# 0. EXECUTIVESUMMARY

## 0.1 BACKGROUND

Ministry of Road Transport & Highways (MORT & H) has decided to implement the Preparation of Feasibility Study and Technical Consultant for preparation of Feasibility Study and Detailed Project Report (DPR) for Widening of Road to Suitable Lane Configuration i/c Construction of Bridges & Culverts.

## 0.2 CONSULTANCYSERVICES

The consultancy services are to be provided in four stages brought tout below.

Stage1:InceptionReport(IR) & Quality Assurance Plan(QAP),

**Stage2:FeasibilityReport**

Stage3:Preliminary Project Report (PPR)

Stage4: Detailed Project Report (DPR)

This Report contains the following:

Volume I- Main Report,

Volume II –Design Report,

Volume III- Material Report,

Volume IV –Cost Estimates & Bill of Quantities,

Volume V –Drawing Volume

### ➢ Objectives

- The main objective of the consultancy service is to establish the technical, economical, and financial viability with due consideration to environmental and social safeguards and prepare Feasibility Report for the section Bhopal-Sanchi-Sagar Road in the State of Madhya Pradesh.
- The viability of the project shall be established taking into account the requirements with regard to development of alignment for Bhopal - Sanchi – Sagar Road based on highway design, pavement design, provision of re-alignment, bypasses, 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 Feasibility Report would inter-alia include detailed highway design, design of pavement, design of bridges and cross drainage structures and grade separated structures, design of service / slip roads, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analysis, 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.

### ➢ Scope of Services

- The Consultant is required to design the widening & reconstruction work to 2 lane with paved shoulder shall be within the existing right of way avoided land acquisition, except for locations having inadequate width, alignment corrections, improvement of intersections are considered necessary and practicable and cost effective. However, new alignment should also be considered, wherever widening to 2 lane of the existing road is not possible. The Consultant shall furnish land acquisition details as per revenue records/maps under M.P. Land Acquisition act for further processing.
- The general scope of services is given in the sections that follow. However, the entire scope of services would, inter-alia, include the items mentioned in the letter of invitation and the TOR. The Consultant will also make suitable proposals for
- Reconstruction of existing road and strengthening of the carriageways, as required at the appropriate time to maintain the level of service over the design period.
- All ready to implement 'good for construction' drawings shall be prepared.
- Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out by the Consultant meeting the requirements of MOE / other statutory bodies.

  Wherever required, consultant will liaise with concerned authorities and arrange all clarifications. Approval of all drawings including GAD and detail engineering drawings will be got done by the consultant from the concerned departments.

- The Consultant shall prepare cost estimate.

## 0.3 PROJECTALIGNMENTDESCRIPTION

The Project Road Bhopal-Sanchi-Sagar starts from Km Stone 81/2 and ends at Km Stone 175on NH-86 Extension.

The Project Road as described in the terms of References is 90.8 Km. Actual design length is 94.8 Km.

There are 2 Major junction very important. T – Junction / Basoda at Ch.86+200 &T – Junction/Bhopal at Ch. 151+800.

The consultancy services for the same is to include design of best possible alignment and pavement composition, design of bridges, culverts and other structures in addition to analysis of costs, determining project feasibility, preparation of Land Acquisition Plan, if any, and obtaining of all requisite clearances.

`

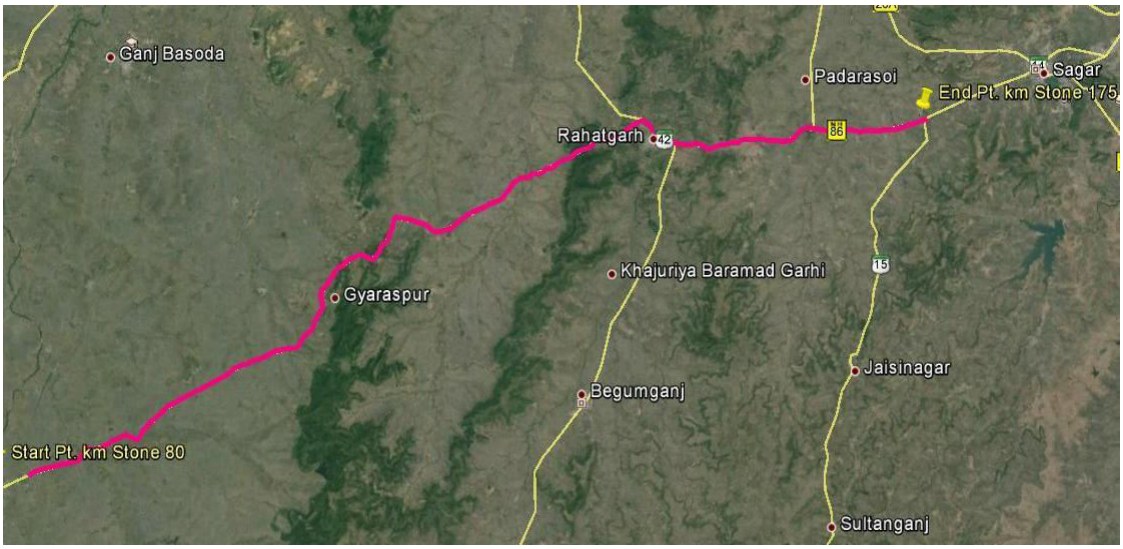



**Figure0.1:-Project Alignment of Bhopal-Sanchi-Sagar Road**

## 0.4 CHAINAGEREFERENCES(EXISTING V/s DESIGN)

**Table0.1:-Chainage References (Bhopal – Sanchi – Sagar Road)**

| S.No | Existing Chainage (km) | | Design Chainage(km) | | Remark |
|---|---|---|---|---|---|
| | From | To | From | To | |
| 1 | 85.1 | 85.5 | 85.1 | 85.5 | Kuakhedi |
| 2 | 85.5 | 90.33 | 85.5 | 90.33 | |
| 3 | 90.33 | 92.7 | 90.33 | 92.7 | Khari |
| 4 | 92.7 | 93.7 | 92.7 | 93.7 | |
| 5 | 93.7 | 94.5 | 93.7 | 94.5 | |
| 6 | 94.5 | 94.75 | 94.5 | 94.75 | ChakPatni |
| 7 | 94.75 | 95.75 | 94.75 | 95.75 | |
| 8 | 95.75 | 96.75 | 95.75 | 96.75 | |
| 9 | 96.75 | 99.75 | 96.75 | 99.75 | |
| 10 | 99.75 | 100.7 | 99.75 | 100.7 | |
| 11 | 100.7 | 101.6 | 100.7 | 101.6 | Atari Khejda |
| 12 | 101.6 | 105.6 | 101.6 | 105.6 | |
| 13 | 105.6 | 107.7 | 105.6 | 107.7 | |
| 14 | 107.7 | 108.3 | 107.7 | 108.3 | Manora |
| 15 | 108.3 | 110.3 | 108.3 | 110.3 | |
| 16 | 110.3 | 111.7 | 110.3 | 111.7 | |
| 17 | 111.7 | 114.4 | 111.7 | 114.4 | Gyaraspur |
| 18 | 114.4 | 117.4 | 114.4 | 117.4 | |
| 19 | 117.4 | 118.5 | 117.4 | 118.5 | |
| 20 | 118.5 | 119 | 118.5 | 119 | Badmi |
| 21 | 119 | 129.1 | 119 | 129.1 | |
| 22 | 129.1 | 130.1 | 129.1 | 130.1 | Bagrod |
| 23 | 130.1 | 131.7 | 130.1 | 131.7 | |
| 24 | 131.7 | 132 | 131.7 | 132 | Budi Bamad |
| 25 | 132 | 135.5 | 132 | 135.5 | |
| 26 | 135.5 | 140 | 135.5 | 140 | |
| 27 | 140 | 140.4 | 140 | 140.4 | Mirkhedi |
| 28 | 140.4 | 142.2 | 140.4 | 142.2 | |
| 29 | 142.2 | 142.9 | 142.2 | 142.9 | AerenMirzapur |
| 30 | 142.9 | 147.2 | 142.9 | 147.2 | |
| 31 | 147.2 | 148.1 | 147.2 | 148.1 | Bahadurpur |
| 32 | 148.1 | 151 | 148.1 | 151 | |
| 33 | 151 | 151.5 | 151 | 151.5 | Kharai |
| 34 | 151.5 | 151.8 | 151.5 | 151.8 | |
| 35 | 151.8 | 155.2 | 151.8 | 155.2 | Rahatgarh |
| 36 | 155.2 | 162.4 | 155.2 | 162.4 | |
| 37 | 162.4 | 163.4 | 162.4 | 163.4 | Barkhedi |
| 38 | 163.4 | 170 | 163.4 | 170 | |
| 39 | 170 | 170.6 | 170 | 170.6 | Muhara |
| 40 | 170.6 | 171.6 | 170.6 | 171.6 | |
| 41 | 171.6 | 172.9 | 171.6 | 172.9 | Sihora |

## 0.5 RIGHTOFWAY[ROW]

The Details of existing right of way is not available with concerned department, however, it is also not marked on revenue maps collected from concerned department.

The revenue maps have been collected of this package except forest locations.

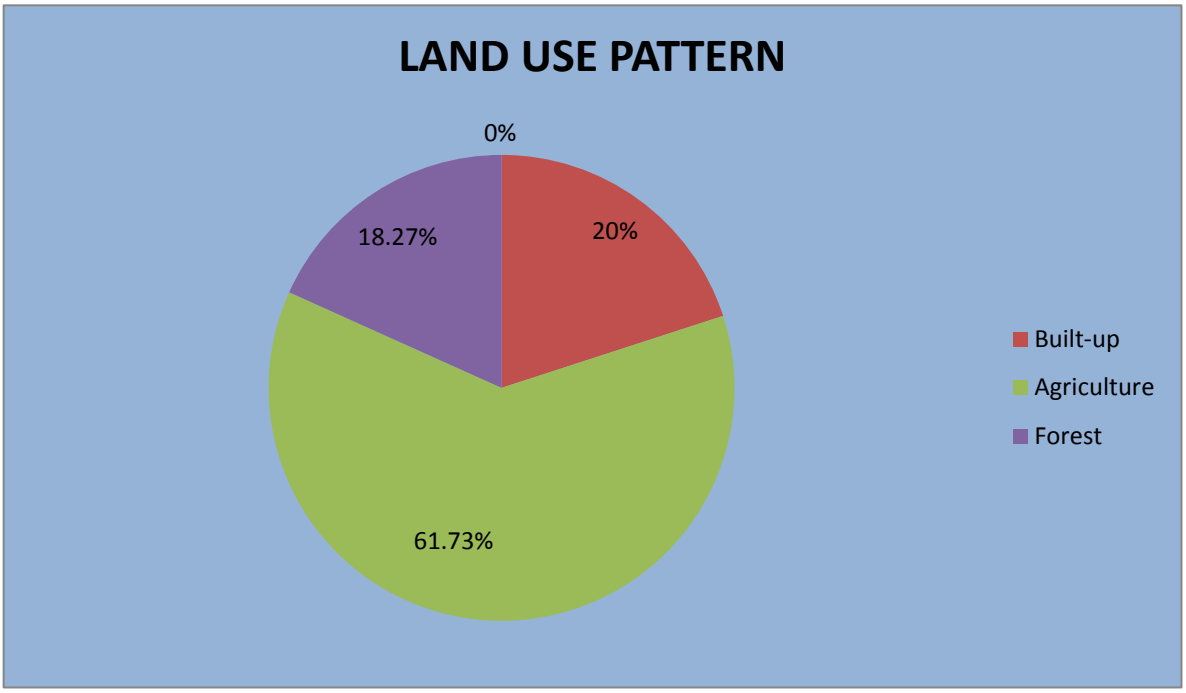
Proposed ROW for widening of existing road is taken 20-25 m in open areas and 15m in built-up areas as per provision in IRC 73-1980, Table 3 for Major District Roads.

## 0.6 ABUTTINGLANDUSEPATTERN

The existing alignment is a link between Kuakhedi, Khari, ChakPatni, Atari Khejda, Manora, Gyaraspur, Badmi,

Bagrod, Budi Bamad, Mirkhedi, Aeren Mirzapur, Bahadurpur, Kharai, Rahatgarh, Barkhedi, Muhara & Sihora. The pattern on both side of road is agricultural, Forest and built-up. The details of land use pattern along the project road are-

| | | |
|---|---|---|
| Built-up | - | 20.00% |
| Agriculture | - | 61.73% |
| Forest | - | 18.27% |



The Details of LandusePatternforProjectroadisasunder-

**Table 0.2:- Existing Land Use Pattern (Bhopal – Sanchi - Sagar Road)**

| S.No | Existing Chainage (km) | | Length | Type | Villages |
|---|---|---|---|---|---|
| | From | To | | | |
| 1 | 85.1 | 85.5 | 0.4 | Builtup | Kuakhedi |
| 2 | 85.5 | 90.33 | 4.83 | Ag. | |
| 3 | 90.33 | 92.7 | 2.37 | Builtup | Khari |
| 4 | 92.7 | 93.7 | 1 | Ag. | |
| 5 | 93.7 | 94.5 | 0.8 | Ag. | |
| 6 | 94.5 | 94.75 | 0.25 | Builtup | ChakPatni |
| 7 | 94.75 | 95.75 | 1 | Ag. | |
| 8 | 95.75 | 96.75 | 1 | Ag. | |
| 9 | 96.75 | 99.75 | 3 | Ag. | |
| 10 | 99.75 | 100.7 | 0.95 | Ag. | |
| 11 | 100.7 | 101.6 | 0.9 | Builtup | Atari Khejda |
| 12 | 101.6 | 105.6 | 4 | Ag. | |
| 13 | 105.6 | 107.7 | 2.1 | Ag. | |
| 14 | 107.7 | 108.3 | 0.6 | Builtup | Manora |
| 15 | 108.3 | 110.3 | 2 | Ag. | |
| 16 | 110.3 | 111.7 | 1.4 | Ag. | |
| 17 | 111.7 | 114.4 | 2.7 | Builtup | Gyaraspur |
| 18 | 114.4 | 115.4 | 1 | Ag. | |
| 19 | 115.4 | 118.5 | 3.1 | Forest | |
| 20 | 118.5 | 119 | 0.5 | Builtup | Badmi |
| 21 | 119 | 125.75 | 6.75 | Forest | |
| 22 | 125.75 | 129.1 | 3.85 | Ag. | |
| 23 | 129.1 | 130.1 | 1 | Builtup | Bagrod |
| 24 | 130.1 | 131.7 | 1.6 | Ag. | |
| 25 | 131.7 | 132 | 0.3 | Builtup | Budi Bamad |
| 26 | 132 | 135.5 | 3.5 | Ag. | |
| 27 | 135.5 | 140 | 4.5 | Ag. | |
| 28 | 140 | 140.4 | 0.4 | Builtup | Mirkhedi |
| 29 | 140.8 | 142.2 | 1.4 | Forest | |
| 30 | 142.2 | 143 | 0.8 | Builtup | AerenMirzapur |
| 31 | 143 | 143.9 | 0.9 | Forest | |
| 32 | 143.9 | 145.9 | 2 | Ag. | |
| 33 | 145.9 | 147.2 | 1.3 | Forest | |
| 34 | 147.2 | 148.1 | 0.9 | Builtup | Bahadurpur |
| 35 | 148.1 | 149.1 | 2.9 | Forest | |

| S.No | Existing Chainage (km) | | Length | Type | Villages |
|---|---|---|---|---|---|
| | From | To | | | |
| 36 | 149.1 | 150.25 | 1.15 | Ag. | |
| 37 | 150.25 | 150.60 | .35 | Forest | |
| 38 | 151 | 151.5 | 0.5 | Builtup | Kharai |
| 39 | 151.5 | 151.8 | 0.3 | Ag. | |
| 40 | 151.8 | 155.2 | 3.4 | Builtup | Rahatgarh |
| 41 | 155.2 | 162.4 | 7.2 | Ag. | |
| 42 | 162.4 | 163.4 | 1 | Builtup | Barkhedi |
| 43 | 163.4 | 170 | 6.6 | Ag. | |
| 44 | 170 | 170.6 | 0.6 | Builtup | Muhara |
| 45 | 170.6 | 171.6 | 1 | Ag. | |
| 46 | 171.6 | 172.9 | 1.3 | Builtup | Sihora |

## 0.7 TERRAIN

Theterrainisplane and has normal gradient throughout the road.

## 0.8 IMPORTANTSETTLEMENTS

There is not any settlement required on Project Road.

## 0.9 TRAFFIC

Inthischapter,thereportisconcernedabout**Bhopal SanchiSagar Road**. Different type of traffic surveys like O-D Survey, Axle Load Survey 7 days traffic Survey were conducted as given below:-

| Sr. No. | Type of Survey and Duration | Location / Chainage | Survey Dates | Duration (Hours/Day) |
|---|---|---|---|---|
| 1 | Classified Volume Counts for seven days | At Km 152+000 | 19/10/2015 | 24 |
| 2 | O-D Surveys for one day ( 24 hours) on a | At Km 152+000 | 19/10/2015 | 24 |
| 3 | Intersection Turning Movement Counts for one day (12 hours) | No major intersection found | - | - |
| 4 | Axle load surveys | At Km 83+000 | 1/11/2015 | 24 |

**Table 0.3 – Different Traffic surveys and there dates of commencement**

The following ADT and PCU were observed on project road –

**Table 0.4– ADT and PCU observed at Different Locations**

| Vehicle Category | 83+000 | |
|---|---|---|
| | ADT | PCU |
| Two Wheeler | 4395 | 2198 |
| Three Wheeler | 43 | 22 |
| Car/Jeep | 1259 | 1259 |
| Mini Bus | 1 | 2 |
| Bus | 72 | 216 |
| LCV | 245 | 368 |
| 2 Axle | 263 | 788 |
| 3 Axle | 236 | 707 |
| M Axle | 175 | 788 |
| Tractors with Trailer | 71 | 320 |
| Tractors | 28 | 42 |
| Cycle | 12 | 6 |
| Cycle Rickshaw | 0 | 0 |
| Animal Drawn | 0 | 0 |
| Horse Drawn | 0 | 0 |
| Hand Cart | 0 | 0 |
| **Total** | **6800** | **6714** |

| Vehicle Category | 127+300 | |
|---|---|---|
| | ADT | PCU |
| Two Wheeler | 797 | 398 |
| Three Wheeler | 4 | 2 |
| Car/Jeep | 889 | 889 |
| Mini Bus | 2 | 2 |
| Bus | 57 | 171 |
| LCV | 96 | 144 |
| 2 Axle | 171 | 512 |
| 3 Axle | 180 | 539 |
| M Axle | 172 | 775 |
| Tractors with Trailer | 23 | 102 |
| Tractors | 9 | 14 |
| Cycle | 3 | 2 |
| Cycle Rickshaw | 0 | 1 |
| Animal Drawn | 0 | 0 |
| Horse Drawn | 0 | 0 |
| Hand Cart | 0 | 0 |
| **Total** | **2402** | **3550** |

| Vehicle Category | 152+500 | |
|---|---|---|
| | ADT | PCU |
| Two Wheeler | 1918 | 959 |
| Three Wheeler | 61 | 31 |
| Car/Jeep | 1384 | 1384 |
| Mini Bus | 10 | 15 |
| Bus | 177 | 532 |
| LCV | 267 | 400 |
| 2 Axle | 343 | 1029 |
| 3 Axle | 240 | 719 |
| M Axle | 252 | 1133 |
| Tractors with Trailer | 56 | 254 |
| Tractors | 31 | 46 |
| Cycle | 109 | 54 |
| Cycle Rickshaw | 0 | 0 |
| Animal Drawn | 0 | 2 |
| Horse Drawn | 0 | 0 |
| Hand Cart | 0 | 0 |
| **Total** | **4847** | **6558** |

Asperthe projected traffic, the values of PCU are very less due to discontinuity of Project road and poor pavement, after development of road, the traffic intensity will increase because of diverted traffic from adjacent roads. So the project road is proposed to be reconstructed with hard shoulder.

## 0.10 PAVEMENT COMPOSITIONS

The existing crust of project alignment is BT layer. The crust has been dismantled in most of the stretches.

The method of design followed is a modification of the CBR method incorporating mechanistic approach. The empirical pavement design presented in IRC-37-2012. "GUIDELINES FOR THE DESIGN OF FLEXIBLE PAVEMENTS" (Second Revision) has been extended to cater design traffic up to 200 MSA using analytical design method and has been followed for this project.

The traffic used in design is in terms of the cumulative number of standard axles to be carried during the design life of the road.

Use of the CBR method for pavement design, the sub grade strength of the new two lanes and widening were assessed in terms of the CBR value as per the procedure prescribed in the standards.

Pavement design catalogues giving standard pavement compositions as given in IRC-37-2012 for various CBR values ranging from 2% to 10% six levels of design traffic 10,20,30,50,100 and ISO MSA are used with necessary extrapolations to obtain pavement thicknesses for 200 MSA.

It was observed that the adequate quantity of sub grade for design CBR of 6% is available.

Using 5% CBR for sub grade and from the curves as mentioned in IRC: 37- 2012 pavement thickness were computed for the relevant millions of standard axles and furnished in Table 0.5.

Pavement thickness required for the above designed MSA and as per IRC guidelines is shown in following table-

**Table – 0.5**

| Sr. No. | Section | ADT | PCU | Calculated MSA (15 Year) |
|---|---|---|---|---|
| 1 | 83+000 | 6800 | 6714 | 28.45 |
| 2 | 127+300 | 2402 | 3550 | 20.37 |
| 3 | 152+500 | 4847 | 6558 | 36.58 |

**Pavement Crust Composition**

| Sr. No. | Section | Adopted MSA | CBR (%) | Pavement Composition (mm) | | | |
|---|---|---|---|---|---|---|---|
| | | | | BC | DBM | WMM | GSB |
| 1 | 152+500 | 40 | 6% | 40 | 110 | 250 | 260 |

## 0.11 PROPOSEDBYPASSES/REALIGNMENT / CURVE IMPROVEMENT

There is not any Bypass or Realignment Proposed for this road. Curve Improvements are Proposed at some places.

## 0.12 ROADJUNCTIONS/INTERSECTIONS

There are a number of junctions very important.T – Junction/Basoda at Ch. 86+200 & T – Junction/Bhopal at Ch. 151+800.

## 0.13 SUBMERGENCE

There is not any submerged major or minor bridge in the entire road.

## 0.14 CROSSDRAINAGEWORKS

**Bridges**

There are 3 major bridges of which 2 are retain and 1 is to be reconstructed & 22 minor bridges in the project road of which 2 are for retain with repair, 1 for reconstruction &19 are proposed for widening.

**Culverts**

Thereareetotal33 culverts.3 of total culverts have been retained with repair and 30 are proposed for Widening.

**Table – 0.6 Details of culverts and bridge**

**INVENTORY & CONDITION SURVEY FOR CULVERTS**

| Name : Bhopal SanchiSagar | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Survey : | | | | | | | | | | | | | |
| **Sl. No.** | **Chainage** | **Type of structures** | **Thickness of Slab (m)** | **Span Arrangement and Total Ventway (No. X Length) (m)** | **Width of Culvert (m)** | | **Length of culvert (m)** | | **Condition of various features of Culvert** | | **Height above Bed Level** | **Praposals** | **Remarks** |
| | | | | | **Total (m)** | **Carriageway (m)** | | **Height of Culvert (m)** | **Slab/ Pipe/ Box/ Arch** | **Parapet/Handrall** | | | |
| 1 | 80+900 | Box | | 3X5 | 11 | 7 | 25 | 7 | | | 2 | Widening | |
| 2 | 83+500 | Box | | 1X3x3 | 11 | 7 | 13.5 | 5.2 | Good | RCC Railing | 2 | Widening | |
| 3 | 83+700 | Box | | 1X3x3 | 11 | 7 | 12.5 | 4.1 | Good | RCC Railing | 2 | Widening | |
| 4 | 84+300 | Box | | 1X2x2 | 11 | 7 | 9.5 | 11 | Good | RCC Railing | 2 | Widening | |
| 5 | 84+600 | Box | | 1X8x6 | 11 | 7 | 15 | 7.5 | Good | RCC Railing | 2 | Widening | |
| 6 | 85+600 | MJB | | 4X30 | 8.3 | 7 | 132 | 16.5 | | RCC Railing | 8.4 | Reconstruction | |
| 7 | 86+100 | Box | | 1X6X6 | 11 | 7 | 14.5 | 6.2 | Good | RCC Railing | 2 | Widening | |
| 8 | 86+800 | Box | | 1X6X6 | 11 | 7 | 14 | 6.1 | Good | RCC Railing | 2 | Widening | |
| 9 | 92+850 | Box | | 1X6x4 | 11 | 7 | 14 | 4.5 | Good | RCC Railing | 2 | Widening | |
| 10 | 95+000 | Box | | 1X6x4 | 11 | 7 | 14 | 5.6 | Good | RCC Railing | 2 | Widening | |
| 11 | 98+300 | Box | | 1X2x2 | 11 | 7 | 10 | | Good | | 2 | Widening | |
| 12 | 100+800 | Box | | 1X2x2 | 11 | 7 | 10 | | Good | | 2 | Widening | |
| 13 | 102+400 | Box | | 3X5X5 | 11 | 7 | 25 | 7.2 | Good | | 2 | Widening | |
| 14 | 105+700 | Box | | 1X6X4 | 11 | 7 | 14 | 4.3 | Good | RCC Railing | 2 | Widening | |
| 15 | 106+600 | Box | | 3X5X5 | 11 | 7 | 25 | 7.2 | Good | RCC Railing | 2 | Widening | |
| 16 | 108+600 | Box | | 1X8X6 | 11 | 7 | 16 | 7.2 | Good | RCC Railing | 2 | Widening | |
| 17 | 110+200 | Box | | 1X8X6 | 11 | 7 | 16 | 7.2 | Good | RCC Railing | 2 | Widening | |
| 18 | 117+700 | Box | | 3X8X5 | 11 | 7 | 39 | 5.1 | Good | RCC Railing | 2 | Widening | |
| 19 | 119+400 | Slab | | 4X7.5 | 8 | 7.2 | 42 | 6.5 | | Steel Railing | 6.14 | Reconstruction | |
| 20 | 121+500 | Box | | 2X4X4 | 10 | 7 | 20 | 4.2 | Good | RCC Railing | 2 | Widening | |
| 21 | 127+100 | HPC | | 1X1000mm | 13 | 7 | 10 | 2 | | | | Retain | |
| 22 | 133+200 | HPC | | 2X1200mm | 13 | 7 | 10 | 1.5 | | | | Retain | |
| 23 | 136+200 | MNB | | 5X6 | 6.8 | 6 | 48 | 6 | | | | Retain | Not in Scope |
| 24 | 137+000 | MNB | | 3X12 | 11.2 | 6 | 102 | 6 | | | 2 | Widening | |
| 25 | 138+900 | Box | | 1X4X4 | 11.4 | 7 | 12 | 5 | Good | RCC Railing | 2 | Widening | |
| 26 | 139+000 | Box | | 1X10X4 | 11.4 | 7 | 20 | 4.2 | Good | RCC Railing | 2 | Widening | |
| 27 | 140+600 | Box | | 1X4X4 | 11.4 | 7 | 12 | 5 | Good | RCC Railing | 2 | Widening | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 141+500 | Slab | | 1X10 | 11 | 7 | 24 | 6 | | RCC Railing | 2 | Widening | |
| 29 | 142+300 | Box | | 1X4X4 | 11 | 7 | 14 | 4 | Good | RCC Railing | 2 | Widening | |
| 30 | 142+700 | Box | | 1X4X4 | 11 | 7 | 14 | 4 | Good | RCC Railing | 2 | Widening | |
| 31 | 143+000 | Box | | 1X6X4 | 11 | 7 | 14 | 4.2 | Good | RCC Railing | 2 | Widening | |
| 32 | 144+900 | MNB | | 1X10 | 11 | 7 | 24 | 4.2 | | RCC Railing | 2 | Widening | |
| 33 | 145+000 | Box | | 1X6X4 | 11 | 7 | 14 | 4.5 | Good | RCC Railing | 2 | Widening | |
| 34 | 147+900 | Box | | 1X8X4 | 11 | 7 | 16 | 4.2 | Good | RCC Railing | 2 | Widening | |
| 35 | 149+100 | Arch | | 14X15.5 | 7.2 | 7 | 300 | 13.2 | | | | Retain | Not in Scope |
| | 149+350 | Arch | | 1X3 | 7.5 | 7 | | 5.6 | | | | Retain | |
| 36 | 150+710 | Box | | 1X2x3 | 11 | 7 | 10 | 3 | Good | RCC Railing | 2 | Widening | |
| 37 | 151+200 | Box | | 1X2x3 | 11 | 7 | 10 | 3 | Good | RCC Railing | 2 | Widening | |
| 38 | 151+600 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | RCC Railing | 2 | Widening | |
| 39 | 152+100 | Box | | 1X8X5 | 11 | 7 | 16 | 5 | Good | RCC Railing | 2 | Widening | |
| 40 | 153+900 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | | 2 | Widening | |
| 41 | 153+100 | Slab | | 1X10 | 11 | 7 | 24 | 4.2 | | | 2 | Widening | |
| 42 | 153+500 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | | 2 | Widening | |
| 43 | 153+900 | Slab | | 1X10 | 11 | 7 | 24 | 4.2 | | | 2 | Widening | |
| 44 | 154+900 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | | 2 | Widening | |
| 45 | 156+000 | Box | | 3X10 | 11 | 7 | 39 | 8 | | | 2 | Widening | |
| 46 | 156+500 | Slab | | 1X10 | 11 | 7 | 24 | 4.2 | | | 2 | Widening | |
| 47 | 157+900 | Slab | | 1X10 | 11 | 7 | 24 | 4.2 | | | 2 | Widening | |
| 48 | 158+300 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | | 2 | Widening | |
| 49 | 158+400 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | | 2 | Widening | |
| 50 | 161+300 | Box | | 2X2X3 | 10 | 7 | 12 | 10 | Good | | 2 | Widening | |
| 51 | 162+000 | Box | | 1X6X4 | 11 | 7 | 14 | 4.5 | Good | | 2 | Widening | |
| 52 | 162+100 | Box | | 1X2X2 | 11 | 7 | 9.5 | 11 | Good | | 2 | Widening | |
| 53 | 163+300 | Slab | | 1X10 | 11 | 7 | 24 | 4.2 | | | 2 | Widening | |
| 54 | 164+900 | Box | | 1X2X2 | 11 | 7 | 9.5 | 11 | | | 2 | Widening | |
| 55 | 165+100 | Box | | 1X2X2 | 11 | 7 | 9.5 | 11 | Good | | 2 | Widening | |
| 56 | 167+600 | Arch | | 5X16 | 5.5 | 7 | 103 | 12 | | RCC Railing | | Retain | Not in Scope |
| 57 | 172+400 | Slab | | 3X10 | 11 | 7 | 48 | 6.6 | | RCC Railing | 2 | Widening | |
| 58 | 172+450 | Slab | | 2X10 | 11 | 7 | 34 | 7.1 | | RCC Railing | 2 | Widening | |

## 0.15 RAILWAYTRACKS/CROSSINGS

There is not any railway track or crossing.

## 0.16 TOLLPLAZA

There is not any Toll Plaza existing but Two Toll plaza proposed at Km-104.000 and Km.-160.000thissectionofProjectroad.

## 0.17 INVESTIGATIONSANDSURVEYS

Inordertodesignvariouscomponentsofprojectroad; followinginvestigationsandsurveyshavebeencarriedout:-

- Traffic surveys
  - 7 days traffic Survey
  - Axle load Survey
  - O-D Survey
- TopographicsurveysincludingGPS
- MaterialSurveys&Investigations
- BorrowareaIdentific ation
- RoadInventorySurve y
- PavementConditionSurvey
- CulvertandBridgeInventorySurvey

## 0.18 DESIGN PARAMETERS

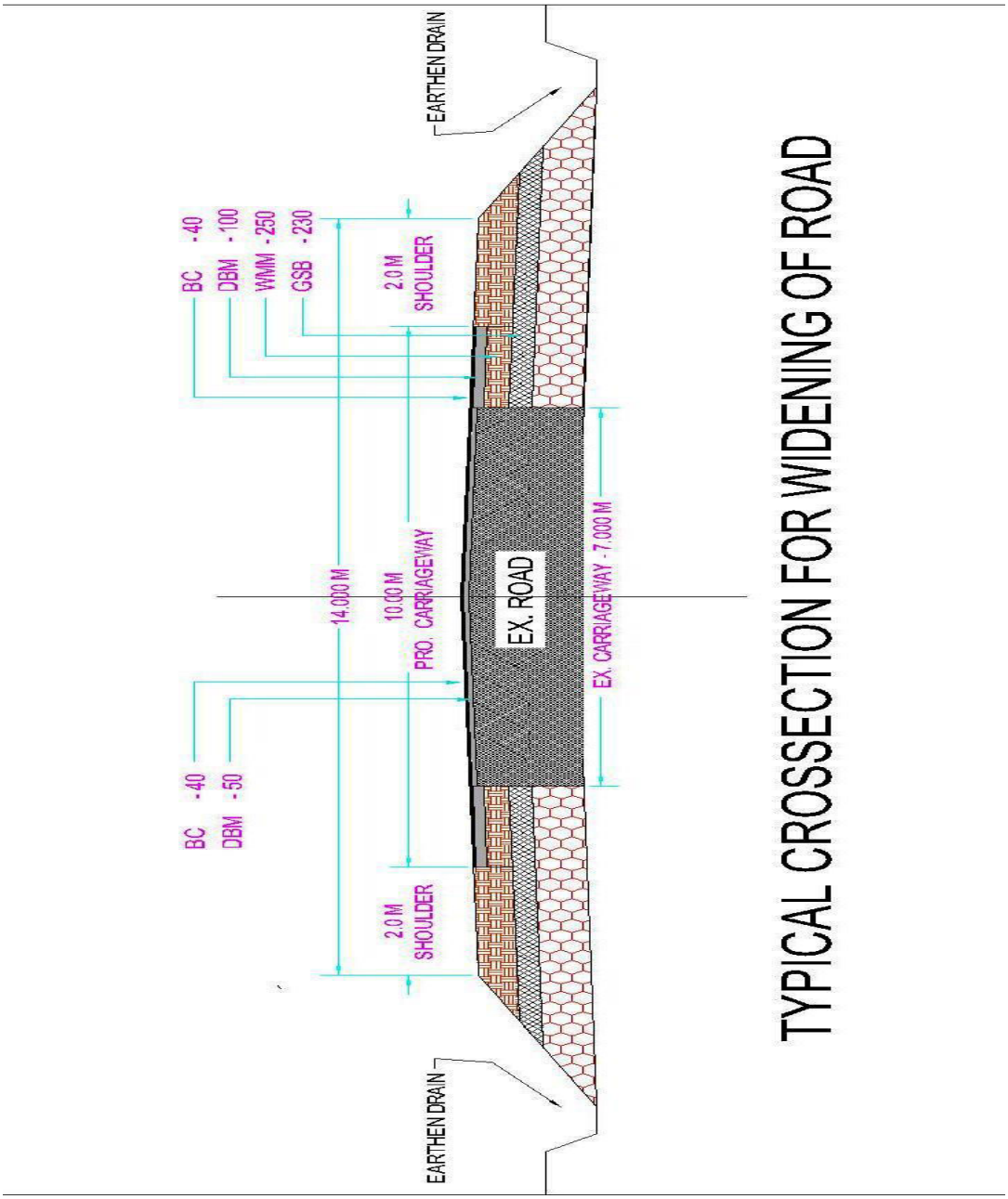
Following design standards have been adopted as per Indian Roads Congress (IRC) Guidelines, contained in IRC: 73, IRC: 86, IRC: 38 and IRC: SP: 23 and is given in Table below:

**Table- 0.7 Design Parameters**

| Sl. No. | Item | Plain/Rolling Terrain |
|---|---|---|
| 1 | Design speed (kmph) | 80Kmph -100 Kmph. |
| 2 | Land width (m) Open / Built-up area | In Open areas – 20 m & in Built-up areas 10-15 m. |
| 3 | Width of carriageway (m) | 7.00 m |
| 4 | Paved shoulders | 2 x 1.50 |
| 5 | Unpaved shoulders | 2 x 2.00 m |
| 6 | Camber/cross fall | |
| (i) | Carriageway & paved shoulders | 2.5% |
| (ii) | Earthen shoulders | 3.0% |
| 7 | Maximum super elevation | 7% |
| 8 | Minimum Radii of horizontal curves (m) | 230m ruling /155m min. |
| 9 | Minimum length of curves (m) | 150 m for every deflection angle of $5^0$ |
| 11 | Drains | As per Design |
| 12 | Sight Distance | As per IRC 73 & IRC 86 |
| 13 | Gradient | |
| (i) | Ruling Gradient | 3.33% |
| (ii) | Limiting Gradient | 5% |

| | | |
|---|---|---|
| (iii) | Exceptional Gradient | 6.7% |
| 14. | Vertical Clearance for power/ telecommunication lines<br>Low Voltage up to 110 V<br>Power Line up to 650V<br>Electric Power line more than 650 V | <br>5.5m<br>6.0m<br>6.5m |

## 0.19 TYPICALCROSSSECTIONANDWIDENINGSCHEME



## 0.20RESETTLEMENTANDREHABILITATION(R&R)POLICY

TheMinistryofRuralDevelopment(DepartmentofLandresources)haspreparedtheNationalPolicyonResettlementandRehabilitationforthepeoplewhowillbeaffectedbytheproject.Thepolicydescribestheprincipleandapproachtominimizeandmitigatethenegativesocialandeconomicimpactscausedbythe project.TheR&Rpolicybroadlyaddressesallissuessuchascompensation,assistance,replacementvalue,vulnerablegroup,etc.Thepolicyensuresthatpeopleaffectedbyprojectmustbeabletorestoretheirlivelihoodtotheprerojectlevel.TheProjectalignmentisproposedinsuchawaywithminimumResettlement andRehabilitation.

## 0.21 COSTESTIMATE-

Thetotalprojectcostiscalculatedbasedonthequantityofindividualitemmultipliedbytherateforthisitemandsummingupthecostofalltheitems.

TheProjectroadhasbeenseparatedinsevensectionsandthebillwisetotalprojectcostistabulatedinTablebelowforallthepackagesoftheproject.

**Table 0.8 – Abstract of Cost Estimate**

| Bill No. | Description | *ORIGINAL CONTRACT* | |
|---|---|---|---|
| | | **Amount in Figure (INR)** | **Amount in Words (INR)** |
| **A** | **Civil Works** | | |
| 1 | Site-Clearance | 10,062,006.64 | |
| 2 | Earthwork | 348,277,867.58 | |
| 3 | Sub-base, Base Courses | 377,214,815.20 | |
| 4 | Bituminous Pavement | 969,254,798.83 | |
| 5 | Traffic Signs, Marking and Road Appurtenances | 97,566,044.28 | |
| 6 | Miscellaneous Items | 155,142,480.00 | |
| | **Cost of Road Works** | **1,957,518,012.53** | |
| | **Cost of Cross-Drainage structures (Bridges & Culverts)** | **269,541,323.00** | |
| | **Cost of Toll Plazas (2 Nos.)** | 100,319,280.67 | |
| ***(A)*** | **Total Cost of Civil Works** | **2,327,378,616.19** | |
| | *Cost per km for Civil Works* | 25,338,907.09 | |
| **(B)** | **Non-civil Works** | | |
| 9 | Cost of Utility Shifting (Electrical Works) | 42,622,056.56 | |
| 10 | Forest and Environment Clearance | 1,837,000.00 | |
| | ***Sub-total for Non-civil Works (B)*** | **44,459,056.56** | |
| | *Cost per km* | 484,039.81 | |
| **C** | **Total Cost (A+B)** | **2,371,837,672.75** | |
| **D** | **Centages** | | |
| | *Provision for Escalation (Price Contingencies)@6% of A* | 139,642,716.97 | |
| | *Supervision Charges @ 6% ofA* | 139,642,716.97 | |
| | *Quality control @ 1% of A* | 23,273,786.16 | |
| | ***Grand Total*** | **2,674,396,892.86** | |
| | *Cost per km* | 29,117,004.82 | |

<table>
<tr><th>Description</th><th></th><th>Existing</th><th>Proposed</th></tr>
<tr><td>Terrain</td><td>:</td><td>Plain</td><td>Plain</td></tr>
<tr><td>Length</td><td>:</td><td>Existing Length = 90.8 Km</td><td>Proposed Length = 94.8 Km</td></tr>
<tr><td>Alignment</td><td>:</td><td>The existing Alignment is almost Poor except at few locations.</td><td>The existing alignment with geometric improvements.</td></tr>
<tr><td>Design Speed</td><td>:</td><td></td><td>80Kmph to 100Kmph.</td></tr>
<tr><td>Cross-Section</td><td>:</td><td>Open Area<br>C/W = 7.00 m<br>Shoulder =1.50-2.00m<br>Formation Width = 10-12m<br><br>Built-up Area<br>C/W width = 7.00 m,<br>Earthen Shoulder = 1.5-2.00m<br>Formation Width = 10-12 m</td><td>Flexible Pavement<br>2-Lane with paved shoulder in Open / Rural Area<br>2.00m Hard Shoulder+1.50m Paved Shoulder + 7.00 m C/W +1.50m Paved Shoulder+ 2.00m Hard Shoulder = 14m<br><br><table><tr><th>Sr. No.</th><th>From</th><th>To</th><th>Length( m)</th></tr><tr><td>1</td><td>80200</td><td>175000</td><td>94800</td></tr><tr><td></td><td></td><td>Total</td><td>94800</td></tr></table></td></tr>
<tr><td>CBR Considered</td><td>:</td><td>6%</td><td>6%</td></tr>
<tr><td>Traffic</td><td>:</td><td>At Km 152+500<br>PCU - 6558<br>ADT- 4547<br>CVPD-1288<br>MSA-36.58</td><td>On basis of projected traffic,<br>* From Km 80.2 to Km 172.0 : 2-Lane with Paved shoulder is considered</td></tr>
<tr><td>Pavement Design Life</td><td>:</td><td>Nil</td><td>10 / 15 Years</td></tr>
<tr><td>Pavement Crust Thickness for widening & new construction</td><td>:</td><td>Thickness. Avg. 200mm to 390mm</td><td><table><tr><th>FLEXIBLE PAVEMENT</th></tr><tr><td>BC-40</td></tr><tr><td>DBM-110</td></tr><tr><td>WMM-250</td></tr><tr><td>GSB-260</td></tr><tr><td>Total-660</td></tr></table></td></tr>
</table>

<table>
<tr><th>Description</th><th></th><th>Existing</th><th>Proposed</th></tr>
<tr><td>Bridges</td><td>:</td><td>2major bridges<br>23 minor bridges</td><td>Retained with Repair-4 , Reconstruction-1<br>Widening-20</td></tr>
<tr><td>Culverts</td><td>:</td><td>Total Culvert = 33 Nos.<br>HPC = 2 Nos.<br>Arch Culvert =1 Nos.<br>Box Culvert = 30</td><td>
<table>
<tr><th>Type</th><th>Existing Nos.</th><th>Retained</th><th>Widening</th><th>Reconstruction</th></tr>
<tr><td>HPC</td><td>2</td><td>2</td><td>Nil</td><td>Nil</td></tr>
<tr><td>ARCH</td><td>1</td><td>1</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Box Culvert</td><td>30</td><td>0</td><td>30</td><td>Nil</td></tr>
</table>
</td></tr>
<tr><td>Longitudinal Drains</td><td>:</td><td>Nil</td><td>Total Length = 2 x 5.675m = 11.350m</td></tr>
<tr><td>Bus - Bay</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Truck Lay Bye</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>ROW</td><td>:</td><td>15rn to 20m</td><td>Design has been done on the basis of existing ROW.</td></tr>
<tr><td>Land to be acquired</td><td>:</td><td>-</td><td>No additional land will be required as the design has been done based on existing land availability.</td></tr>
<tr><td>Forest Proposal</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Major Intersection</td><td>:</td><td>1</td><td>1</td></tr>
<tr><td>Minor Intersection</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Flyover</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Grade Separator</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Underpasses(VUP Cattle/Pedestrians)</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>ROBS</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>RUBS</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Service Road</td><td>:</td><td>Ni,</td><td>Nil</td></tr>
<tr><td>Slip Road</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Protection & Others Work</td><td>:</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Total Cost (Rs.)</td><td>:</td><td></td><td>Rs. 267.44 Cr (Rs 2.912 Cr/Km)</td></tr>
</table>