charges @ 0.25% on C =		:	55.70
H	Maintenance @ 5% on C =		:	1113.91
I	Escalation @5% per annum for 3 years on C =		:	3341.73
J	Grand Total (C+D+E+F+G+H+I) =		:	**28181.94**