Development of Package-15 (KM 468+100 to KM 503+250) of Phase-II of Delhi-Katra Expressway in the UT of J&K

PROJECT REPORT

May - 2021

CONTENTS

LIST OF TABLES

LIST OF FIGURE

1.1 PROJECT BACKGROUND

The National Highways Authority of India (NHAI) has been constituted through an Act of Parliament for faster, economical and Quality Road Construction work throughout India. NHAI aims at provisioning and maintaining the National Highways network to meet user expectations in the most time-bound and cost-effective manner within the strategic policy framework. The National Highways Authority of India (NHAI) is the nodal agency of Ministry of Road Transport and Highways (MoRT&H), Government of India and has been entrusted with the Development of Delhi - Ludhiana - Amritsar – Katra Expressway having an approximate length of 600 Kms including spurs through BOT & EPC basis.

As part of the development, MoRT&H entrusted NHAI with engagement of a consultant to carry out the "Consultancy services for Preparation of DPR for Development of Delhi - Amritsar – Katra Expressway having an approximate length of 600 Kms including spurs" for project transaction preparation. NHAI through competitive bidding has appointed M/s. Feedback Infra Private Limited, Gurugram for providing the required consultancy services and issued letter of Commencement of Services vide their letter No.: NHAI/Punjab/ CC/ N-1/109706 dated 11.12.2017.

The Delhi - Amritsar – Katra expressway has been referred to as the Project Highway in this Report. The Project Highway starts from Kundli Manesar Palwal Expressway (KMP) in National Capital Region (NCR) and ends at Katra in Jammu & Kashmir. As phase I development, Delhi to Gurdaspur (397.700 km) has been considered the entire Greenfield Alignment passes through Districts of Jhajjar, Jind, Kaithal, Karnal, Rohtak, Sonipat of Haryana State and Sangrur, Patiala, Ludhiana, Kapurthala, Jalandhar and Gurdaspur of Punjab State. As Phase 2 development, Gurdaspur to Katra has been considered. The Project Highway starts at Ch. 397.700 and ends at Ch. 567.000, the total length of the Project Highway is 169 Kms.

Presently Delhi – Amritsar – Katra is connected by two different routes:

- Delhi to Katra via Panipat-Jalandhar-Pathankot-Jammu (NH44)
- Delhi to Katra via Jind - Sangrur - Amritsar - Pathankot – Jammu (NH-352 & 52)

The present project report pertains to Package 15 of Phase 2 in Four Lane access-controlled expressway in Greenfield and six lane access-controlled expressway in Brown field sections from Junction with Hiranagar Road near village Gurha Baildaran to Junction with Jammu Ring Road NH 244A near Jakh village (Km 468+100 to Km 503+250) in the UT of J&K.

1.2 Project Location

The project starts from Junction with Hiranagar Road near village Gurha Baildaran at Ch. 468+100 and ends at Junction with Jammu Ring Road NH 244A near Jakh village at Ch. 503+250 along the approved alignments by the NHAI/ MoRT&H.

Project section is passing through Kathua and Samba districts in the UT of Jammu & Kashmir. Extent of the alignment length under Package 15 (from Ch 468.100 to Ch. 503.250) across the districts is presented in Table below.

Table 0.1: List of Districts and Talukas along the Project Highway Package-15

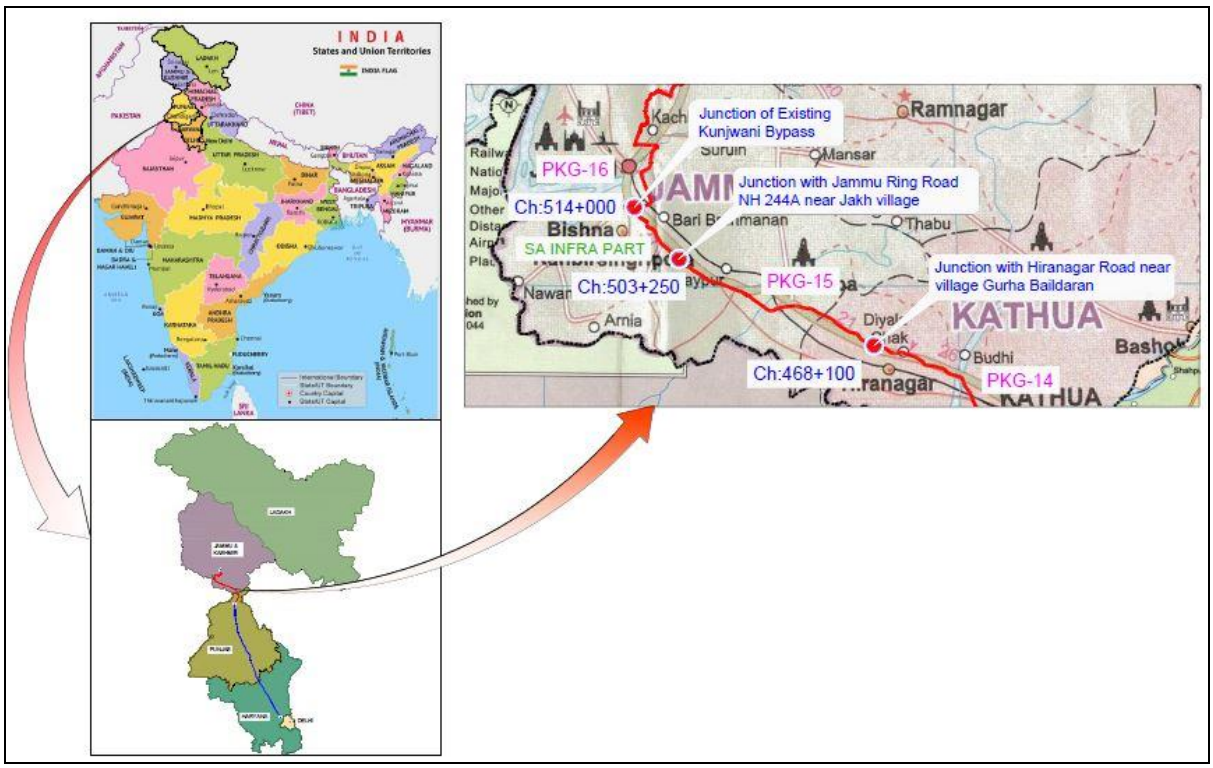
Sl. No.	Union Territory	Name of District	Name of Taluka	Approx. Length in Km

1	Jammu & Kashmir	Kathua	Hiranagar	5.100
2		Samba	Ghagwal, Samba, Vijaypur,	30.050
			Total Length, Km	**35.150**

The distribution of alignment among the above districts is given as under:

Chainage (Km)			District/UT/State
Start	**End**	**Length (Km)**	
468+100	473+380	5.280	Kathua/ UT of J&K
473+380	503+250	29.870	Samba/ UT of J&K
	Total	**35.150**	

Key plan of the project highway is shown in figure below:



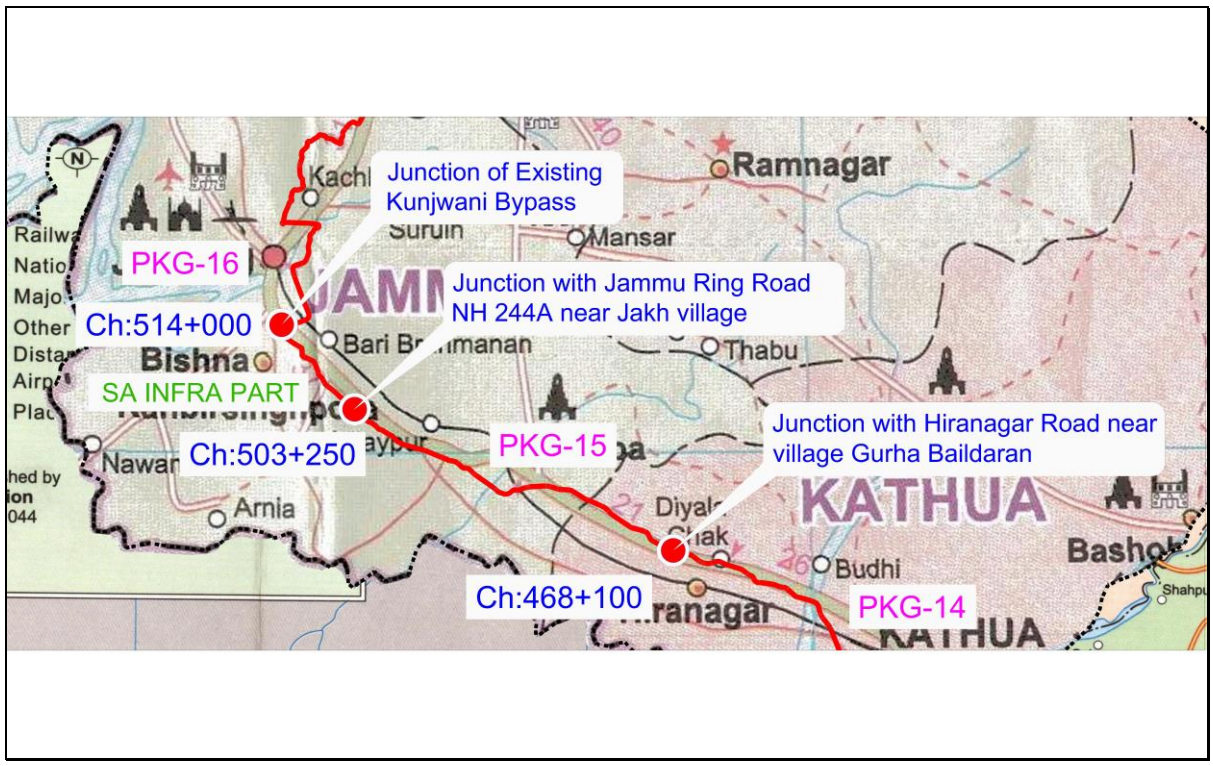


Figure 0.1: Key Plan of the Project Highway

1.3 ENVIRONMENT FEATURES OF PROPOSED PROJECT HIGHWAY

Physical Environment

Physiography and Terrain

Kathua is located in the Indian administered Union Territory of Jammu and Kashmir, near its border with Punjab and Himachal Pradesh. It is situated along NH-44. The town has a bustling industrial area and an Army Cantonment adjoining it. It has an average elevation of 393 meters (1,289 ft). The city is surrounded by three rivers. Ravi is just 7 km down and its plains are highly fertile and high yielding varieties of wheat and rice are grown here. Kathua itself is situated along the banks of many hill streams known as khads. Kathua being a Plain, the area is surrounded in the North by snowcapped Shivalik hills. Kathua lies 88 kilometers south of Jammu. Kathua district has three distinct areas. The area of low elevation up to 500 metres in southern part touches Pakistan and Punjab border. The second zone falling in its north extending up to foothills of Himalayas and falling mostly in the Shivalik ranges and is called Kandi area. The third area falls beyond Shivalik ranges and extends up to Pir-Panjal ranges and this area is mountainous in nature.

Samba is situated in the Shivalik Hills alongside the National Highway 1-A on the bank of the Basantar River, at a distance of 40 km (25 mi) from the city of Jammu. It has an average elevation of 384m (1,260 ft). Samba District borders Udhampur District to the north, Kathua District to the east, Tehsils Jammu and Bishnah of Jammu District to the west, and the Working Boundary Line of Pakistan to the south. Most of the area of Tehsil Samba is Kandi and rain-fed. The southern area downward of the National Highway is irrigated through the Ravi-Tawi Irrigation canal network, contributing to major cereal and vegetable crops as specially assigned by the Ministry of Water Resources through the Command Area Development Department. A modern industrial complex, the Industrial Growth Center, is located on the bank of the Basantar River. Several small and medium industrial units have been established.

Climatology

The climate of the region is classified as sub-humid to sub-tropical type of climate in Jammu and Kashmir. The climate of project region can be divided into three major conventional seasons as follows:

- Hot Weather Season (mid-March to end of June)
- Monsoon Season (End of June to September)
- Cold Weather Season (October to February)

The climate conditions prevalent in project influenced districts are summarized in Table below:

Table 1.2: Climatic Conditions in Project Districts

Project District	Climate Distribution
Kathua	Various parts of the district experiences wide range of climate from sub-tropical to temperate and even Alpine in higher regions of Bani and Lohai-Malhar blocks. Due to altitudinal variations the temperature differs in the different tehsils of the district.
Samba	The climate of the area is sub-tropical. The area experiences hot and dry summers and severely cold winters.

Source: District Ground Water Brochures, Central Ground Water Board

The Indian Meteorological Department's (IMD) observatories in vicinity of proposed alignment is located at Kathua in UT of J&K. Long-Term climatological data (Year 1981 – 2010) has been analysed for assessment of prevailing meteorological scenario in the project region and is shown in the Table 4-2.

Table 1.3 : Long-Term Climatologically Conditions at IMD Observatories (1981-2010)

Month	Temp Monthly (°C)		Humidity (%)		Avg. Wind Speed (kmph)	Dominant Direction (from)	Avg. Rainfall (mm)
	Max	Min	Mor	Eve			
Kathua							
January	23.7	3.3	85	65	-	NE	46.3
February	26	4.7	77	55	-	NE/E	73.2
March	31.6	8.5	67	50	-	E/NE	43.3
April	39.1	12.1	53	37	-	E/NE	35.4
May	41.7	17.5	45	31	-	E/SE	34
June	42.6	20.4	55	39	-	E/SE	114.7
July	38	20.6	78	64	-	E/SE	329.4
August	35.9	20.6	84	72	-	E/SE	425.9
September	35.2	18.1	79	66	-	E/SE	127.2
October	34.1	12.5	70	57	-	E/NE	26.9
November	30	7.5	73	63	-	NE/E	18.4
December	25.3	4.1	80	69	-	NE/E	20
Total / Avg.	**33.6**	**12.5**	**71**	**56**	**-**	**E**	**1294.7**

Source: Climatological Normals, 1981-2010, India Meteorological Dept., Govt. of India

Winds are generally variable as the union territory has mostly hilly terrain with lofty mountains and valleys. With the progress of the monsoon, southwesterly and westerly components of the wind

become increasingly predominant. October onwards, the changeover of the pressure to winter pattern commences but wind pattern slightly changes as sometimes northerly and easterly components are seen. The average annual rainfall observed at Kathua Observatory is ~1294.7 mm. Project region generally experiences hot climatic conditions during summer and chilled weather during winter with mercury reducing to 3.3°C.

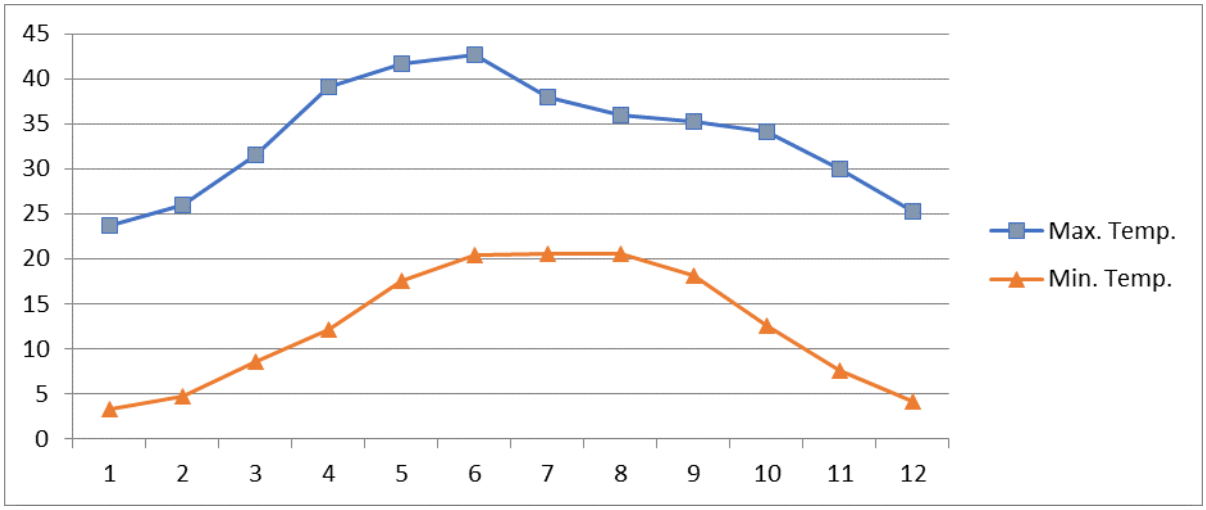


Figure: Max & Min Temperature Variation at Kathua

Geology

Kathua district has rock formations which ranges in age from Cambrian to Quaternary. Hard formations forming hilly and mountainous terrain mainly comprises of igneous and metamorphic rocks belonging to the Panjal traps and Granitic intrusives. Alluvium of Quaternary and Tertiary age (Plio-Pleistocene) underlies the Outer Plains and consists of boulders pebbles, cobbles and coarse sand forms the Kandi belt near Siwalik foothills, and fine to coarse sands with occasional beds of gravel, pebbles and intervening clayey and silty layer constitutes the Sirowal belt. Two major thrust faults are observed in the district *viz* Main Boundary Fault and Murree Thrust. Main Boundary fault is a high angle fault along which Murree formations override the Shiwalik formation while along the Murree thrust the Pre-tertiary sequence of Panjal, Gala Bani, Sarthal-Daggar area is folded into major anticline. The most prominent structural unit in the district is Surin-Mastgarh anticline which has faulted axis. This anticline is truncated by Mandli Kishanpur thrust which has brought upper Murree succession over Lower Shiwaliks and is followed by Lower, Middle and Upper Siwalik subgroups.

Samba district falls in the upper Shiwalik of the area. Kutwalta formation and subdivided the same into three members i.e. Parmandal sandstone member, Nagrota silt member and Tawi conglomerate member. The upper Siwalik sequence conformably lies over the middle Siwalik subgroups. The Upper Shivalik subgroup in the entire foothills of north east Himalayas consists mainly of conglomerate with thin intercalations dull, red and brown clays and silts and grey and buff coloured sandstone. In this area, development of thick clay, silt and sandstone bed is observed and these beds gradually thin out laterally towards east and west.

Seismicity

Bureau of Indian Standards [IS-1893 Part 1:2002] categorises the country into four seismic zones viz. Zone-II, Zone-III, Zone-IV and Zone-V. Seismicity increases from Zone-II (Least active) to Zone-V (Highest Active). Alignment of proposed project is found in Seismic Zone IV (High

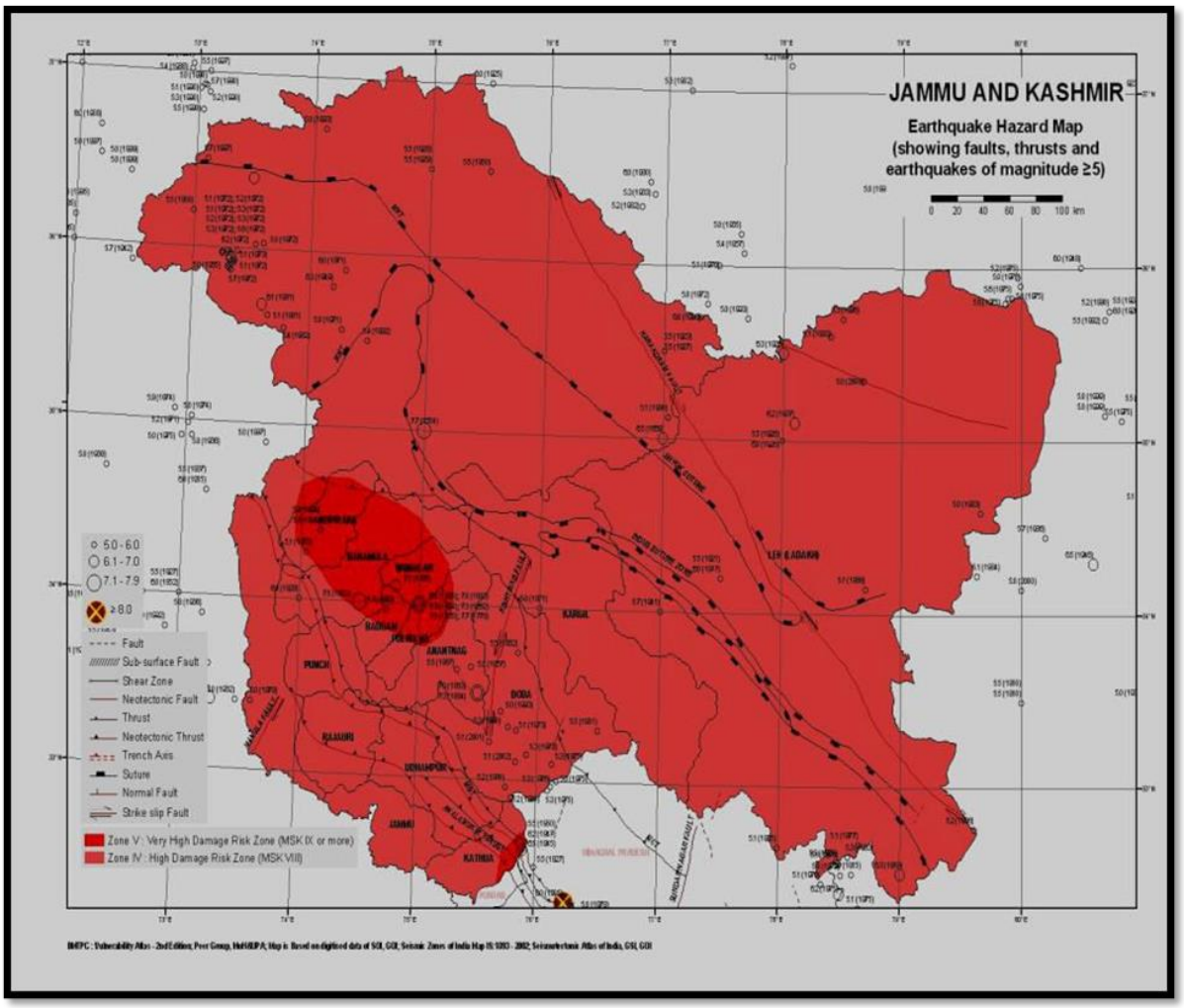
Damage Risk Zone). The project districts are falling within the High damage earthquake Risk Zone.

Table 1.4: Earthquake Frequency of Project district

Sl. No.	Seismic Zone	Intensity MSK	Magnitude	District
1	IV (High damage risk zone)	VIII	6.0 - 6.9	**J&K:** Kathua and Samba

Source: Building Materials and Technology Promotion Council, MoH&UA, GOI

Figure: Seismic Zones Map of Punjab



Source: Building Materials and Technology Promotion Council, MoH&UA, GOI

Forest Area

As per Champion & Seth Classification of Forest types (1968), there are five forest types occurring in the UT of Jammu & Kashmir *viz.* Subtropical Dry Evergreen, Himalayan Moist Temperate, Himalayan Dry Temperate, Subtropical Pine and Sub-alpine and alpine Forests. Vegetation and climate can broadly be categorized into sub-tropical, temperate and alpine zones with wide diversity of fauna and flora. More than 50% of the plant species used in British pharmacopoeia are reported to grow in Jammu and Kashmir. Literature indicates that 572 plant species belonging to 109 different families have medicinal value.

The recorded Forest area is 20230 Sq. Km. which constitutes 19.95 % of geographical area of the UT. The forest cover of the UT as per ISFR-2019 revealed that the extent of forest cover and the trees outside the forests in UT of Jammu and Kashmir is 29,066 sq km, which is 55 percent of the total geographical area of UT of J&K. The UT comprising four National Parks, 12 Wildlife Sanctuaries and 27 Conservation & Wetland Reserves. Jammu and Kashmir has recorded the highest diversity of herbs in the country. The last study had shown that in J&K the area under very dense forest cover had grown by 14 sq km only which now has grown by 206 sq km which shows that area under very dense forest cover has increased the maximum. Forest cover of the Jammu & Kashmir and proposed districts are given in the table 4-28.

Table 1.5: Forest cover of UT of J&K and Districts under Proposed Project (km^2)

District	Geographical Area (km^2)	Very Dense Forest (km^2)	Mod. Dense Forest (km^2)	Open Forest (km^2)	Total (km^2)	% of GA
Kathua	2512	108.16	607.96	615.32	1331	53.00
Samba	921	0.00	124.26	207.53	331.79	36.02
J&K	222679	4280.48	8612.36	10719.05	23611.89	10.63

Land Use and Administrative Set-up

The land use pattern of 10 Km either side of the project alignment is mainly agricultural and human habitation.

Details of various environmental clearances applicable for the project package are presented below.

- Environment Clearance: Project Package is the part of Delhi-Amritsar-Katra Expressway in the UT of Jammu and Kashmir. Proposed project is widening and improvement of existing National Highway, with additional right of way or land acquisition less than 40m on existing alignment and 60m on re-alignments or by-passes. Hence, as per conditions of EIA Notification 2006 and it's subsequent amendments, Environmental Clearance is not applicable for the project package-15.
- Wildlife Clearance: The package doesn't fall within any notified Eco Sensitive Zone or within 10 Km (in absence of notified ESZ) of any National Parks and Wildlife Sanctuaries. Therefore, wildlife clearance is not applicable for the project Package-15.
- Forest Clearance: There is no Protected/ Reserve Forest getting affected in project package-15 in UT of Jammu and Kashmir. Hence, no forest clearance under FCA, 1980 is required for the project.

Other than the above clearances obtained by NHAI, the Contractor need to procure and obtain a number of other permissions and NOCs for the project, before starting the construction work. These are:

- Prior Environmental Clearance from MoEF&CC / SEIAA for mining of sand and aggregate quarries, if new mines opened by the Contractor
- Conversion of land use, from the State revenue department for setting camps and plants
- Approval of Monitoring Consultant / Supervision Consultant / Authority Engineer for location and layout of Camps & plants before start of Construction

- NOC and Consents under Air & Water Acts for establishing and operating the construction plants including but not limited to hot mix plants, WMM, Crushers etc. from State Pollution Control Board
- Prior permissions for felling of trees from Forest dept. / District Authorities
- NOC under the Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 from SPCB
- PUC certificate for use of vehicles for construction from Transport department
- NOC for water extraction for construction and allied works from Irrigation department
- Approval of Monitoring Consultant / Supervision Consultant / Authority Engineer for Traffic Management Plan before start of Construction
- Approval of Monitoring Consultant / Supervision Consultant / Authority Engineer for the Emergency Action Plan for accidents responding to involving fuel & lubricants before the construction starts.

Socio-Economic Profile

Socio-economic analysis has been conducted for the state and project influence districts (Kathua and Samba districts in the UT of J&K) along the proposed project road. The primary purpose of socio-economic analysis is to provide an overview of the socio-economic setup of the affected districts. The population forms the basic planning parameter for the preparation of any transport related plan/study and indicates the scale of required development. Punjab is situated in the north western part of the country. It is bounded by the Indian states of Jammu and Kashmir to the north, Himachal Pradesh to the northeast, Haryana to the south and southeast, and Rajasthan to the southwest and by the country of Pakistan to the west, while, Jammu and Kashmir is situated in the north western part of the country in the Himalayan Region, bordered in west by Pakistan's Azad Kashmir division, in north by Gilgit-Baltistan, the Pakistani territory formerly known as the Northern Areas, to the north east by the disputed border area of Aksai Chin, now administered by China, in east by the Autonomous region of Tibet, and in south by the Indian states of Punjab and Himachal Pradesh.

Population

As per details from Census 2011, Jammu and Kashmir has population of 1.25 Crores, an increase from figure of 1.01 Crore in 2001 census. Total population of Jammu and Kashmir as per 2011 census is 12,541,302 of which male and female are 6,640,662 and 5,900,640 respectively. In 2001, total population was 10,143,700 in which males were 5,360,926 while females were 4,782,774. The total population growth in this decade was 23.64 percent while in previous decade it was 29.04 percent. The population of Jammu and Kashmir forms 1.04 percent of India in 2011. In 2001, the figure was 0.99 percent.

It is significant to note that decadal growth rate of Kathua is 20.53% and Samba is 17.01%. in the period 2001-2011.

Table 1.6: Population Distribution (Year, 2011)

S. No.	State	District	Tehsil	Population		AAGR
				2001	2011	
1.	Jammu & Kashmir	Kathua	Kathua	1,81,852	2,10,949	1.60
2.			Hiranagaar	1,16,238	1,37,798	1.86
3.		Samba	Samba	2,72,539	3,18,898	1.71

S. No.	State	District	Tehsil	Population		AAGR
				2001	2011	
4.		Total		570629	667645	1.70

Source: Census of India, 2001 and 2011

Population Density

Jammu and Kashmir has a geographic area of 101387 Sq. Km with a population density of 246 per sq. km in Kathua district and 350 per sq. km in Samba district which is below the national population density of 382 persons per sq. km.

Sex Ratio

The sex ratio in Jammu and Kashmir was 889 females for each 1000 males in 2011 compared to a ratio of 892 females for each 1000 males in 2001. The sex ration in Kathua district in 2001 was 898 while in 2011 it reduced to 890 while in Samba district sex ration in 2001 was 886 which increases in 2011 to 897.

Literacy rate

According to the 2011 census, the literacy rate in Jammu and Kashmir was 67.16%. The male literacy then was 76.75%, while female literacy was at 56.43%.

The literacy rate in Kathua district is 73.09% out of which 81.53% males are literate and 63.72% females are literate while in Samba district literacy rate is 81.41 out of which 88.41% males are literate and 73.64% females are literate.

Agriculture Profile

Kathua district

There are three agriculture subdivisions in the district namely Billawar & Basohli and Dayalachak divided in Command and Non-Command areas. Billawar and Basohli constitutes non-command area and Dayalachak sub-division falls in Command area. The command area is 30% irrigated & where as only 10% of the area in non-command is irrigated. In respect of crop production potential the command area is quite productive than upper areas. The major horticultural crops are apple, apricot, mango, guava, pear, litchi, lemon, peach, plum, citrus, ber, almond, walnut, grapes Table below provides a brief profile of agriculture in the district and area cultivated under major crops.

Table 1.7: Agricultural Base of Kathua (2016-17)

Description	Area ('000 ha)
Total Cultivated Area	117.008
Net Area Sown	117.008
Area Sown more than once	58.211
Major Field Crops	
Wheat	50.195
Rice	35.913
Maize	15.304
Barley	1.698
Bajra	1.454

Source: Digest of Statistics, Government of J&K, Srinagar (2010-11)

Samba district

The district has a total cultivated area of 64718 ha, out of which area sown more than once is 32073 ha. The major crops cultivated in the district are wheat, paddy, bajra, maize and barley. The major horticultural crops are mango, guava, pear, litchi, lemon, peach, plum, citrus, ber, amla, grapes. Table below provides a brief profile of agriculture in the district and area cultivated under major crops.

Table 1.8: Agricultural Base of Samba (2016-17)

Description	Area ('000 ha)
Total Cultivated Area	64.718
Net Area Sown	64.718
Area Sown more than once	32.073
Major Field crops	
Wheat	29.549
Rice	19.328
Bajra	4.437
Maize	26.67
Barley	0.512

Source: Digest of Statistics, Government of J&K, Srinagar (2010-11)

Industrial Profile

Kathua district

The district has ~4,775 registered industrial units, out of which~4 are registered industrial medium and large units. The major industries in the district are Mfg. of Food Products, Wood/wooden furniture, Agro based, Ready-made garments, Mineral based, Textiles, Mfg. of Textiles, Maintenance & Repair Household and Metal Products industries etc. The summary of industrial scenario of the district is shown in the Table.

Table 1.9: Industrial Profile of Kathua

Sl. No.	Head	Units (in no.)
1	Registered Industrial Units	4775
2	Registered Medium and large Units	4
3	Total Industrial Areas	7
4	Employment in large and medium Industries	8753

Source: www.msmedijammu.gov.in(2011)

Samba district

The district has ~68 registered industrial units, out of which~18 are registered industrial under medium and large units. The major industrial units in the district are agro based, Soda based, Ready-made garments, Cotton textile, soda-water, Paper and paper products, Ready-made garments, Chemicals & Chem. Products, Rubber & Plastic Products, Machinery & Equipment etc. The summary of industrial scenario of the district is shown in the Table.

Table 1.10: Industrial Profile of Samba

Sl. No.	Head	Units (in no.)
1	Registered Industrial Units (large, medium, micro, small)	68
2	Registered Medium and large Units	18
3	Total Industrial Areas	1
4	Employment in large and medium Industries	3768

Source: www.msmedijammu.gov.in(2011)

District wise affected households and PAPs

District and gender wise project affected population is presented in the Table below out of 9666 of total PAPs, male comprises of 5120 (52.97%) and females are 4546 (47.03%).

Table 1.11: District-wise Project Affected Population

State	District	PAHs	%	PAPs (Gender wise)				Total Affected PAPs	%
				Male	%	Female	%		
Jammu & Kashmir	Kathua	677	33.27	1969	20.37	1669	17.27	3638	37.64
	Samba	1358	66.73	3151	32.6	2877	29.76	6028	62.36
Total		**2035**	**100**	**5120**	**52.97**	**4546**	**47.03**	**9666**	**100**

Source: *March 2021, Census Survey*

Social Categories of PAHs

As per the census survey of all of the 2035 affected households, the social stratification of the project area shows that 1514 (74.40%) households are from general category followed by 230 (11.30%) are from Other Backward Class, 261 (12.83%) are from Schedule Caste (SC) and 30 (1.47%) are from Schedule Tribe. Other Backward Class (OBC.

Table 1.12: Social Stratification of PAH

Social Category	Kathua	Samba	Total
General	499	1015	1514
OBC	88	142	230
SC	85	176	261
ST	5	25	30
Total	**677**	**1358**	**2035**

Source: *March 2021, Census Survey*

Affected Family Types

The socio-economic survey revealed that out of total 2035 affected households, 73.32% are nuclear families and 26.68% are joint families. The nuclear family in the project affected area is growing due to employment etc. The details of affected family type is mentioned in Table.

Table 1.13: Family type of PAHs

Districts	Nuclear	Joint	Total
Kathua	546	131	677

Districts	Nuclear	Joint	Total
Samba	946	412	1358
Total	**1492**	**543**	**2035**
Percentage	**73.32**	**26.68**	**100**

Source: *March 2021, Census Survey*

1.4 INDICATIVE DESIGN STANDARDS and SPECIFICATIONS

1.4.1 General

The postulates and considerations for designing the Greenfield eight lane Highway are as follows:

- The Highway will be designed as a fully access-controlled high-speeded facility.
- The Highway will be designed for eight-lane divided configuration.
- The Highway will be provided with modern road furniture and traffic information systems for the safe, convenient, and fast movement of vehicles.
- The roadsides will be made aesthetically pleasing through suitable planting of trees, shrubs, etc. Wayside amenities to provide rest, food, fuel, repair facilities etc. at periodic intervals for the convenience of the traveling public and truck drivers will also be a part of the project.
- Traffic safety will be in-built in the design process itself, and all the accident prevention measures will be taken.

The formulation of the design standards is required in order to avoid any inconsistency in design from one section to the other and provide desired level of service and safety. For this project it is proposed to follow Design Standards given in IRC codes, guidelines and special publications, and MORTH circulars as applicable to National Highways. The project corridor is eight lane Greenfield Highway and is to be designed as per standards and specifications of IRC SP 99-2013. Where the said standards are silent the following standards shall be referenced and the one considered the best and most relevant adopted:

- American Association of State Highway and Transport Officials (AASHTO) standards
- British Standards
- Any other National or International Standard as considered suitable.

1.4.2 Classification of Design Standards for Geometrics of Highway

The project highway shall follow the design standards mentioned below.

Table 0.14: Carriageway

S. No.	Existing Chainage (km)		Design Chainage(km)		Carriageway	Remarks
	From	To	From	To		
1	Km 53+342 of NH-44	Km 61+642 of NH-44	471+450	479+750	Four-lane with paved shoulders and with/without slip road	
2	Km 74+440 of NH-44	Km 86+709 of NH-44	490+780	503+250	Four-lane with paved shoulders and with/without slip	

					road	

Lane Width of Carriageway

The standard lane width of the Project Corridor is 3.750 m. Project Corridor shall have two lanes in each direction of traffic and total 4 lane in Greenfield sections of stage 1. In stage 2, future widening with additional lane in each direction of traffic is to be done on the median side and accordingly the median width has been kept as 12 m to cater for the future expansion. In Brownfield section and at Bridges and ROB locations 3 Lanes will be constructed in Stage 1.

Design Speed

The design speeds given in table below are adopted for various terrain classifications.

Table 0.15: Design Speed

Nature of Terrain	Cross Slope of Ground	Design Speed (KMPH)
		Ruling
Plain and Rolling Terrain	Up to 25%	120 in Greenfield/ 100 Kph in certain Brownfield sections

The project corridor passes through plain and rolling terrain. The adopted design speed is 120 Kmph in the Greenfield and 100 Kmph in certain Brownfield Section.

Right of Way

The recommended minimum Right of Way is given in table below;

Table 0.16: Recommended Minimum Right of Way

Section	Right of Way (ROW)
Rural Section	60m
Rural sections passing through semi urban areas	45m
Forest Area	60m

Median

The median shall be depressed and recommended width of median including shyness is 12m in Greenfield section and at Bridge and ROB sections in Greenfield sections a median width of 4.5m is proposed. In Brownfield sections 4.5m wide median is proposed and at elevated expressway location a median width of 2.5m is proposed.

Shoulders

The shoulders on the outer side (left side of carriageway) shall be 3 m wide paved plus 2 m wide earthen as per Section 2, Clause 2.6 of SP 99.

Barriers

Thrie -beam crash barrier has been provided throughout the project corridor except at structure locations. At culverts parapet wall has been provided and at SVUP/LVUP /VUP/FO/ RoB concrete crash barrier has been provided.

Radii of horizontal Curves

The desirable minimum radii of horizontal curves are given below.

Table 0.17: Minimum Radii of horizontal Curves

Design Parameters	Radii (m)	
Design Speed (Km/h)	120	100
Absolute Minimum Radius (m)	670	440
Desirable Minimum Radius (m)	1000	700

Transition Curves

Properly designed transition curves are provided at both ends of the circular curve. The minimum length of transition curves is designed for 120 / 100 Kmph as per IRC: 38 (latest).

Cross fall and Super Elevation

The cross fall on straight sections of project road carriageway shall be as given in table below. Each carriageway shall have unidirectional cross fall.

Table 0.18: Cross fall on different Surfaces

Cross-sectional Element	Annual Rainfall	
	1000 mm or more	Less than 1000 mm
Carriageway, Paved Shoulders, Edge Strip	2.5 Percent	2.0 Percent

The cross fall for earthen/granular shoulders on straight portions is at least 1.0 percent steeper than the values given in above table. On super elevated sections, the earthen portion of the shoulder on the outer side of the curve is provided with reverse cross fall so that the earth does not drain on the carriageway and the storm water drains out with minimum travel path.

Super Elevation

The super elevation is limited to 5%. Super elevation shall not be less than the minimum specified cross fall.

Typical Cross Sections

Table 0.19: Applicable Stretches of Typical Cross Section (Main Expressway)

S No.	Chainage (Km)		Length (m)	TCS
	From	To		
1	468+100	468+500	400	TCS-3C
2	468+500	468+560	60	TCS-2A
3	468+560	468+694	134	TCS-3C
4	468+694	468+726	32	TCS-2A
5	468+726	468+943	217	TCS-3C

S No.	Chainage (Km)		Length (m)	TCS
6	468+943	468+953	10	TCS-2A
7	468+953	470+029	1076	TCS-1
8	470+029	470+045	16	TCS-2A
9	470+045	470+420	375	TCS-3C
10	470+420	470+476	56	TCS-2A
11	470+476	470+778	302	TCS-3D
12	470+778	470+982	204	TCS-2B
13	470+982	471+176	194	TCS-3D
14	471+176	471+224	48	TCS-2A
15	471+224	471+359	135	TCS-3D
16	471+359	471+575	216	TCS-10
17	471+575	471+845	270	TCS-9
18	471+845	471+893	48	TCS-17A
19	471+893	472+050	157	TCS-11
20	472+050	473+316	1266	TCS-6A
21	473+316	473+575	259	TCS-19
22	473+575	473+680	106	TCS-6A
23	473+680	473+814	134	TCS-9
24	473+814	473+826	12	TCS-10
25	473+826	474+230	404	TCS-9
26	474+230	474+606	376	TCS-6A
27	474+606	474+660	54	TCS-16
28	474+660	475+046	386	TCS-9
29	475+046	476+600	1554	TCS-8
30	476+600	477+000	400	TCS-9
31	477+000	477+268	268	TCS-6A
32	477+268	477+348	80	TCS-16
33	477+348	477+900	552	TCS-6A
34	477+900	478+358	458	TCS-9
35	478+358	478+378	20	TCS-10
36	478+378	478+700	322	TCS-9
37	478+700	478+842	142	TCS-6A
38	478+842	478+894	52	TCS-17A
39	478+894	479+170	276	TCS-6A
40	479+170	479+663	493	TCS-9
41	479+663	479+815	152	TCS-10
42	479+815	480+064	249	TCS-3C
43	480+064	480+128	64	TCS-2A
44	480+128	480+590	462	TCS-1
45	480+590	481+134	544	TCS-3C
46	481+134	481+156	22	TCS-2A
47	481+156	481+313	157	TCS-3C
48	481+313	481+325	12	TCS-2A
49	481+325	481+473	148	TCS-3C
50	481+473	481+483	10	TCS-2A

S No.	Chainage (Km)		Length (m)	TCS
51	481+483	481+603	120	TCS-3C
52	481+603	481+667	64	TCS-2A
53	481+667	482+630	963	TCS-14C
54	482+630	482+870	240	TCS-3C
55	482+870	482+980	110	TCS-1
56	482+980	483+100	120	TCS-3C
57	483+100	483+164	64	TCS-2A
58	483+164	483+589	425	TCS-3C
59	483+589	483+624	35	TCS-2A
60	483+624	484+038	414	TCS-3C
61	484+038	484+053	15	TCS-2A
62	484+053	484+205	152	TCS-3C
63	484+205	484+235	30	TCS-2A
64	484+235	484+532	297	TCS-3C
65	484+532	484+562	30	TCS-2A
66	484+562	485+069	507	TCS-3C
67	485+069	485+081	12	TCS-2A
68	485+081	485+246	165	TCS-3C
69	485+246	485+266	20	TCS-2A
70	485+266	485+390	124	TCS-3C
71	485+390	485+450	60	TCS-2A
72	485+450	485+697	247	TCS-3D
73	485+697	485+824	127	TCS-3B
74	485+824	485+980	156	TCS-3D
75	485+980	485+992	12	TCS-2A
76	485+992	486+800	808	TCS-3C
77	486+800	487+824	1024	TCS-14A
78	487+824	487+831	7	TCS-2A
79	487+831	487+854	24	TCS-3C
80	487+854	487+864	10	TCS-2A
81	487+864	488+139	275	TCS-3C
82	488+139	488+149	10	TCS-2A
83	488+149	488+391	242	TCS-3C
84	488+391	488+398	7	TCS-2A
85	488+398	488+740	343	TCS-3C
86	488+740	489+260	520	TCS-2A
87	489+260	489+620	360	TCS-3C
88	489+620	490+100	480	TCS-1
89	490+100	490+255	155	TCS-3E
90	490+255	490+262	7	TCS-2A
91	490+262	490+691	430	TCS-3E
92	490+691	491+291	600	TCS-7
93	491+291	491+712	421	TCS-9
94	491+712	491+768	56	TCS-17A
95	491+768	491+921	153	TCS-9

S No.	Chainage (Km)		Length (m)	TCS
96	491+921	491+935	14	TCS-10
97	491+935	492+351	416	TCS-9
98	492+351	492+371	20	TCS-10
99	492+371	493+400	1029	TCS-9
100	493+400	493+533	133	TCS-6A
101	493+533	493+941	408	TCS-19
102	493+941	494+177	236	TCS-6A
103	494+177	494+197	20	TCS-19
104	494+197	494+264	66	TCS-6A
105	494+264	494+304	41	TCS-19
106	494+304	494+367	62	TCS-6A
107	494+367	494+387	20	TCS-19
108	494+387	494+530	143	TCS-6A
109	494+530	494+731	201	TCS-9
110	494+731	494+743	12	TCS-10
111	494+743	494+837	94	TCS-9
112	494+837	494+869	32	TCS-17A
113	494+869	495+350	481	TCS-9
114	495+350	497+360	2010	TCS-8
115	497+360	498+000	640	TCS-9
116	498+000	498+226	226	TCS-6A
117	498+226	498+331	105	TCS-18
118	498+331	498+500	170	TCS-6A
119	498+500	498+815	315	TCS-9
120	498+815	498+845	30	TCS-10
121	498+845	499+380	535	TCS-9
122	499+380	499+585	205	TCS-6A
123	499+585	499+609	24	TCS-18
124	499+609	499+789	180	TCS-6A
125	499+789	499+821	32	TCS-17
126	499+821	500+750	929	Tollplaza
127	500+750	501+293	543	TCS-9
128	501+293	501+803	510	TCS-8
129	501+803	502+473	670	TCS-9
130	502+473	502+497	24	TCS-17A
131	502+497	502+720	203	TCS-9
132	502+720	502+780	60	TCS-10
133	502+780	502+905	125	TCS-9
134	502+905	502+915	10	TCS-17
135	502+915	503+250	335	TCS-9

Table 0.20: Typical Cross Section (Loop/Ramp)

Interchange No & Chainage	Ramp /Loop No	Description	Lane Configuration	Length (m)	TCS Type

(Km)					
Interchange 481+150	R2	Entry from NH to Expressway	2	220	TCS-5B
		From Samba side to Katra side			
	R3	Exit from Expressway to NH	2	457	TCS-5B
		From Katra side to Samba side			
	R6		2	415	TCS-5B
	R1	Exit from Expressway to NH	2	180	TCS-5B
		From Delhi side to NH			
	R4	From NH to Expressway	2	348	TCS-5B
		From NH to Expressway Delhi side			
	R5		2	442	TCS-5B
	L1	Between NH and Expressway	2+2	850	TCS-5A
	L2		2+2	750	TCS-5A

Interchange No & Chainage (Km)	Ramp /Loop No	Description	Lane Configuration	Length (m)	TCS Type
VOP 486+993	Cross raod	From Samba side to Pangdour side	2	808	TCS-14B
	R1	Entry from Cross road to expressway	2	825	TCS-5B
		From samba side to Expressway Delhi side			
	R2	Exit from Expressway to Cross road	2	850	TCS-5B
		Expressway Delhi side to crossroad Pangdour side			
	R3	Entry from Cross road to expressway	2	690	TCS-5B
		From Pangdour side to Expressway Katra side			
	R4	Exit from Expressway to Cross road	2	682	TCS-5B
		From Expressway Katra side to Samba side			

1.4.3 Structures

Flyover

Flyovers are provided at crossing between the project road and the NH/SH depending upon the importance of road. All existing four lane road are considered for Flyovers.

Table 0.21: Details of Flyovers

Sl. No.	Chainage (Km)	Intersecting Road	Type of Structure	Clear Span (m)	Skew angle (deg)	Deck Configuration (m)	Total length C/C of Exp. Joint (m)	Width of Open Median (m)	Minimum Vertical Clearance (m)
1	468+530	Hiranagar BT Road	PSC I Girder	2x30	0	2x13.75	63.75	9.5	5.5
2	502+750	Ring Road	PSC I Girder	2x30	0	1x11.5+1x33.5	66.2	0.5	5.5

Major Bridge

Table 0.22: Major Bridge (Over Rivers/ Streams/ Nallas)

Sl. No.	Chainage (in Km)	Name of Bridge	Span Arrangement c/c Expansion (m)	Total length C/C of Exp. Joint (m)	Skew angle (deg)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)
1	470+640	MJB over Nalla	4x8+4x8+4x8	102.5	0	RCC Box	2x18.5	-
2	480+096	MJB over Uchhal Khad River	4X8+4X8	67.6	0	RCC Box	2x13.75	9.5
3	481+635	MJB over Supali Khad	4X8+4X8	67.6	0	RCC Box	2x13.75	9.5
4	483+132	MJb over nalla	4X8+4X8	67.6	0	RCC Box	2x13.75	9.5
5	489+000	MJB over Basantar River	12x44.8	537.6	0	PSC BOX Girder	1x33.5	-

Minor Bridge

Table 0.23: Minor Bridge (Over Rivers, Streams, Nallas)

Sl. No.	Chainage (Km)	Name of Bridge	Span Arrangement c/c Expansion (m)	Total length C/C of Exp. Joint (m)	Skew angle (deg)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)
1	468+709	MNB over Nalla	4x8	34.50	0	RCC BOX	2x18.5	-
2	469+570	MNB over Pond	2x20	40.0	0	RCC I Girder	2x13.75	9.5
3	470+037	MNB over Nalla	2x8	17.2	0	RCC BOX	2x13.75	9.5
4	470+448	MNB over Nalla	4x8+3X8	59.7	45	RCC BOX	2x13.75	9.5
5	471+200	MNB over Nalla	3x8+3x8	51.00	0	RCC BOX	2x13.75	9.4 to 11.6
6	481+478	MNB over Nalla	1X10	11.3	40	RCC BOX	2x13.75	9.5
7	484+040	MNB over Nalla	1x15	15	0	RCC I Girder	2x13.75	9.5
8	484+220	MNB over Nalla	1x30	30	0	PSC I Girder	2x13.75	9.5

Vehicular Under Pass (VUP)

VUP's are provided at crossing between the project road and MDR's. The lane width of the crossroad varies from 7.0m to 10.0m. The provision of future widening from 2 lane to 4 lanes is taken into consideration for these roads. These are provided perpendicular to the Project Road.

Table 0.24: Details of Vehicular Underpasses

Sl. No.	Chainage (km)	Type of Crossing	Type of Structure	Clear Span (m)	Skew angle (deg)	Deck Configuration (m)	Width of Open Median (m)
1	473+291	U-turn facility	RCC BOX	2x10x5.5	0	2x28.86	-

2	478+368	BT road	PSC I Girder	1x20	0	2x16.75	-
3	485+256	Samlha-Samba station BT Road	RCC BOX	2x10x5.5	45	2x13.75	9.5
4	492+361	BT road	PSC I Girder	1x20	0	2x16.75	-
5	498+830	BT road	RCC BOX	2x10x5.5	0	2x16.75	-

Minor Bridge cum LVUP

Table 0.25: Minor Bridge cum Lvup (Over Irrigation Canals)

Sl. No.	Chainage (Km)	Name of Bridge	Span Arrangement c/c Expansion (m)	Total length C/C of Exp. Joint (m)	Skew angle (deg)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)
1	483+606	MNB over Ujh Canal	1x8+1x10+1x8 (clear)	28.40	8	RCC BOX+RCC Solid SLab	2x13.75	9.5

Minor Bridge cum SVUP

Table 0.26: Minor Bridge cum Svup (Over Irrigation Canals)

Sl. No.	Chainage (Km)	Name of Bridge	Span Arrangement c/c Expansion (m)	Total length C/C of Exp. Joint (m)	Skew angle (deg)	Type of Structure	Deck Configuration (m)	Width of Open Median (m)
1	468+948	Lined drain	1x10(Clear)	11.1	23	RCC BOX	2x13.75	9.5
2	470+956	Ujh Canal	LHS=1x40.0,RHS=1x32.977	LHS=40.0,RHS=32.977	18	PSC I Girder	2x17.5	3.5
3	484+547	Ujh Canal	1x8+1x10+1x8 (clear)	28.40	36	RCC BOX+RCC Solid SLab	2x13.75	9.5

4	485+420	Ujh Canal	2x30	60	45	PSC I Girder	2x13.75	9.5
5	488+144	D-17 of MRC	1x10(clear)	11.1	0	RCC BOX	2x13.75	9.5
6	491+922	Minor canal	2x7	15.2	0	RCC BOX	2x29.36	-

Table 0.27: Existing Bridges to be Re- constructed/Widened

Sl. No.	Design Chainage (In Km)	Existing Chainage of NH-44 (In Km)	Salient details of existing bridge	Proposed Span Arrangement (m)	Type of Structure Proposed	Deck Configurations (m)	Remarks
1	471+440	53+332	RCC Box ,Span 4X4, Deck width 2x10.5	2x8	RCC BOX	18.225+13.960	Nalla
2	471+869	53+765	RCC Box, Span 5x4+1x4+5x4, Deck width 2x10.25	3x8+3x8	RCC BOX	2x28.86	Nalla
3	473+445 (LHS Span)	55+341	RCC Box Girder Span 9X25.9+1x17.2, Deck Width 1x8.2	9x25.9+ 1x17.2	PSC I Girder+ RCC I Girder	LHS=12.5+16.75	River
4	475+409	57+308	RCC Box Span 5X4 Deck Width 2x12.75	2x10	RCC BOX	2x28.86	Nalla
5	478+868	60+777	RCC Box Span 4X6+1X4+4X6 , Deck Width 2x10.25	4x8+3x8	RCC BOX	2x 28.86	Nalla
6	491+740	75+199	RCC Box Span 4x6+1x4+4x6, Deck Width 2x10.5	3x8+4x8	RCC BOX	2x28.86	Nalla
7	493+743 (LHS span)	77+198	RCC Solid Slab Span 121x6.8 Deck Width 1x7.8	20X20.4	PSC I Girder	1x28.86	Devak River
8	494+161 (LHS span)	77+616		1X20.4	RCC I Girder	1x28.86	Devak River
9	494+253 (LHS span)	77+708		2x20.4	RCC I Girder	1x28.86	Devak River
10	494+344 (LHS span)	77+800		1X20.4	RCC I Girder	1x28.86	Devak River
11	494+853	78+308	RCC Box Span 5X6	4x8	RCC BOX	2x28.86	Nalla

Sl. No.	Design Chainage (In Km)	Existing Chainage of NH-44 (In Km)	Salient details of existing bridge	Proposed Span Arrangement (m)	Type of Structure Proposed	Deck Configurations (m)	Remarks
			Deck Width 2x11.5				
12	502+488	86+169	RCC Solid Slab Span 3X8 Deck Width 2x10.25	3x8	RCC BOX	40.860+29.86	Nalla
13	502+910	86+717	RCC Solid Slab Span 1x10 Deck Width 2x10.25	1x10	RCC BOX	40.860+29.86	Nalla

Table 0.28: Existing Narrow Bridges to be Widened

Sl. No.	Design Chainage (In Km)	Existing Chainage of NH-44 (Km.)	Salient details of existing bridge	Existing width (m)	Extent of widening (m)
1	473+445 (RHS span)	55+341	RCC Box Girder, Span 9X25.9+1x17.2	1x10.25	1x 28.86
2	474+633	56+531	RCC Box, Span 2x10+4X6+1x4+4x6 (2x10 added for U-turn)	2x10.25	2x 28.86
3	477+308	59+200	RCC Box Span 4X6+1X4+4X6+1X4+4X6	2x10.25	2x 28.86
4	493+743 (RHS span)	77+198	RCC I Girder Span 20X20.4	1x10.25	1x 28.86
5	494+161 (RHS span)	77+616	RCC I Girder Span 1X20.532	1x10.25	1x 28.86
6	494+253 (RHS span)	77+708	RCC I Girder Span 20.423+20.509	1x10.25	1x 28.86
7	494+344 (RHS span)	77+800	RCC I Girder Span 1X20.532	1x10.25	1x 28.86
8	498+276	82+021	RCC I Girder Span 5X21	2x10.25	2x 28.86
9	499+597	83+281	RCC Box Span 3x3+2x3+3x3	2x10.25	41.774+43.755
10	499+805	83+489	RCC Box Span 3x3+2x3+2x3+3x3	2x10.25	50.330+65.628

Railway Over Bridges (ROBs)

Table 0.29: Railway Over Bridges (Robs)

Sl. No.	Chainage (Km)	Name of Bridge	Type of Structure	Span Arrangement c/c Expansion (m)	Total length C/C of Exp. Joint (m)	Skew angle (deg)	Deck Configuration (m)	Median Width (m)
1	470+860	Hira Nagar Crossing	Truss & Steel Composite I Girder	LHS=1x45+1x90.0+1x29, RHS=1x29+1x90.0+1x45	LHS 164.0 RHS 164.0	0	2x17.50	3.5
2	485+760	New Railway line proposed & Samba Station Crossing	Steel composite I Girder	LHS=1x20+1x36.0+1x44.0+1x32, RHS=1x32+1x36.0+1x44.0 +1x20	LHS=132.0, RHS=132.0	0	2x17.50	2

Elevated Structures

Table 0.30: Elevated Structures

Sl. No.	Chainage (Km)	Structure	Type of Structure	Span Arrangement c/c Expansion (m)	Total length C/C of Exp. Joint (m)	Skew angle (deg)	Deck Configuration (m)	Median Width (m)	Remarks
1	471+467	Elevated	PSC I Girder	2x30 + 1x35 + 1x30+1x31+2x30	216.0	0	1x33.5	-	471+467
2	475+785	Elevated	PSC I Girder	53x30+1x35	1625.0	0	1x33.5	-	475+785
3	479+739	Elevated	PSC I Girder	2x30+1x32+2x30	152.0	0	1x33.5	-	479+739

4	490+991	Elevated	PSC I Girder	22x30	660.0	0	1x33.5	-	490+991
5	496+580	Elevated	PSC I Girder	82x30	2460.0	0	1x33.5	-	496+580
6	501+500	Elevated	PSC I Girder	2x30+1x35+5x30+1x35+6x30+2x35+3x30	525.0	0	1x33.5	-	501+500

Culverts for Cross Drainage

Table 0.31: List of Culverts for Cross Drainage

Sl. No.	Chainage (Km)	Type of Crossing	Type of Culvert	Size
				No x Width (m) x Height (m)
1	468+130	Drain	New Construction	1x2x2
2	468+370	Drain	New Construction	1x6x4
3	469+232	Drain	New Construction	1x4x3
4	469+500	Drain	New Construction	1X2X2
5	469+720	Drain	New Construction	1x4x3
6	469+810	Drain	New Construction	1X4X3
7	469+940	Drain	New Construction	1X4X3
8	470+130	Drain	New Construction	1X4X3
9	470+312	Drain	New Construction	1x4x3
10	479+600	Drain	New Construction	1x6x4
11	479+876	Drain	New Construction	1x6x4
12	480+400	Drain	New Construction	1x4x3
13	480+760	Drain	New Construction	1x2x2
14	481+100	Drain	New Construction	1x2x2
15	481+360	Drain	New Construction	1x2x2
16	482+550	Drain	New Construction	1x2x2
17	482+710	Drain	New Construction	1x6x4
18	483+840	Drain	New Construction	1x6x4
19	483+870	Drain	New Construction	1x6x4
20	485+555	Drain	New Construction	1x2x2
21	486+356	Drain	New Construction	1x2x2
22	487+860	Drain	New Construction	1x6x4
23	488+098	Drain	New Construction	1x2x2
24	488+441	Drain	New Construction	1x2x2

25	490+477	Drain	New Construction	1x2x2
26	490+630	small lined canal/watercourse	New Construction	1x2x2

Table 0.32: List of Culverts for Road cum Drain

Sl. No.	Chainage (Km)	Type of Crossing	Type of Culvert	Size
				No x Width (m) x Height (m)
1	469+590	Earthen track	New Construction	1x4x3

Table 0.33: List of Culverts For Interchanges

Sl. No.	Design Chainage	Type of structure	Location	Proposal	Size No x Width (m) x Height (m)
1	481+150	RCC BOX	Loop-1	New Construction	1X2x2
2		RCC BOX	Loop-2	New Construction	1X2x2
3		RCC BOX	Ramp-1	New Construction	1X2x2
4		RCC BOX	Ramp-2	New Construction	1X2x2
5		RCC BOX	Ramp-3	New Construction	1X2x2
6		RCC BOX	Ramp-4	New Construction	1X2x2
7		RCC BOX	Ramp-5/6	New Construction	1X4x3
8		RCC BOX	Ramp-3/4	New Construction	1X2x2

Light Vehicular under pass (LVUP)

The location of LVUP has been provided for metal Roads/ODR's. These are low configuration road compared to VUP's. These are provided perpendicular to the Project Road.

Table 0.34: Details of Light Vehicular Underpasses

Sl. No.	Chainage (in Km)	Type of Crossing	Type of Structure	Span Arrangement (Clear opening) (m)	Skew angle (deg)	Deck Configuration (m)	Width of Open Median (m)
1	473+820	Ratwan-Railway colony BT	RCC Box	1x12x4.5	0	2x16.75	-
2	481+319	Chakjangi-Devani BT road	RCC Box	1x12x4.5	0	2x13.75	9.5
3	485+075	Sambhamarket	RCC Box	1x12x4.5	0	2x13.75	9.5
4	486+004	BT cross road	RCC Box	1x12x4.5	25	2x13.75	9.5
5	494+653	AIIMS - Gujjar Village	RCC Box	1x12x4.5	0	2x16.75	-

Small Vehicular Underpass (SVUP)

To ensure complete access control and make cost effective grade separation, a smaller dimension VUP (SVUP) has been provided for Village Road/Mud roads with width lesser than 5.50m. All crossroads are not provided with SVUP's. At s few crossroad Box of size 4mx3m Box is provided.

Few, mud roads/ tracks which are at close interval and for which direct underpasses are not provided shall be connected by connecting roads with crossroads were Underpass is provided.

Table 0.35: Details of Small Vehicular Underpasses

Sl. No.	Chainage (Km)	Type of Structure	Span Arrangement (Clear opening) (m)	Skew angle (deg)	Deck Configuration (m)	Width of Open Median (m)
1	487+827	RCC BOX	1x7x4.5	15	2x13.75	9.5
2	488+394	RCC BOX	1x7x4.5	20	2x13.75	9.5
3	490+258	RCC BOX	1x7x4.5	0	2x13.75	9.5

1.4.4 Interchange Design

Being fully access controlled, there will be no at grade junctions with Expressway. Entry/Exit will be only from interchanges. At grade intersections adversely influence the quality of highways in terms of speed, capacity and safety because of interruptions to the flow of traffic. Thus the basic requirement for the design of intersections is not only to cater for safe movements for the drivers, but also to provide them full traffic information by way of signs, pavement markings and traffic signals. Further, simplicity and uniformity should be the guiding principles for interchange design to ensure the safe passage of maneuvers and reduce conflict points, either by elimination of certain maneuvers or separated in space, horizontally or vertically. The interchanges are proposed on National highway/ State Highways.

Table 0.36: Major Intersections (Interchanges)

Sl. No.	Location (km)	Connecting Road	Type of Interchange	Type Design	Remarks
Main Expressway					
1	481+150	NH-44	Interchange	Type Design as given below	NH and Expressway
2	486+993	Samba-Pangdour ODR [link road to SIDCO complex]	VOP at Rotary	Type Design as given below	Cross road and expressway

Service/Slip/Connecting Roads

Connecting roads of service road standard are provided to maintain proper circulation of local traffic, continuity of travel and to facilitate crossing over to the other side of the Project Road through an underpass wherever required. These have been provided outside the RoW. These roads have been provided at locations where the distance between 2 crossroads is less than 200m. Width of connecting road is kept as 7 m.

Table 0.37: Service Roads

Sl. No.	Design Chainage (Km)		Side (LHS/RHS]	Length (m)	Width of Service Road (m) (Lane Width + Shoulder Width
	From	To			
1	471+300	479+800	Both	8500	Lane width 2x7m + (Shyness + Paved shoulder as per TCS)
2	490+700	499+630	Both	8930	Lane width 2x7m + (Shyness + Paved shoulder as per TCS)
3	500+700	503+200	Both	2500	Lane width 2x7m + (Shyness + Paved shoulder as per TCS)

Table 0.38: Slip Roads

Sl. No.	Design Chainage (Km)		Side (LHS/RHS]	Length (m)	Width of Slip Road (m)
	From	To			
1	472+800	473+290	Both	980	5.5
2	475+200	476+450	Both	1250	5.5
3	490+100	491+160	Both	2120	5.5
4	495+540	497+540	Both	2000	5.5
5	501+340	501+670	Both	330	5.5
6	502+300	503+260	LHS	960	7.5

Table 0.39: Connecting Roads-Main Expressway

Sl. No.	Design Chainage (Km)		Side (LHS/RHS]	Length (m)	Width of Connecting Road (m)
	From	To			
1	468+940	468+980	RHS	40	Please refer Note (e) below

1.4.5 Median Openings

Median openings with detachable barrier have been provided at about 12 to 15km (between two interchanges) for traffic management for maintenance works and vehicles involved in accidents.

1.4.6 Boundary Wall at ROW

Road boundary wall to be constructed as specified in Ministry Circular no. RW-NH 24036/27/2010-PPP/dated 04.02.2019.

1.4.7 Drainage

The IRC: SP 42 will generally be followed for design of highway drainage. The planning of highway and drainage is intricately linked with the terrain, alignment of the highway and the proposed cross drainage works. The planning and designing of adequate drainage system is a primary requirement for maintaining a structural soundness and functional efficiency of a road. Pavement structure including sub-grade must be protected from any ingress of water; otherwise over a period of time

it may weaken the sub-grade by saturating it and cause distress in the pavement structure. Hence disposal of water from the pavement and sub-grade is a basic consideration in road design. Over and above quick drainage takes away the water from pavement surface and reduces chances of skidding of vehicles. In order to guard the pavement from the poorly drained conditions, planning, designing, construction and maintenance of longitudinal drains on either side of the roads is very much essential. The surface water from the pavement and shoulders will be made to flow in to the drains by providing suitable cross Slopes / Camber.

Earthen drains are provided through-out the project corridor to ensure the efficient drainage from carriageway to drain. All drains are connected to cross drainage structure. Median drains are provided with rain water harvesting structure. Proper drainage arrangements are provided for grade separated structures. If requires, CD work is also provided for loops and ramps.

1.4.8 Capacity of Project Highway

For the purpose of design and future augmentation of the Project Expressway, the design service volume for level of service- B for plain/rolling terrain shall be 1300 PCU/hr/lane. The design service volume can be determined as per MORTH Guidelines for Expressways. The design service volume per day will depend on the peak hour flow and will be as specified in the below given table.

Table 0.40: Design service volume for Expressways in Plain and Rolling Terrain (in PCUs/Day) for LOS-B

Design Service Volume in PCUs per day for LOS B		
4- Lane	**6-Lane**	**8-Lane**
86,000 for Peak hour flow (6%) 65,000 for Peak hour flow (8%)	1,30,000 for Peak hour flow (6%) 98,000 for Peak hour flow (8%)	1,73,000 for Peak hour flow (6%) 1 30,000 for Peak hour flow (8%)

1.4.9 Embankment and Cut Sections

The design and construction of the road in embankment and in cutting shall be carried out in accordance with Section 300 of MORTH Specifications IRC: SP-99 latest version.

1.4.10 Highway Amenities:

Wayside amenities provided in the project highway are of size 4ha. Wayside amenities generally provided at approximately 20 to 25Km interval

In the smaller wayside amenity having size of 160m x 250m, facilities such as drinking water kiosk, toilet facilities, truck parking, bus parking, car parking, restaurants, petrol station, garage, generator set/ solar system area, ATM's etc. to be provided. At present small way side amenity of size 4 hec to be developed.

1.4.11 Traffic Control Devices, Road Safety Devices and Road Side Furniture

Traffic Control Devices, Road Safety Devices and Road Side Furniture shall comprise of road signs, road markings, object markers, hazard markers, studs, delineators, attenuators, safety barriers, boundary fences, boundary stones, kilometer stones, etc. Relevant IRC Guidelines (IRC 2, IRC:8, IRC:35, IRC:67, IRC SP 99,etc), MORTH Guidelines, IRC:SP - 99 and Section 800 of MORTH Specifications shall be followed.

1.4.12 Traffic Management Systems

Advance Traffic Management Systems (ATMS) shall be provided as per Clause-816 of MORTH Specifications for road and bridge works.

1.4.13 Toll booth

Toll booths shall be provided as per IRC: SP-99.

The Toll Plazas on loops / ramps / main carriageway shall be provided as per Schedule D and minimum lane requirement in the opening year are as follows.

Interchange No.	Chainage on DKE (in km.)	Toll Plaza	Location	Direction (Entry: to expressway, Exit: from Expressway)	No. of toll lanes (ETC + Hybrid + Extra Wide)
Int. 1	480+600	TP-1	On loop/ Ramp road	Entry	5+0+1
				Exit	3+0+1
Int. 2	486+650	TP-2	On loop/ Ramp road	Entry	3+0+1
				Exit	5+0+1
Int.2	487+300	TP-3	On loop/ Ramp road	Entry	3+0+1
				Exit	5+0+1
On Main Carriageway	489+800	TP-4	On Main Carriageway	Entry	6+2+1
				Exit	3+1+1
On Main Carriageway(combined Toll plaza for Expressway and Jammu Ring Road)	500+200	TP-5	On Main Carriageway	Entry	12+0+1
				Exit	12+0+1

Toll booth are designed for peak hour traffic projected for minimum 25 years. The total number of toll booths and lanes are designed to ensure the service time of not more than 10 seconds per vehicle at peak flow. The width of each toll lane will be 3.5m for ETC/Manual/Smart card lanes proposed as per NHAI guidelines and one lane at the extreme outer side for over dimensional vehicles of 4.50m. Between each toll lane, traffic islands will be provided so as to accommodate toll booth. These islands will be of minimum 25 m length and 1.8m width. Protective barriers of reinforced concrete will be placed at the front of each island to prevent out of control approaching vehicles crashing into the toll booth. They would be painted with reflective chevron markings.

The area of toll booth covering the flared portion shall be same as that of main carriageway. The fee collection system shall be electronic toll collection (ETC) system. The design of the Toll Booth(s) shall be aesthetically pleasing. The fee collection staff should be efficient, courteous and adequately trained before deployment.

1.5 TRAFFIC SURVEYS

In order to capture traffic and travel characteristics, speed characteristics, users' preference regarding toll imposition of traffic passing through the existing alternative routes from Delhi to Gurdaspur, following primary traffic surveys were conducted.

- Classified traffic volume count (CTVC) using ATCC method

- Origin – destination survey (OD)
- Speed and Delay studies

The classified volume count surveys were carried out at five locations, considering the possibility of diversion of traffic from existing alternative routes to proposed expressway. These locations are characterized by centres of heavy economic activities, population and are away from the influence of city areas in order to avoid the influence of local traffic. The surveys were conducted continuously for seven consecutive days for 24 hours through Automatic Traffic Counter and Classifier (ATCC) method.

Table 0.41: Schedule of Traffic Volume Count Survey

Location	Start Date	End Date	Duration (days)
Mukarba Chowk-Panipat Section of NH-44(Near Bhagan Toll Plaza)	21/05/2018	01/05/2018	7
Kurukshetra- Ambala Section of NH-44(Near Sharifgarh)	21/05/2018	01/05/2018	7
Ludhiana-Jalandhar Section of NH-44*			-
Jalandhar-Pathankot Section of NH-44*			-
Pathankot-Jammu Section of NH-44*			-
Amritsar - Gurdaspur Section of NH-54*			-
Gurdaspur - Pathankot Section of NH-54*			-
Hissar-Sirsa Section of NH-9*			-
Churu -Hissar Section of NH-52	10/01/2019	16/01/2019	7
Jalandhar-Amritsar Section of NH-3	11/01/2019	17/01/2019	7
Patiala-Rajpura Section of NH-44(Near Daun Kalan)	21/05/2018	01/05/2018	7
Jammu – Domel Section of NH-44*			-
Domel – Katra	06/02/2020	12/02/2020	7

CVC surveys at rest of locations along NH-44, NH-09 and NH-54 were not carried out as IHMCL data was available. For the purpose of OD analysis, the CVC data from the surveys carried out earlier has been used to determine the volume count according to the vehicular classification used for the present study.

The AADT value of base year (FY-2019) is used for the traffic volume projection up to horizon year and projected traffic volume is used in design of pavement and for projecting the tollable traffic.

Table 0.42: Summary of ADT and AADT at Survey Locations

Sl. No.	Location	ADT		AADT	
		Nos.	PCUs	Nos.	PCUs
1	Mukarba Chowk-Panipat Section of NH-44	73241	88652	71556	86154
2	Kurukshetra- Ambala Section of NH-44	53228	75367	51825	72851
3	Ludhiana-Jalandhar Section of NH-44	51141	59177	52081	60010
4	Jalandhar-Pathankot Section of NH-44	15243	21498	16336	23041
5	Pathankot-Jammu Section Of NH-44	21333	26544	23420	29545
6	Amritsar - Gurdaspur Section of NH-54	21572	23923	23132	25656
7	Gurdaspur - Pathankot Section of NH-54	22188	28458	22204	28377
8	Patiala-Rajpura Section Of NH-7	28702	31910	28150	31150

9	Hissar-Sirsa Section of NH-9	12995	17289	14475	19314
10	Churu -Hisar Section of NH-52	5715	13189	6073	14024
11	Jalandhar-Amritsar Section Of NH-44	37998	38386	39838	40430
12	Jammu - Domel Section of NH-44	16995	23501	16374	22485
13	Domel – Katra Section	5542	6486	5428	6339

Table 0.43: Annual Average Daily Traffic at Survey Locations

Vehicle Type	Mukarba Chowk-Panipat Section of NH-44	Kurukshetra- Ambala Section of NH-44	Ludhiana-Jalandhar Section of NH-44	Jalandhar-Pathankot Section of NH-44	Pathankot-Jammu Section Of NH-44	Amritsar - Gurdaspur Section of NH-54	Gurdaspur– Pathankot section of NH-54	Patiala-Rajpura Section of NH-7	Hissar-Sirsa Section of NH-9	Churu -Hissar Section of NH-52	Jalandhar-Amritsar Section of NH-3	Jammu - Domel Section of NH-44	Domel - Katra
Car / Jeep / Van	45343	32784	27731	6335	8916	11567	7004	17469	8193	1791	21319	8934	3066
Taxi										0	478		470
Shared Jeep										24	70		0
Minibus	681	608	0	0	0	0	0	94	0	8	181	0	158
School. Bus	2437	2406	0	0	0	0	0	891	0	8	89	0	11
Govt. Bus										49	475	0	59
Pvt. Bus										58	532	0	259
Maxx/Pick-Up	2251	1424	3175	604	317	1019	671	1171	789	593	1369	866	0
LCV (4 tyre)	5595	3874	2946	811	953	427	586	605	675	167	146	888	0
LCV (6 tyre)	0	0	0	0	0	0		0	0	282	781		110
2 Axle	1044	1956	3016	2064	2187	1078	1302	417	912	203	392	2324	171
3 Axle	1773	2049	1277	1252	1298	761	1581	434	536	618	268	384	23
MAV (4 to 6 Axles)	1221	2114	643	314	743	531	1050	328	534	1565	366	235	8
MAV (> 6 Axles)	0	5	0	0	0	0	0	7	0	0	0	0	0
Others	35	0	11	4	4	2	5	0	2	0	3	8	0
Total vehicles	**60380**	**47220**	**38799**	**11384**	**14418**	**15385**	**12199**	**21416**	**11641**	**5366**	**26469**	**14539**	**4335**
Total PCUs	**78423**	**69700**	**51147**	**19535**	**24479**	**21142**	**21951**	**26422**	**16751**	**12944**	**31827**	**21250**	**5543**
Non Tollable Traffic													

Vehicle Type	Mukarba Chowk-Panipat Section of NH-44	Kurukshetra- Ambala Section of NH-44	Ludhiana-Jalandhar Section of NH-44	Jalandhar-Pathankot Section of NH-44	Pathankot-Jammu Section Of NH-44	Amritsar - Gurdaspur Section of NH-54	Gurdaspur– Pathankot section of NH-54	Patiala-Rajpura Section of NH-7	Hissar-Sirsa Section of NH-9	Churu -Hissar Section of NH-52	Jalandhar-Amritsar Section of NH-3	Jammu - Domel Section of NH-44	Domel - Katra
3-Wheeler	1535	293	1687	97	193	203	557	726	313	17	2277	130	280
2-Wheeler	9030	4001	11121	4436	8466	7043	8978	5621	2225	503	10435	1634	764
Agriculture Tractor	60	37	49	34	14	15	23	32	25	5	18	9	2
Agriculture Tractor/ Trailer	293	131	329	232	102	104	275	206	239	176	142	61	14
Cycle	182	11	87	140	195	310	157	29	26	2	351	1	3
Cycle Rickshaw	18	1	9	13	32	72	15	8	6	0	38	0	0
Animal Drawn Cart	10	0	0	0	0	0	0	0	0	1	5	0	0
Toll Exempted Car	23	73	0	0	0	0	0	49	0	2	53	0	11
Toll Exempted Bus	0	0	0	0	0	0	0	0	0	0	20	0	1
Toll Exempted LCV	8	28	0	0	0	0	0	35	0	0	28	0	1
Toll Exempted Truck	17	30	0	0	0	0	0	28	0	1	2	0	17
Total Non-Tollable (Nos.)	**11176**	**4605**	**13282**	**4952**	**9002**	**7747**	**10005**	**6734**	**2834**	**707**	**13369**	**1835**	**1093**
Total Non-Tollable (PCUs)	**7732**	**3151**	**8863**	**3506**	**5066**	**4514**	**6427**	**4728**	**2564**	**1080**	**8603**	**1236**	**796**
Grand Total (Nos.)	**71556**	**51825**	**52081**	**16336**	**23420**	**23132**	**22204**	**28150**	**14475**	**6073**	**39838**	**16374**	**5428**
Grand Total (PCUs)	**86154**	**72851**	**60010**	**23041**	**29545**	**25656**	**28377**	**31150**	**19314**	**14024**	**40430**	**22485**	**6339**

2 COST ESTIMATE

The detailed cost estimates are given in table below:

Table 2.1: Cost Estimates

Sr. No.	Particulars	Amount (INR)
1	Site clearance and Dismantling	1,94,66,091
2	Earth Work	1,15,82,03,898
3	Granular Sub Base Courses and Base Courses (Non- Bituminous)	87,64,74,238
4	Bituminous and Rigid Pavement Courses	1,36,73,11,403
5	Culverts	51,76,21,205
6	Bridges	
	a) Minor Bridges	92,37,82,265
	b) Major Bridges	1,38,78,92,776
	c) FO, ROB	5,05,98,81,367
	d) VUP/PUP	22,65,78,656
	e) RE Wall	1,33,18,99,488
	f) FOB	0
7	Drainage & Protective Works	41,60,41,281
8	Junctions	0
9	Traffic signs, Road markings and other road appurtenances	59,06,94,274
10	Miscellaneous Works	47,67,60,000
11	Maintenance of roads	0
12	Toll Plaza	88,10,98,419
13	Environmental Plan	3,08,19,210
	Civil Cost	**15,26,45,24,573**
	12% GST on Civil Cost	**1,83,17,42,949**
	Utility Shifting	**32,80,19,841**
	Total Civil Cost	**17,42,42,87,363**
	Cost Per Km in Crores (On Civil Cost)	**43.49**
	Cost Per Km in Crores (On Total Civil Cost)	**49.64**
	Supervision Charges of Utility Shifting	**82,00,496**
	GST @ 18% on Supervision Charges	**14,76,089**
	Land Acquisition, Resettlement and Rehabilitation Cost	**3,36,48,65,670**
	Other Preconstruction Expenses (EMP Cost)	**15,60,00,000**

3 PROJECT BENEFITS

Community will accrue the benefit from proposed development project by way of improvement in the physical infrastructure; social infrastructure; development of economy; reduced pollution, vehicle maintenance, fuel saving, lesser carbon footprint, employment potential and other tangible benefits. In general Project will have following benefits at national and regional level:

- **High-speed connectivity and access:** The proposed project is a greenfield access controlled expressway. This will avoid traffic congestion and speed-up the freight movement. It is expected that overall, the proposed Delhi-Katra corridor will reduce the travel time between these places by half.
- **Aiding economic growth:** The seamless connectivity will provide better access to vehicles. The Project will reduce travel time and provide boost to trade, tourism and commerce linked to the regions.
- **Decongestion of existing National and State Highways:** The proposed corridor will take away traffic pressures from existing SH and NH passing through various cities. Also, long-distance traffic will shift to the proposed highway, thereby reducing traffic and congestion on the existing NH and SH for regional and local usage.
- **Usage shift:** Long-distance traffic will shift from existing National Highways to the proposed highway, resulting in lesser congestion leading to higher fuel savings and reduced travel time.
- **Improved safety:** Due to access control, the road & travel safety of the traffic connecting the region will be enhanced as there will be minimum distractions & conflict zones.
- **Support to industry:** Different types of industries like Tourism, Manufacturing, warehouse facilities, etc. along the proposed corridor will be facilitated in their business operation and reachability.

Detailed benefits associated with the proposed highway development are described in sections below.

Efficient and Safe Connectivity Option

The Project is a part of the proposed access-controlled greenfield Delhi-Katra expressway corridor (~588 km) interlinking different State & National Highways. The project is planned as high-speed corridor which provides high speed connectivity between states of North India, more importantly giving a reliable access to the economic and tourism destination located alongside the project expressway. The development of proposed project will improve the connectivity of UT of J&K with the Punjab, Haryana and the National Capital Territory of Delhi. The highway will be access-controlled and ensure high speed traffic movement from Delhi to Katra.

At present, the connectivity between Delhi to Katra is either through NH-44 or through a combination of NH-52, NH-7, NH-5, NH-703, NH-703B, NH-344A. NH-3, NH-54 & NH-44, which are 4/6 lane. The proposed development is expected to reduce the travel time between Delhi to Gurdaspur by at least 2-hour w.r.t. NH-44 and four-hour w.r.t. NH-352. Moreover, the new highway facility is access controlled and hence will provide good riding quality, better safety and a reliable infrastructure. All these elements will result in cost savings and efficiency improvement.

Traffic Decongestion

A traffic study was conducted across various locations of the existing NHs and SHs. It was found

that the traffic movement capacity of NH-44 will get exhausted by another few years in most of sections even after widening to 6/8 lanes. Hence, requirement of widening of existing road / new highway arises. The existing alignments are congested requiring more travel time. Average travel time presently is 60 km/hr for this section. Hence, as an alternate, the alignment is proposed to provide direct access from Delhi to Katra. This proposed proposed will act as feeder to many districts.

Following major types of traffic load are expected to accrue the maximum benefit from the project:

- **Commercial and Industrial:** Traffic on the existing roads is driven by local, tourism, commercial and industrial traffic. The Expressway will support the local businesses and economy along the proposed corridor. The proposed expressway will act as a significant axis of entry to Delhi from UT of J&K via state of Punjab and Haryana. It will facilitate rapid growth of the small, medium and large-scale industries mentioned above, by streamlining transport of raw materials and finished goods. Apart from this, the project corridor would help in quicker movement of agricultural commodities to the consumption centres and provide enhanced accessibility to tourists, helping in the overall development of the region.
- **Tourist:** Passenger traffic will be generated due to the major pilgrimage centre - 'Shri Mata Vaishno Devi' at Katra.
- **Health and Education:** Faster connectivity and accessibility to Delhi NCR will help in higher flow of traffic from J&K especially for higher education, tertiary healthcare and specialized treatments. Reduction in travel time will allow patients to avail OPD / other medical services from the national or state capital region.

Savings in Travel Time and Cost

The proposed project is expected to reduce the travel time between Delhi to Katra by at least 2-hour w.r.t. NH-44 and four-hour w.r.t. NH-352. This further leads to the following cost savings for users:

- Vehicle Operation Cost
- Travel Time and
- Toll costs

Benefit to Local Trade and Economy

The proposed Project plans to link Delhi NCR to Jammu and Kashmir via Haryana and Punjab state. The strong regional connectivity proposed through the Project will further increase regional tourism, trade and economic growth. The regions to be connected through the project have their distinct economic profiles.

Employment Generation (Direct and Indirect)

Proposed development is expected to generate employment during construction phase. Further, due to ecosystem which will be created during construction and operations phase of the project, the highway will also create considerable indirect employment opportunities in form of

transportation of construction materials, greenbelt development, ancillary facilities like canteens, dhabas, etc.

During operations phase, the Project will largely have indirect employment benefits in form of highway amenities and through economic & social hubs developed around the highway. Efficient reach and connectivity to distant markets will further enhance economy of the districts and create employment opportunities.

परियोजना निदेशक
Project Director
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण परियोजना इकाई जम्मू
National Highway Authority of India PIU, Jammu