PROJECT NOTE

Project Road from Design km 0+000 to Design km 78+837 (Jind - Gohana - Sonipat section in the State of Haryana. Project Road traversing Jind and Sonipat District. Project Road divided into two Packages-I (from km 0+000 to km 40+601) and Package-II (from km 40+601 to km 78+837) therefore package wise note is presented into two sections. Project Road falls under Jurisdiction of Forest Division Jind (from Design km 0+000 to km 24+480) and Forest Division Sonipat (from Design km 24+480 to km 78+837). Proposed 4-laning of Project Road will divert 32.903ha. PF land on Roads/ canal/ Railway line/ Drain side strip declared as Protected Forest land.

Project Notes - Package-II

EXECUTIVE SUMMARY

1 INTRODUCTION

The Detailed Project Report has been prepared for the project of Feasibility Study cum Detailed Project Preparation for Redesigning, Rehabilitation and Up-gradation to 4-Lane Configuration of **New NH-352A Gohana - Sonepat Road** in the State of Haryana. The Executive Summary brings out in brief the details of the various chapters of the report. It mainly covers the Existing Features of Project Road, Traffic Surveys, Analysis and Forecasts, Improvement proposals, Detailed Cost Estimates for the improvements proposed, and finally the Economic and Financial Analysis for the project. The details are presented in each of the relevant sections.

2 PROJECT ROAD DESCRIPTION - EXISTING FEATURES

Gohana-Sonepat Section of NH-352A starts from the intersection of NH-352 A and NH-709 (Gohana Bypass) near Village Barotha. It runs through villages namely, Kheri Damkan, Bidhal, Pinana, Mohana and Barwasni in Sonepat District. The length of alignment along 352-A in this section is 29.60 km. It further follows newly constructed two lane Sonepat bypass road and ends at intersection with NH-44 (New) Delhi - Panipat Highway. The length of existing Sonepat bypass is 9.158km.

Thus, the total length of existing Gohana-Sonepat Section is 38.758 km.

The project road in this section predominantly consists of long straight stretches with few numbers of horizontal curves. The horizontal curves especially at structures on canal and drain are sharp in nature and would need the geometric correction. Vertical profile of this section has almost flat gradients. Few locations were observed with rise and fall at the locations of canal crossing and approaches to minor bridges.

The existing pavement along NH 352 A is bituminous surface of 9 m of width with earthen shoulder on either side, whereas it is 7 m of wide bituminous surface with earthen shoulder on either side along Sonepat Bypass road. The pavement surface condition is generally varying from fair to good. Overall riding quality throughout the stretch is fair to good.

The earthen shoulder widths range from 1.0 to 1.5 m along the project road stretch. Shoulders are found to be in fair to poor condition. At some locations there is lack of proper cross–slope and drainage. Thick vegetation have grown on the earthen shoulder.

ROW boundary stones are not available along the project road. The ROW available along Gohana - Sonepat section (NH-352A) is about 20.12 m while ROW available along existing Sonepat Bypass road is 30 meters.

The summary of structures along the existing project alignment in this section is presented in the table below:

Table 2-1 Summary of Existing Structures

Gohana – Sonepat Road		
Sr. No.	**Structure Type**	**Nos.**
1	Major Bridges	Nil

Gohana – Sonepat Road		
Sr. No.	**Structure Type**	**Nos.**
2	Minor Bridges	10 nos.
3	Cross Drainage Works	68 nos.
4	At grade Railway crossing	2 nos.
5	ROB	1 no.
6	RUB	Nil
7	VUP	Nil
8	LVUP	Nil
9	PUP (at ROB approaches)	2 nos.

The detailed Inventory and Condition survey of all the structures has been carried out accordingly, proposal for Retention / Widening / Reconstruction / Rehabilitation has been finalized.

The existing road crosses railway lines enroute at three locations as described in the table below:

Table 2-2 Railway line Crossing (Gohana – Sonepat Section)

Sr. No.	Section	Existing Chainage	Railway Line	Type of Gauge and Track
1	Gohana-Sonepat	Km 38+300 of NH 352-A	Jind - Sonepat	Existing Two-Lane ROB near Mohana Town. (L/C No. B-21A/2T-C between Railway km 69/0 and km 70/0) - Broad Gauge Single Track (Existing L/C Now Closed)
2	Gohana-Sonepat	Km 1+000 of Sonepat Bypass	Jind - Sonepat	Three Lane ROB under construction. At-Grade Level Crossing (L/C No. 30C/2E at railway km 85/796 and km 86/0) - Broad Gauge Single Track.
3	Gohana-Sonepat	Km 3+408 of Sonepat Bypass	Sonepat - Panipat Section	Two Lane RUB under construction At-Grade Railway Track Crossing (Between Railway km 47/0 and 48/0)- Broad Gauge Double Tracks.

The terrain of the project corridor is classified as plain terrain. The trees are predominant in the project road stretch. The land use is primarily agriculture land throughout the project stretch with few built-up sections as mentioned above.

Road signs are limited to warning signs preceding sharp curves. Other signages are practically absent and grossly inadequate, especially at intersections, which make acute angles with the project road. Destination/Direction Signs are mostly available throughout the project road, however these are not as per relevant IRC/IS codes.

Road center line markings are missing at some places along the project road. At some locations the markings have weathered due to ageing. Road edge markings are absent at most of the locations in this stretch.

Safety provisions in the form of crash barriers or guardrails are provided along sharp curves as well as high embankment areas. Sight distance is also inadequate at approaches of some of the bridges.

Wayside amenities do exist along the highway such as petrol pumps, eating places (Dhabas), etc. these are required to be relocated after widening. Utilities such as OFC cables, electric and telephone line exist along the road stretch, which are proposed to be shifted wherever the widening affects them.

3 IMPROVEMENT PROPOSALS

Various improvement proposals by way of construction of New 4 laned Road conforming to geometric standards of 4 laning manual, construction of new bridges and cross-drainage structures, improvements to junctions, proposal of road markings, road signs and traffic lights, provision of ROBs, facilities such as Truck lay bye and passenger shelters have been recommended.

3.1 Project Road Section

The Project road is proposed to be developed as presented below:

Description	Design Length (km)
Gohana - Sonepat (NH 352A)	**38.236 km**

3.2 Proposed ROW

The existing ROW along the project road is 20.12 m from Gohana to Sonepat section and 30 m along existing Sonepat Bypass road.

As per 4 Laning Manual, the proposed ROW is 60 m for the development of 4 lane road for the entire project road. However, proposed ROW for the length of 5.442 km towards end of project road is 70 m, considering the future development plans within the Sonepat town.

Additional land has been proposed to be acquired at Toll Plaza and VUP/ LVUP locations.

The summary of Proposed Cross sections is presented below

Table 3-1 Application of Typical Cross sections

Sr. No.	TCS Type	TCS Description	Widening Type	Length (m)
1	TCS - 1A	4 Lane Divided Highway without Service Road and with Raised Median	Bypass/Realignment	6420
2	TCS - 1B	4 Lane Divided Highway without Service Road and with Raised Median	Eccentric Widening on RHS	6365
3	TCS - 1C	4 Lane Divided Highway without Service Road and with Raised Median	Eccentric Widening on LHS	480
4	TCS - 1D	4 Lane Divided Highway without Service Road and with Raised Median	Reconstruction with Raising	890
5	TCS - 2A	4 Lane Divided Highway with Service Road and with Raised Median	Greenfield/Bypass/Realignment	1575
6	TCS - 2B	4 Lane Divided Highway with Service Road and with Raised Median	Existing Road used in LHS Service Road	1169
7	TCS - 3A	4 Lane Divided Highway with Service Road cum	At VUP/LVUP/Flyover/ROB including Approaches	11682

Sr. No.	TCS Type	TCS Description	Widening Type	Length (m)
		Slip Road and with Raised Median		
8	TCS - 3B	4 Lane Divided Highway with Service Road cum Slip Road and with Raised Median	At VUP/LVUP/Flyover/ROB Including Approaches - Existing Road used in LHS Service Road	540
9	TCS - 4A	4 Lane Divided Highway without Service Road and with Raised Median	At VUP/LVUP/Flyover/ROB Including Approaches	1315
10	TCS - 5A	4 Lane Divided Highway with Raised Median, Service Road, Cycle Track	Eccentric Widening on LHS	3887
11	TCS - 6A	4 Lane Divided Highway with Raised Median, Service Road, Cycle Track	At VUP/LVUP/Flyover Including Approaches	1320
12	TCS - 6B	4 Lane Divided Highway with Service Road cum Slip Road and with Raised Median	At VUP/LVUP/Flyover/ROB Including Approaches - Existing Road used in RHS Service Road	190
13	TCS - 7A	2 Lane New ROB on LHS and 2 Lane Existing ROB on RHS with Service Road	At ROB including Approaches	1150
14	TCS - 8A	4 Lane Divided Highway with Entry/Exit Ramp and with Raised Median	At Flyover Approaches	481
15	Flyover	-	-	272
16	Toll Plaza	-	-	500
			Total Length (m)	**38236**

3.3 Proposed Bypass

Bypasses have been proposed for towns as below:

Sr. No.	Name of Bypasses	Design Chainage (km)		Length (km)
		From	To	
Gohana-Sonepat (NH-352A)				
1	Kheri Damkan	43+070	45+070	2.000
2	Bidhal Pinana	49+580	53+290	3.710
3	Mohana	55+940	57+455	1.515
4	Barwasni-Sonepat	66+555	73+630	7.075

It is observed that available ROW is 20.12m in these towns. There is ribbon development abutting the road which includes houses and commercial buildings. The widening of the road in these towns will involve razing of existing houses and commercial establishments. The cost of resettlement and rehabilitation and shifting of utilities will be very high. In addition, movement of local traffic is also very high at these sections and it will hinder the through traffic and the speed will be compromised.

3.4 Proposed Interchange

Interchange is not proposed in the project section.

3.5 Proposed Pavement

Pavement design has been carried out for both types, i.e. flexible and Rigid pavement. New flexible pavement has been designed for design life of 15 years while Rigid pavement has been designed for design life of 30 years. Vehicle Damage Factor has been derived from Axle Load survey data. The AADT has been derived from Classified Traffic Volume survey. The total pavement thickness arrived after design has been used. Flexible pavement has been proposed for the construction of New road, Widening of existing road, Reconstruction and Bypass sections including slip road / Service roads.

Rigid Pavement is proposed for Service Road with cycle track of length 5.207 km at end section of project road connecting to NH-44 (New) and at Toll Plaza location (including taper portion).

Table 3-2 Flexible Pavement – New Construction

Sr. No.	Description	Design Life (Years)	Minimum Design Traffic in MSA	Minimum Pavement thickness (mm)			
				BC	***DBM***	***WMM***	***GSB***
1	Main Carriageway	15	40	40	95	250	200
2	Slip road / Service road	15	10	40	60	250	200

Table 3-3 Flexible Pavement – Overlay Construction

Sr. No.	Description	Design Life (Years)	Minimum Design Traffic in MSA	Minimum Pavement thickness (mm)	
				BC	***DBM***
Gohana-Sonepat (NH-352A)					
1	Main Carriageway	15	40	40	50
2	Slip road / Service road	15	10	40	50

Table 3-4 Rigid Pavement

Sr. No.	Description	Design Life (Years)	Minimum Pavement thickness (mm)		
			PQC	**DLC**	**GSB**
Gohana-Sonepat (NH-352A)					
1	Service road (km 73+630 to km 78+837)	30	200	150	150
2	Toll Plaza	30	250	150	150
3	Cycle Track	30	100	150	150

3.6 Proposed Structures

Based on the site conditions, crossings of canals & streams, railway crossings and road crossings, new construction proposals have been recommended for Major and Minor Bridges and other structures.

Table 3-5 Summary of Proposed Structures

Gohana to Sonepat				
Structure Type	**New Construction**	**Reconstruction**	**Retain + Repair**	**Widening**
Culvert	13	34	-	15
Major Bridge	-	-	-	-
Minor Bridge (6 locations)	6 – LHS 4 - RHS	-	2 - LHS	-
Minor Bridge on Service Road (2 locations)	1 – LHS SR 2 – RHS SR		1 - LHS SR	
ROB (3 locations)	3 – LHS 2 - RHS	-	1 – RHS	-
RUB	-	-	-	-
PUP	2	-	2	-
VUP	10	-	-	-
LVUP	3	-	-	-
Flyover	3	-	-	-

3.7 Project Facilities

Project facilities like Toll Plaza, Truck Lay byes, Passenger shelter have been proposed along the project road.

Toll Plaza		
Sr. No.	**Existing Chainage (km)**	**Design Chainage (km)**
1	km 35+650 of NH 352 A	Km 58+035

Truck Lay bye			
Sr. No.	**Existing Chainage (km)**	**Design Chainage (km)**	**Side**
1	km 44+570 of NH 352A	48+980	Both Side

Section	Bus Shelter Locations (Nos.)	Side
Gohana-Sonepat	13	Both Side

For ensuring a high standard of road safety, road furniture and safety features as per relevant IRC codes have been recommended such as road signs and marking which are proposed to be suitably sited and designed as per latest state-of-art retro-reflectivity standards.

4 TRAFFIC SURVEYS AND ANALYSIS

Traffic Surveys such as Classified Traffic Volume Count survey at mid-block, Origin and Destination survey, Speed and Delay survey and Pedestrian crossing count survey, were conducted at various locations along the project road.

Volume Count Survey analysis gave the Average Daily Traffic (ADT), and Annual Average Daily Traffic (AADT). After reconnaissance surveys and detailed study, the volume count locations was at km 69 (Barwasni).

The AADAT is presented in table below;

Vehicle Type	Gohana- Sonepat AADT at Ch: 69 km (Barwasni)
Car/Taxi	5383
Mini Bus	10
Bus	201
LCV	452
2 Axle Truck	144
3 Axle Truck	216
MAV	150
Two Wheeler	3443
Auto- 3 Seater	656
Auto-6 Seater	11
Tractor with Trailer	213
Tractor without Trailer	57
Cycle	27
Animal Drawn	2
Others	4
Total Vehicles	**10969**
Total PCU	**12242**

An O-D survey was carried out for 24 hrs periods at Km 69. Around 94% of the passenger traffic is found to have the origin and destination within Haryana, the rest 5% from Delhi and Punjab. Similarly 85% of truck traffic is originating from Haryana and about 10% from Delhi.

Axle-load surveys conducted shows that heavy trucks are used for long haul assignment in the corridor.

Speed and Delay Survey was conducted using the moving car observer method to understand the speed and delay characteristics and to arrive at the existing level of service provided by the road. The average journey speed was studied in 2 sections, wherein each section was sub divided into further sections to understand the variation of speeds near towns as well. The Average speed along the different stretches of the corridor was found to vary between 46 kmph to 53 kmph.

5 TRAFFIC FORECASTS

Three different forecasting methods, i.e., Trend Based Analysis, Econometric Model and Trip-End Factor Model have been used to forecast the traffic. In the first method, past traffic data and vehicle registration data in the influence region was collected and analysed up to 2015. The study of this data revealed that there was an overall growth of cars and trucks of 15.2% and 7.68 % respectively.

The second method where the Econometric Model was used, the trends in the growth of economy (GDP) was studied. The studies revealed that a relationship could be

established between the traffic level in the corridor and the vehicle registration growth with the GDP. By this method the growth rate for cars is 14.6 % and 8.6 % for trucks respectively.

The third method used was the Trip-End Factor Model, which is based on regional economy based parameters. It showed that socio-economic parameters and temporal trends in the growth of economy have a good correlation with the growth of traffic in the region. Various socio-economic indicators collected were analysed and used to forecast horizon years to relate the temporal growth in the economy. The weighted Economy based parameters of the contributing states are regressed with weighted number of vehicles. The growth rate emerging from this method showed an increase of 14.4% in cars, and 7.4% in trucks respectively.

Based on the above three methods the base year growth rates were selected as 6% for Cars, 6% for Trucks and 6% for Buses. It is forecast that the level of traffic using the project road will continue to increase due to the growth in the socio-economic factors and the new development taking place within the influence area.

A tolling strategy was adopted based on the new Model Concession Agreement using the projected tollable traffic and the revenues were generated for the Toll Plaza.

6 DETAILED COST ESTIMATE

Detailed Cost for the Project improvement proposals was estimated for the year 2017-18 and summary of Civil cost estimated is given below;

Section	Civil cost
Gohana - Sonepat Road	Rs. 590.51 Crores

7 RECOMMENDATIONS

At present, it can be observed that, the traffic on Gohana- Sonepat section of the project road is 12242 PCUs as observed at the traffic survey location. The project influencing area including the state of Haryana has recorded a high growth of vehicles due to the presence of industries such as manufacturing, pharma and automobiles. A number of planned developments in terms of industry, Dedicated Freight Corridors, Proposed DMIC and related developments are under implementation in the PIA which is promising to the project stretch and expected to attract more traffic. Keeping in mind the current traffic, future developments in PIA, need of increased road safety, as an immediate improvement, the entire project road can be considered for construction of Four lane configuration. In view of this, and considering the results of the economic viability analysis the whole project corridor is recommended to be upgraded to 4 lane configuration under EPC/ Hybrid Annuity mode.

Authorised Signature,
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