STATEMENT OF CASE

Brief note on proposed alignment passing through Tenga Reserve Forest near Khupi.

1.0 Location

	From	To	Length
Existing Chainage	19+100	28+500	9.4 km
Project Chainage	17+280	20+850	3.57 km
Segment 1B Chainage	0+100	3+670	3.57 km
Latitude	27.210900^0	92.684751^0	
Longitude	27.222652^0	92.711283^0	
Nearby Built-up areas	Khupi		

2.0 Problems with Existing Alignment

The alignment in this section from exist. Km 19.100 to Km 28.500 is single lane BT road with 6-7m formation width and passes through built-up area of Khupi Village at Km 19.100. The improvements along the existing road would involve acquisition of all roadside structures of Khupi village in a length of 150m.

The geometry of the existing road is very poor with substandard curves all along the section. The radius of most of horizontal curves is as low as 25m and does not confirm to IRC standards. There are 73 nos. of horizontal curves @ an average of 8 curves/km and an average degree of curvature is 910 deg/km. These values show that the geometry of the existing road is very substandard. This geometry coupled with the vertical grades and steep hill slopes restricts the visibility in lateral direction and thus accident prone.

The gradient of the existing road for 84% length is less than 5% and for remaining 16% length gradient is steep and goes upto 10%. The existing road goes in up gradient from RL 1487 to RL 1666 with smooth vertical geometry and then comes down to RL 1560 with steep grades. The gradients in the initial sections i.e., from Km 19.370 to Km 24+000 are smooth, whereas, from Km 24.000 to Km 28.750 gradient is steep. It is to be noted that, as the horizontal curvature of the existing road is very high and improvement of horizontal curves would result in reduction in length, and thus increases the vertical gradients of already steep road. The geometry of existing road can only be improved by re-alignment.

The details of existing geometry are given in the following table.

Table 1.0: Details of Existing Geometry

Exist. Chaiange		No. of Curves	Degree of Curvature	Rise/Fall (m)	Grade							
From	To				<=4	>4 & <=5	>5 & <=6	>6 & <=7	>7 & <=8	>8 & <=9	>9 & <=10	>10
19370	20000	13	931.482	30.874	242.985	225.923	123.205	50.892	27.230	29.008	0.000	0.757
20000	21000	5	1079.480	31.856	675.964	261.166	39.896	20.344	2.630	0.000	0.000	0.000
21000	22000	5	836.417	20.733	819.767	140.438	39.795	0.000	0.000	0.000	0.000	0.000
22000	23000	12	959.789	24.261	861.417	51.224	52.632	34.727	0.000	0.000	0.000	0.000
23000	24000	6	608.962	34.498	643.928	192.283	153.345	10.444	0.000	0.000	0.000	0.000
24000	25000	2	557.975	35.553	666.401	149.122	106.242	40.421	37.814	0.000	0.000	0.000
25000	26000	8	1362.651	24.067	860.860	72.047	41.272	14.630	11.191	0.000	0.000	0.000
26000	27000	8	902.565	27.877	775.622	88.357	92.912	43.109	0.000	0.000	0.000	0.000
27000	28000	6	677.017	28.404	754.323	88.146	101.091	29.750	26.690	0.000	0.000	0.000
28000	28750	8	641.712	41.32	198.385	110.960	103.335	149.559	85.604	57.047	27.251	17.859

Summary

Length	9380
No. of Curves/km	8
Degree of Curvature/km	912
Rise/Fall (m)/km	32

Grade							
<=4	>4 & <=5	>5 & <=6	>6 & <=7	>7 & <=8	>8 & <=9	>9 & <=10	>10
6500	1380	854	394	191	86	27	19
69%	15%	9%	4%	2%	1%	0%	0%

The problems with the existing corridor are summarized below:

a. *Needs acquisition of all road side structures at Khupi village;*
b. *Complete re-grading of existing road to bring the geometry within the permissible IRC standards, which would involve cutting of the existing road more than 40m;*
c. *Cutting for road formation in a length 9.4km, which is also forest area*
d. *Steep unstable slopes on valley side;*
e. *Design speed possible 20 to 30 kmph.*

In view of the above, the alignment along the existing corridor is not feasible and the geometry can only be brought within permissible limits of IRC standards by major improvements.

3.0 Proposed Alignment

Alignment design is one of the most important features influencing the efficiency and safety of a highway. The ideal highway alignment is the one which will cause the least over-all transportation cost taking into account the cost of construction, maintenance and recurring cost of vehicles operation. Hence, the aim has been to establish a safe, easy, short and economically possible alignment, considering the physical features of the region and traffic needs apart from least disturbance to the eco-system.

The proposed alignment has been selected in consistent with the prevailing terrain conditions of the area in such a way that,

- It fits well with natural terrain and requires least mitigation measures against adverse environmental impacts with due to consideration to least deforestation, resettlement etc;
- Least disturbance to existing traffic during construction;
- Least disturbance to existing eco system;
- As direct as possible so that there is maximum economy in vehicle operations and maintenance;
- Also consistent with the IRC guidelines.

4.0 Alignment Options

At km 19.100 and at km 28.500 the existing alignment is on top of ridge with RLs of 1487 and 1560 respectively. As the alignment is on top of ridge at both ends, there are 2 options for the alignment to follow in between. The alignment can be on LHS or RHS of ridge line. The existing road was built on LHS of ridge line following the topography of hills.

As per the IRC SP:48 hill road manual, "the criteria for deciding the alignment of hill roads is economy in operating cost of transport vehicles. The Economy in operating cost of transport vehicles to be achieved by adopting easy grades, minimizing rise and fall and by following a direct line as far as possible between obligatory points. Improvement of features like grade and curvature at a later date can be very expensive and sometimes be impossible. It is, therefore, necessary that ultimate geometric requirements of hill roads are kept in view right in the beginning".

To achieve this, it is proposed to improve the alignment onto RHS side of the ridge so that, grades are flat with minimum rise and fall and economy in operating cost of vehciles. The proposed improved alignment takes off from Km 19.10 near Khupi village and merges with the existing road at km 28.500 following hill contours with smooth horizontal and vertical geometry. The following table gives comparative statement of alignment options.

Table 2.0: Comparative statement of Alignment Options at Khupi

Attribute	Alignment on LHS	Alignment on RHS (Proposed Alignment)
Length	9.4 km	3.57 km
Connectivity	Connects Khupi Village and West Kameng Hydro Power road	Connects Khupi Village and West Kameng Hydro Power road
Terrain	Steep	Steep
Speed (Km/h)	20/30	50/60
Horizontal Geometry	Serpentine; 73 curves	Smooth; 20 curves
Gradients	Max 10%;	Max 6%;
Land Impact	Forest Land and Built-up area	Forest Land
Social / R&R Issue	Needs acquisition of structures in entire length of Khupi built-	No R&R Issue

Highway (W/Z),PWD,AP,Itanagar

No. CEAP(HW)/ WZ/W-7/2016-17/ **Dated: 13th April 2017**

Copy to:

1. The Regional Officer, MoRTH Itanagar for information. A copy of Muck
2. The District Forest Officer, Bomdila West Kameng for information and necessary action please.
3. M/s SUSHEE-IVRCL, Arunachal highways Ltd. for information and necessary action.
4. The Executive Engineer Naharlagun Highway Division PWD Nirjuli for information.
5. Shri Hage Tachang Assistant Engineer (BOT) Nechipu-Hoj, Naharlagun Highway Division for necessary liason with Forest Department for above work.
6. Shri Biju C. D/Man-II, O/o the Chief Engineer, Highway (EZ). He is directed to provide al assistance in the data entry online.

(D Ete)
Superintending Engineer
For Chief Engineer,
Highway (W/Z),PWD,AP,Itanagar

Attribute	Alignment on LHS	Alignment on RHS (Proposed Alignment)
	up area	
Cumulative rise and fall	299.4 m	168.5m
Area of land required	28.2 hect.	12.89 hect.
Volume of Earth cutting	7.2 lac cum	5.014 lac cum

Based on the comparative study as presented above, the alignment option on RHS of existing road through Tenga Reserve Forest has been recommended.