

EXECUTIVE SUMMARY

0.1 BACKGROUND

The work for Consultancy Services for Preparation of Feasibility Report for Two-laning of **Km. 0.000 to Km. 35.000 of SH-19 comprising the section from Nagaur to Tarnau (the “Highway-III”)** in the State of Rajasthan has been awarded to **YONGMA Engineering Company Ltd** in consortium with **M/s. STERLING Indo Tech Consultants P Ltd**, by Public Works Department, Government of Rajasthan vide letter no.**F-7(25)/PPP/2014-15/Package-11/D-21**, dated on **21-08-2014**. The commencement date of the project is **10th September 2014**.

0.2 INVESTIGATIONS & EVALUATIONS

Feasibility Study was carried out by **YONGMA Engineering Company Ltd** in consortium with **M/s. STERLING Indo Tech Consultants P Ltd** and the report evaluates Financial Viability in terms of Financial Internal Rate of Return (IRR) of the homogeneous road sections for optimum upgrading. The above evaluation has been based on various surveys and investigations carried out during the course of the study and these include traffic, topography, pavement condition, inventory and condition of road/structures and material investigations. Special attention has been given to maximize the use of existing pavement and available land and use of local resources. Beside, due care is also taken to ensure use of modern construction technology to achieve the desired quality and performance requirements and attain the intended level of service.

0.3 PROJECT DEVELOPMENT DESCRIPTIONS

0.3.1 General

The Project Road starts from Nagaur City (Vijay Vallabh Chowk) at Km. 0+000 and ends at Tarnau Town on T-Junction of Khatu Road at Km 39+676. The Nagaur-Tarnau Section of the Project Road is SH-19. The project road traverses through Nagaur district in the State of Rajasthan. The Present Project Road length is 39.676 Km instead of 35.000 km as per agreement. Project Road passes through Nagaur City, Rol, Phardod, Tarnau villages and built up areas. A summary of the project corridor consist the following configuration as given in **Table 0.1**

Table 0.1: Project Length

Sl. No.	Description	Length (Km)
Nagaur to Tarnau (SH-19)		
1	7.0m wide carriageway with 1.0m to 1.5m Earthen shoulder	39.676(100%)
	Total	39.676 (100%)

0.3.2 District and Nodal Towns/Villages on the Project Road

The project road passes through Nagaur district of Rajasthan State. The nodal town/villages on major part of the project road (SH-19) are Nagaur City, Rol, Pharrod, Tarnau.

0.3.3 Traffic Volume

The summary of the Average Annual Daily Traffic (AADT) for the project stretch is given in **Table 0.2**

Table 0.2: Average of Traffic Survey Data in October 2014 & January 2015

Vehicle Category	Km 6+500	Km 30+640
Tollable Traffic (Nos)		
Car/Jeep/Van	1336	1073
Light Commercial Vehicles	640	480
Buses	233	188
2-Axle	210	143
3-Axle	280	258
HCM/EME/MAV (4 to 6)	120	175
OSV (7+++)	0	0
Total Tollable Traffic (Nos)	2819	2317
Total Tollable Traffic (PCUs)	5005	4348
Non-Tollable Traffic (Nos)		
2 Wheeler	1368	809
3Wheeler	27	6
Tractors - With Trailer	143	64
Tractors - Without Trailer	24	12
Bi-Cycle	20	9
Cycle-Rickshaw	0	0
Animal-Drawn	20	7
Hand-Drawn	1	0
Exempted Vehicle - Car	13	9
Exempted Vehicle - Bus	1	2
Exempted Vehicle - LCV	8	4
Exempted Vehicle - Truck	11	10
Total Non-Tollable Traffic (Nos)	1636	932
Total Non-Tollable Traffic (PCUs)	1585	814
Grand Total (Nos)	4455	3249
Grand Total (PCUs)	6590	5162

0.3.4 Proposed Developmental Plan/Construction features are summarised as here under:

- Widening scheme can be summarised as given in **Table 0.3**

Table 0.3: Summary of Widening Scheme-SH-19

Sl. No.	Description	Length (km)	Remarks
A. Existing Road Width 7.0 (Two Lane)			
IA	4 Lane Proposed in Built up with Both Side Drains	1.980	Widening of 2lane to 4-Lane with strengthening of Existing 2 lane with Bituminous mix(DBM+BC)
IIA	4 Lane Proposed in Built up with Both Side Drains	0.220	Widening of 2lane to 4-Lane with Reconstruction of Existing 2 lane
IIIA	2 Lane With Paved Shoulder Proposed	35.038	Widening of 2 lane to 2 Lane with Paved Shoulder with Strengthening of Existing 2 Lane
	2 Lane With Paved Shoulder Proposed	2.130	Widening of 2 lane to 2 Lane with Paved Shoulder with Reconstruction of Existing 2 Lane
IVA	Toll Plaza-Rigid Pavement	0.300	New Construction of Pavement for Toll Plaza
Total Length		39.668 KM	

0.3.5 Bypasses and Realignment

Based on the detailed design bypass and realignments have not been proposed for existing road length of 39.676 Km (Design Length 39.668 Km) long section extending between Nagaur - Tarnau except improvement of existing curves for which acquisition of land required .

Clear land available along the project road is 22-25m in the entire project length. In the settlement areas of Nagaur, Rol, Phardod, Tarnau the land width available is just sufficient for further widening of road 2 Lane plus configuration. However there are some constraints in habitated stretches due to which speed restriction proposed at these locations.

0.3.6 IRC: 37-2012 Method of Flexible Pavement Design –Widening and for New construction

Pavement composition thicknesses were designed for widening, reconstruction and new construction sections as per IRC: 37-2012. For strengthening of existing flexible road pavement, overlay thickness were established as per IRC: 81-1997. At Toll Plaza locations provision of rigid pavement is given and pavement composition was determined as per IRC: 58-2011.

The flexible pavement thicknesses required for pavement widening and New Pavement of stretches is given in **Table 0.4**

The Flexible Pavement Crust Thickness has been designed as per Plate no7 and 8 of IRC 37-2012 taking CBR-12.5% and MSA-24 for 15 Years Design life for Non Bituminous Sub Base/ Base Course and MSA-11 for 8 Years Design life for Bituminous Layers for design purpose.

Table 0.4: Flexible Pavement Thickness for Widening of Existing Lane, New pavement and Reconstruction Stretches

Existing Chainage		Design Traffic (MSA)	Design Traffic (MSA)	CBR of Sub-grade (%)	Viscosity Grade of Bitumen	Proposed Minimum Pavement Thickness (mm)				
From	To	8 Years	15 Years			BC	DBM	WMM	GSB	Total
0+000	39+668	11	24	12.50	VG-30	40	50	250	200	540

It is recommended to design the bituminous layers for 8 years considering 11MSA and non-bituminous considered 24MSA for a design life of 15 years for the entire stretch considering one homogeneous section.

0.3.7 IRC: 81-1997 Method of Flexible Overlay – For Strengthening of Existing Pavement

The Bituminous macadam overlay Thickness required for 11 MSA and Max Characteristic Deflection (Dc) of 1.34 mm, Based on Fig.9 (Overlay thickness design curves) worked out to be 104 mm.

Thickness Required for DBM/ BC = $104 \times 0.70 = 72.8$ mm say 73 mm

Therefore proposed composition for overlay taken as given hereunder in **Table 0.5**

Table 0.5 Overlay Thickness

Description	Design Traffic	Characteristic Deflection Dc(mm)	BC	DBM
Stretches proposed for Strengthening only	11	1.34	40mm	50 mm

For Details of BBD measurements and correction for Temperature and seasonal corrections see Annexure 3.6.

0.3.8 IRC: 58-2011 Method of Rigid Pavement Design –:

a) Pavement composition thickness for rigid pavements is given in **Table 0.6**.

Table 0.6: Rigid Pavement Composition

Material Type	Thickness (mm)
Pavement Quality Concrete (M-40)	300
Dry Lean Concrete (M-10)	150
Granular Sub-base	150

Subgrade	500
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0.3.9 Junction Improvement

SH-19

There are 6 nos. T Junctions, 05 nos. Y Junctions and 8 Cross Junction observed during the site visit for inventory details. Most of the minor junctions lead to the nearby villages while major junctions leading to important cities of Rajasthan. Based on reconnaissance survey the details of major intersections are tabulated here under in Table No 0.7-

Table: 0.7- Intersection

S. No.	Location (km)	Chainage Design	Way to (Side)	Type Junction	Major/ Minor	Category		Width of Cross Road
						LHS	RHS	
1	0+000	0+000	Start at Junction	X	Major	NH-65 (Salasar)	NH-89 (Ajmer)	7.00
2	2+050	2+085	LHS	Y	Minor	Salwa		3.75
3	4+480	4+460	BHS	X	Minor	Phagali	Bagnada	3.75
4	5+970	5+950	LHS	Y	Minor	Bansara		3.75
5	6+590	6+575	BHS	X	Minor	Bansara	Athiyasan	3.75
6	9+678	9+658	LHS	T	Minor	Hans Mata Mahashakti Mandir		3.75
7	10+600	10+585	BHS	X	Minor	Sadawa	Inada	3.75
8	13+872	13+855	BHS	X	Minor	Gangwana	Kherbad	3.75
9	17+403	17+400	LHS	Y	Major	Rol		7.00
10	18+690	18+655	BHS	X	Major	Rol	Mundwa Nara Thana	7.00
11	19+235	19+200	LHS	Y	Minor	Rol		3.75
12	19+646	19+610	RHS	Y	Minor		DidiyaKalan Julala	7.00
13	25+270	25+260	BHS	X	Minor	Bugreda	Chatwa Khurd	3.75
14	26+155	26+142	BHS	X	Minor	Kaniya	Tangala	3.75
15	31+755	31+750	RHS	T	Minor		Mata Sukh	3.75
16	38+350	38+345	RHS	T	Major		Sanju/Rohina	7.00
17	38+650	38+645	LHS	T	Minor	Mehbas		3.75
18	39+108	39+100	LHS	T	Minor	Dharna		3.75
19	39+675	39+668	RHS	T	Major		Khatu	7.00

0.3.10 Proposal of Bridges, Culverts and other Structures

There is no major and minor bridge on the project road. All the structures are proposed to meet the requirement of configuration of 2-Lane with paved shoulder width as per the provision given in IRC: SP: 73-2015

a) Major & Minor Bridges

There is no any major/ minor bridge along the Project Highway.

The development proposal for all the existing bridges is tabulated in **Table 0.8**.

Table 0.8: Summary of Development of Existing Bridges

Location (Chainage)	Type of Structure	Length (m)*	Number of Spans	Length of Span (m)	Average vertical clearance* (m)	Width of carriageway between kerbs (m)
-NIL-						

b) Culverts

There are total 23 existing culverts in the proposed road corridor. A summary of the development proposal is given in **Table 0.9**

Table 0.9: Summary of Development of Culverts

Type of Culvert	Existing	Proposed		
	Slab	Retained	Reconstruction	Widening
Slab	21	19	1	1
Pipe	1	--	1	-
Box	1	-	1	-
Sub -Total	23	19	3	1
TOTAL	23	23		

c) ROB at Railway line crossing

The project road does not crossing the railway tracks at any level crossing.

Table 0.10: List of Railway crossing and its Development Proposal

S.No.	Location	Track Detail		LC No.	Proposal
		Gauge	Type of Crossing		

S.No.	Location	Track Detail		LC No.	Proposal
		Gauge	Type of Crossing		
-Nil-					

0.3.11 Proposal for Underpass/Flyover

No underpass or flyover is proposed along the project road.

0.3.12 Truck Lay byes

As discussed the Truck lay byes are not to be provided, therefore, has not been proposed.

0.3.13 Bus Shelters

Bus shelters are tentatively proposed on both sides of all built-up locations as per the recommendations of IRC: 80-1981 and circular no 732 dated 29.07.2015 guideline for the project formulation for development of state Highways under PPP. However, the exact locations to be decided on ground in consultation with Independent Engineers/Client.

Table 0.11: List of Bus Shelters

S.No	Design Chainage	Side(LHS/RHS)
1	0+200	LHS
2	0+250	RHS
3	13+900	LHS
4	14+000	RHS
5	18+600	LHS
6	18+700	RHS
7	32+400	RHS
8	32+450	LHS
9	38+600	LHS
10	38+700	RHS

1.3.11 Toll Plaza

Location of toll plazas has been proposed based on the traffic dispersal pattern at the respective homogenous sections, road geometry and vertical profile of the road and the surrounding area.

The location and details of the toll plaza is given in **Table 0.12**.

Table 0.12: Details Toll Plaza

Tolling Homogenous Section #	Toll Plaza Location as Per Existing Chainage	Toll Plaza Location as Per Design Chainage	From km to km	Design Length (Km)	Bypass > 5 Cr., if any	Structure > 5 Cr. , if any
THS 1	16+005	16+000	0+000 to 39+668	39.668	Nil	Nil

	(SH-19)	(SH-19)				
			Total Design Length (Km)	39.668		

0.3.14 The project cost on above items has been worked out based on development proposal of the project corridor. Total Cost of the Project as assessed at this stage is given in **Table 0.13**

Table 0.13: Abstract Cost Estimate

S. NO	ITEM OF DESCRIPTION	AMOUNT (Cr.) if under VGF	AMOUNT (Cr.)-If Under Annuity
1	SITE CLEARANCE	0.74	0.74
2	EARTHWORKS	2.90	2.90
3	SUB-BASE COURSE & BASE COURSE	14.11	14.11
4	BITUMINOUS PAVEMENT WORKS	41.18	41.18
5	STRUCTURES		
a)	Culverts	1.61	1.61
b)	Minor Bridge		
6	C.C. PAVEMENT	1.28	1.28
7	DRAINAGE, PROTECTION WORK & RE WALLS & Repair & Rehabilitation of Bridges	3.79	3.79
8	JUNCTION IMPROVEMENT	3.20	3.20
9	TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES	3.19	3.19
10	TOLL PLAZA (1 Nos.)	2.25	2.25
11	ARBORICULTURE (Bus Shelters) & (Bus Bay) & Plantation & Truck Lay Bye	0.46	0.46
13	CIVIL CONSTRUCTION COST	74.71	74.71
14	Add 25% (if Project Under VGF) or 15% (If Project Under Annuity) as per Clause 3.16 of RFP (Including Provision for Physical and Price contingencies, interest during construction and other Financing cost , pre Construction expenses, etc. on Item No.13	18.68	11.21
15	TOTAL PROJECT COST	93.39	85.92

S. NO	ITEM OF DESCRIPTION	AMOUNT (Cr.) if under VGF	AMOUNT (Cr.)-If Under Annuity
16	PROJECT COST PER KM.	2.35	2.17