

BRIEF SUMMARY ON

SIX LANING OF AHMEDABAD (KM 12.0) TO BAMANBORE (KM. 182.5) SECTION OF NH-8A IN THE STATE OF GUJARAT (KM.0.000 TO 170.700 OF NEW NH 47)

1.0 INTRODUCTION

National Highways Authority of India (NHAI) is engaged in the development of National Highways. As a part of this endeavor, the Authority has decided to widening and strengthening of Ahmedabad – Bamanbore - Samakhiali & Bamanbore – Rajkot sections into 6-lane divided carriageway configuration. The Joint Venture of M/s. Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. and M/s. Nag Infrastructure Consulting Engineers Pvt. Ltd., Hyderabad has been awarded the work of preparation of detailed project report. The details of the project stretch are given in Table -1.

Table -1: Details of the Project Stretch

Section	Chainage	NH – No	State	Length Km.
Ahmedabad – Bamanbore – Samakhiali section	Km.12.000 to Km. 306.000	NH-8A	Gujarat	338 (App.)
Rajkot – Bamanbore section	Km. 185.000 to Km. 215.600	NH-8B		

Based on the Revised NH No's and viability the project Road is divided into two packages which are as given in Table -2.

Table -2: Details of the Existing and Design Chainage of the NH

Package	Existing Chainage	Ex. NH	Design Chainage	New. NH
I	Km. 12.000 to Km. 182.500	NH8A	Km 0.000 to Km 170.700	NH47
II	Km 185.244 to Km 215.600 & Km 182.500 to Km 306.000	NH8B & NH8A	Km 184.700 to Km 341.477	NH27

2.0 PROJECT DESCRIPTION

The Form I and TOR now submitted pertain to Package 1 which is reproduced here under:

Package -1: Six Laning of Ahmedabad (Km. 12.000) to Bamanbore (Km. 182.500) section of NH 8A in the State of Gujarat

The proposed highway project stretch falls in two districts of Gujarat State namely Ahmedabad and Surendranagar. The existing and Design Chainages of project are as follows:

- Ahmedabad to Bamanbore (Chainage Km. 12.000 to Km. 182.500) on NH-8A Section (Km.0.000 to 170.700 New NH-47 Chainage) in the State of Gujarat

The total length of the project is approximately 170.700 kms. The widening of the existing project from 4 to 6-laning divided carriageway will result in safe and efficient traffic operation and will accommodate the future growth in traffic. Project road passes through the Ahmedabad, Bavla, Limbdi, and Chotila towns. The project also traverses through Protected Social Forestry throughout the project stretch. The salient features of the project are given in the Table -3 & 4. The location map showing the project stretch is given in Figure-1.

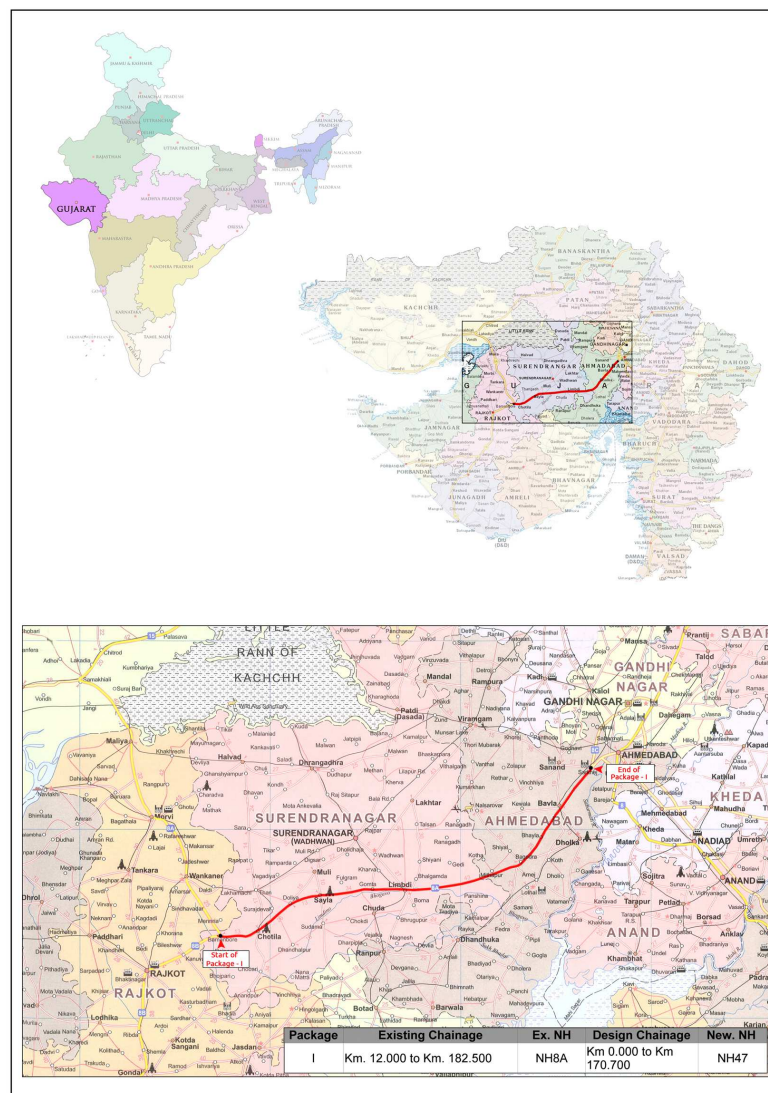


Figure -1: Location Map Showing the Project Road Stretch

Table -3: Salient Features of the Project

S.No.	Parameter(s)	Description
1	Location of Project	Ahmedabad(Km 12.000) to Bamanbore (Km.182.500) section of NH-8A(Km.0.000 to 170.700 of NH 47). The total length of the project is 170.700 kms. From Km 15.000 to Km 23.000, the project road traverses through Changodhar industrial corridor and it is having six lane configuration. The stretch passes through Ahmedabad, Bavla, Limbdi and Chotila towns
2	Terrain	The existing project stretch is passing through Plain and Rolling terrain.
3	Major Settlement along the Project Stretch	The project stretch is having densely populated or built up areas in Ahmedabad, Bavla, Limbdi and Chotila towns. All the built up areas either having already bypasses. In the current proposal one bypass near Chotila is proposed.
4	Rivers/ Streams/ Canals	The project stretch is crossing main rivers such as, River Sabarmati, River Bhagao, and River Machhu, and their tributaries.
5	Forest area and Sanctuaries	As per the Government of Gujarat, Gazette Notification, 16 th May 1974 / Vaisakha 26,1896, the Government of Gujarat declared the road side area or roads under PWD/ NHA I of the study districts such as Ahmedabad and Surendranagar, as protected forests. Hence, in the entire stretch of 170.7 km, part of the existing RoW is falling within the Protected Social Forestry.
6	Length of the Existing Alignment	170.500 Km
7	Existing Carriageway Width	The existing carriageway is having 2 X 8.75m with 1.0m to 4.5m median and having 4-lane configuration throughout the project stretch.
8	Proposed Carriageway width	The proposed carriage way is having 2 X 12.75m with 4.5m Median for Six laning.
9	Administrative locations	Ahmedabad and Surendernagar districts
10	State	Gujarat State

Table -4: Other Features of the Project Road

S.No.	Parameter(s)	Existing	Proposed
1	Right of Way (RoW)	45 m	60 m
2	Design Speed	100 KMPH	100 KMPH with speed restrictions for safety wherever required.
3	Major Bridges	3	3+3=6
4	Minor Bridges	49	42+5=47
5	No. of Railway Crossings	3	3
6	Railway Over Bridge (ROB)	3	3+2=5
7	Railway Under Bridge (RUB)	0	0
8	No. of Culverts	139	141+9=150
9	Pedestrian / Cattle Underpasses	0	23
10	Vehicular Underpasses / Overpasses	1	1+31=32
11	Fly Overs	0	1
12	Foot Over Bridges	0	0
13	Bus Bays	10	10+38=48
14	Truck Lay Bys	0	3
15	Rest Areas	0	2
16	Toll Plazas	2	3
17	Bypasses / Realignment	2	Chotila Bypass: Starts from Km. 166.250 to 173.500 Realignment: from Km 177.750 to Km 178.900
18	Total Number of trees affected	4000 nos.	--
19	Tree Plantation Proposed	--	12000 nos. (1:3)
20	Land to be Acquired (incl. social Forestry)	--	(301.41+469.215) 770.63 Ha
21	Project Cost	--	2772.5 Crores

2.1 Site and its Environs

The reconnaissance survey and subsequent field studies are carried in the months of February to May 2013 in the study area and various aspects pertaining to the geography, geology & soil, hydro-geology, river basins, forests & wildlife sanctuaries, transportation, socio-economic aspects, industries, and climatological conditions of the region are collected and analysed. The details of the findings are given below:

a) Geographical features

This section contains a detailed description on existing environment of the proposed project area including physical and biological environment in the study districts and more particularly in the area of study. The project area is located in Gujarat State covering two districts namely Ahmedabad and Surendranagar Districts:

Ahmedabad District: Ahmedabad is Geographically at the center of Gujarat is situated between 21.6 to 23.4 north latitude and 71.6 to 72.9 east longitude at an elevation of 53 m (174 ft) from MSL on the banks of the River Sabarmati river. Except for the small hills of Thaltej - Jodhpur Tekra the district is almost flat. Ahmedabad District is surrounded by Kheda District in the east, Mehasana in the north, Anand District in the south and Surendranagar in the west. There are 10 talukas of the District include 517 villages, 1 deserted village, 1 corporation, 1 cantonment area and 7 municipalities.

The River Sabarmati is west flowing river of Gujarat which originates from Dhebar lake in Aravalli Range of the Udaipur District of Rajasthan and meets the Gulf of Cambay of Arabian Sea after travelling 371Km. The River Sabarmati frequently dries up in the summer, leaving only a small stream of water, and the district is located in a sandy and dry area.

Surendranagar District: Surendranagar District of Gujarat is situated between 22°00' to 23°05' North Latitude and 69°45' to 72°15' East longitudes. The District has Ten Talukas including Vadhvan, Muli, Sayla, Limbdi, Chotila, Chuda, Lakhtar, Dasada, Halwad and Dhrangadhra. The district is situated on an average Mean Sea Level of 108 m.

The district is draining with River Machhu. River Machhu rises in the hills of Jasdan near village Khokhara in Chotila taluk of Surendranagar districts at an elevation of 220 m above MSL. This is one of the North flowing rivers of Saurashtra in Gujarat state. River Machhu drainage basin in the district is 591 Sq. Km.

b) Geology & Soil Characteristics

Geology: The Gujarat State exposes rock belonging to the Precambrian, Mesozoic, Cenozoic, Eras. Stratigraphically, the record is incomplete as the rocks of Paleozoic era are totally absent in Gujarat. The hard rock covers about 49% of total area of Gujarat. The rest being occupied by sediments of Quaternary period. The hard rocks comprise Precambrian Metamorphites and associated Intrusives, sedimentary rocks of Mesozoic and Cenozoic eras and the trap I flows constituting Deccan Volcanics of Cretaceous, Eocene age.

Soil: A major texture of the soil in the study region is 'Loamy'. However, in South-

West part (in Ahmedabad and Surendranagar district) a soil texture in few area is found to be 'Clayey'. It is also 'Sandy' soil in some area of the Northern part (Banaskantha district) of the region.

A very few area of southern part of the region (Adjoining area of Ahmedabad and Surendranagar district) and in Western part (Patan district) is showing 'moderately well' drained soil. In few area of middle part of Ahmedabad district and Eastern part of Surendranagar district is 'Slightly Saline'. A southern part of Ahmedabad district and North-West part of Banaskantha district is representing 'Moderate' salinity of the soil. Very few area have 'Severe' saline soil in Southern part of Ahmedabad district.

c) Hydro-geology

The diverse terrain conditions have given rise to different ground water situations in the study districts. The rock formations ranging in age from Archaean to recent include gneisses, schists, phyllites, intrusive, medium to coarse grained sandstones, basalts and recent alluvium. The high relief area in the eastern and north eastern part occupied by Archaean and Deccan Trap have steep gradient allowing high run-off and therefore have little groundwater potential. The yield of wells in these formations range from 5-10 m³/hr. The yield in sandstones varies from 50 to 170 m³/hr. The yield of wells tapping Quaternary alluvium in Cambay basin ranges between 75-150 m³/hr.

In Ahmedabad district, the shallow phreatic aquifer is a regionally extensive and extends down to 30 to 60 m depth with an average 40m BGL. It is also observed that seasonal fluctuation of water table, between pre-post monsoon periods, ranges from -0.25 to 3.72m in phreatic aquifer.

In Surendranagar district, the shallow phreatic aquifer is a regionally extensive and extends down to 30 to 40 m depth with an average 35m BGL. It is also observed that seasonal fluctuation of water table, between pre-post monsoon periods, ranges from -0.25 to 4.25m in phreatic aquifer.

d) River basins, Flood and Cyclones

The study districts area is drained by ephemeral rivers Sabarmati, Machhu, Khari, Kaila, Niruna, Nara, Matiwariwari, Rukmavati, Kankavati, Bhukhi, etc. and their tributaries.

River Sabarmati Basin: The Sabarmati River with its origin in Rajasthan flows generally in South – West direction. It enters the Gujarat State and passes through the plains and continues to flow in the same direction and joins the Gulf of Khambhat in the Arabian Sea. At the 51 km of its run, the river is joined by the Wakal on the left bank near village Ghanpankari. Flowing generally in the South – West direction at 67th km of its run, it receives the Sei on the right bank near Mhauri and then the Harnav on the left bank at about 103 km. From respective sources beyond this confluence, Sabarmati flows through the Dharoi gorge. Emerging from the gorge it passes through the plains and is joined on its left bank at about 170 km from its source by the Hathmati, which is its major tributary. Continuing to flow in South – West direction, the river passes through Ahmedabad and about 65 km downstream, another major tributary, Watrak joins it on the left bank, flowing for a further distance of 68 km, the river outfalls in the Gulf of Khambhat in Arabian Sea.

River Machhu Basin: The total length of this North flowing river from its origin to

its outfall into the little Rann of Katchch is 141.75 km. Machhu receives several tributaries on both the banks. There are 6 major tributaries having length more than 25 km out of which 4 tributaries namely Jamburi, Benia, Machhori and Maha feed from the right and the remaining 2 tributaries namely Beti and Asoi from the left. The drainage system on the right bank of Machhu is more extensive as compared to the left bank. The Beti, Asoi, Machhori and Maha, the 4 important tributaries together account for nearly 42.52% of the total catchment area of Machhu. Maha, the principal tributary, rises from Rampura in Chotila taluk of Surendranagar district and drains in North Western direction and fertiles Surendranagar and Rajkot districts and joins main stream Machhu about 1.6. km downstream of Panchaisa village. Machhori another important tributary also rises from Chotila taluka and drains towards North direction and meets the main stream about 8.5 km downstream of Wankaner in Rajkot district. Asoi tributary rises from the hilly region of village Vanjhara of Wankaner taluka and drains towards North direction and meets the main stream just upstream of village Derali.

Generally floods and cyclones are not occurred in the semi arid region of the study area and the same has been confirmed from the meteorological data collected from the study region.

e) Forests, Biosphere and Sanctuary

Forest Stretch: It is learnt from the site visit and subsequent discussions had with the concerned Forests officials that the entire project stretch of 338 Km is passes through the Protected Social Forestry and apparently requires forest clearance as per the Forests (Conservation) Act, 1980 and subsequent amendments thereof. The photographs showing the protected social forest stretch in the RoW are given in Figure -2.



Figure -2: Protected Social Forestry along the RoW

f) Socio-economic status

As per the Census 2011, the Gujarat state has the Population of 60,383,628. Gujarat is the 10th largest state in terms of Population in India. Gujarat is one of the most

industrialized states of India and thus attracts people from India both in terms of investment and jobs. From a small figure of 50,671,017 in 2001, the population of Gujarat has gone to 60,383,628. Population growth in Gujarat has witnessed an increase of 19.17 in this decade. Out of this figures, total male population stands at 31,482,282 and female at 28,901,346 in state of Gujarat. In terms of Population, Ahmedabad is the largest city of Gujarat with 6.2 million people living here. Surat and Vadodara are other two major cities with high number of urban population residing here. Rajkot is the fourth largest city of Gujarat with population of 1.50 million. The cities like Bhavnagar, Bhuj, Junagadh and Jamnagar constitutes a large number of urban populations in Gujarat.

Literacy Rate: The state of Gujarat has also shown an increase in its literacy rate by 10 percent in this decade. Currently it stands at 79.31 percent as compared to last census (2001) figures of 69.14 percent. Better education facilities by the state government have proved a vital role in improving overall literacy rate of Gujarat. According to latest Census of 2011, Male Literacy rate in Gujarat stands at 87.23 percent while female literacy rate is 70.73 percent.

Sex Ratio of Gujarat: Sex Ratio of Gujarat which is currently recorded as 918 females per 1000 males is lower than the national figures 940. Gujarat Sex Ratio has not shown any improvement from last census figures of 921 per 1000 females in 2001. According to latest census of 2011, there are 918 females available in Gujarat for every 1000 males.

Religious Composition: Hinduism is the most dominant religion in Gujarat with 89.1% of the population being Hindus. The other religions include Muslims 9.1%, Jain and Sikhs 0.1% of the total Population in Gujarat. Gujarati is the official language of Gujarat while Hindi and English are also widely spoken. Kutchi, Bhili and Gamit are also spoken in the areas like Kutch region of Gujarat.

Population Growth: Gujarat has witnessed a descent growth in its population in the last 60 years. From a small figure of 16 Lakh in 1950, it has gone passed 6.03 Crore in 2011. Rapid Industrialization and development of the Gujarat state has attracted people from all over India. Thus Population of Gujarat has increased a lot in the last 6 decades beginning from 1950.

g) Industries

There are plenty of small, medium and large scale industries present in Ahmedabad and Surendranagar districts in the study area. The majority of the industries are locating all along the existing NH-8A. Industries in study districts generating employment for the people are automobile, marbles, ceramics, pharmaceutical, steel, rubber, plastics, minerals, metal, electrical, cotton, wooden, food & beverages etc. The forests in the region help the nation to earn foreign currency by exporting quality of wood. The other by-products of the forest are honey, tamarind and many ayurvedic plants, which earn revenues for the State. Study area is a major market center for ceramics and marbles. The photographs showing the industries located along the Right of Way of NH-8A are given in **Figure -3**.



Figure -3: Photographs Showing the Industries Located Along the RoW

h) Transportation

The study districts are having a good transport system in the State of Gujarat. These are connected to all the major cities across the country through various major and local highways, railways and air. There is a couple of major highways, State Highways and MDRs, Panchayat roads etc. Common modes of road transport within the cities /towns are city buses, cars and auto-rickshaws.

i) Infrastructure

The study region has well-developed and extensive infrastructural facilities in place. The power supply position is good and almost all the villages in study districts are electrified. The district headquarters such as Ahmedabad and Suredranagar have facilities like housing, hospital, drinking water facility, school and technical education, universities, medical college, etc. Emergency medical care and firefighting facilities are also available at all Tehsils head quarters along the proposed project corridor.

j) Seismic Details of the Area

As per the seismic hazard map of India updated in 2000 by the Bureau of Indian Standards (BIS), the study district such as Ahmedabad lies in Zone -III, Rajkot and Suredranagar lies in Zone -IV. As classified in BIS map, Zone -V indicates the most seismically active region, while zone -II is the least seismically active region. However, the project influence area falls in 'Moderate to hazard' region.

History of Earthquake: On January 26, 2001, while India celebrated its Republic Day, an earthquake of shattering intensity – 7.9 on the Richter scale – occurred at 20km northeast of Bhuj in the dry and arid district of Kutch in the western Indian state of Gujarat. The earthquake left 20,005 dead, 166,812 injured, 600,000 homeless and 212.6 billion Indian rupees in damage. The earthquake damaged the entire Kutch district, partially damaged the Suredranagar and limited impact on Ahmedabad district.

k) Archeological Sites/Places of Tourist Interest

No archeological sites were present within the Right of Way (ROW) of project highway. The archeological and places of tourist interest present within the study area are:

Adalaj Step-well, Bhadra Fort, Sabarmati Ashramam, Sidi Sayad mosque, Jumma Mosque, Karba Gandhi No Delo / Mahatma Gandhi House, Watson Museum and Library, Lalpari Lake & Randarda Lake, Chamunda Mata Temple, Chotila, Naraya sarovar, Koteswar temple, Wild ass sanctuary, LRK etc.

I) Sources of Irrigation and Cropping Pattern

The major sources of irrigation are wells and tube-wells in the study area. Besides this, very limited area is irrigated through small rivers & ponds. During Kharif, the groundnut crop is produced in irrigated areas. Maize also requires irrigation. Generally other crops are sown at the commencement of the rainy season. Bajra, Groundnut, Maize and Cotton are sown by broadcasting the seeds. Fertiliser is applied before sowing of groundnut and cotton.

During Rabi, the mustard and gram is sown from September to October, in unirrigated land, while in the irrigated land, barley, gram and mustard are sown in October-November and wheat in November-December.

The study area has little double cropped area with the crop cycle as moong-wheat, groundnut-wheat, moong-mustard, bajra-mustard, bajra-gram etc. The principal crop in the study area in Kharif is Bajra and the most important food grain crop in Rabi is wheat.

2.2 Meteorology of the Region

Regional Meteorological and climatological data was compiled for IMD, Ahmedabad, which is be the nearest meteorological station located within the project study district. The meteorological data has been collected for a period of 30 years for Ahmedabad (1971 to 2000).

2.2.1 Climatic Conditions

The study districts are falling under semi arid region of Gujarat State. The area has a distant place from Arabian Sea as well as Bay of Bengal gives rise of continental climate. During monsoon period from July to September and occasionally during rest period of the year in the wake of western disturbances humidity, cloudiness and rainfall activities increase. The year is broadly divided into four seasons namely:

- the winter season starts from mid December to mid February,
- summer or hot weather season from March to May,
- monsoon season spread from end of June to mid September, and
- October and November are known as transit period or post monsoon period.

i) Temperature

The mean minimum temperature of the area is ranging from 7.5°C – 32.1°C during winter season and mean maximum temperature is ranging from 23.3°C – 44.4°C in summer season.

ii) Relative Humidity

The mean humidity varies from minimum at 21.0% to maximum at 87.0% and the humidity figure shows that area belongs to hot semi-arid region.

iii) Wind Speed

The mean Wind speed normally is in the range of 4.8 to 11.8 Km/hr. The wind speed range is high during June to September due to entry of SW monsoons.

iv) Wind Direction

The predominant wind direction prevails from SW, W and NW. Following are the season wise predominant wind directions; during winter – Northwesterly, summer – Northwesterly, monsoon – westerly, northwesterly & southwesterly and in post monsoon season – Northwesterly.

v) Rainfall

The rainfall in this region, in general receives from the south-west towards the north-east. The maximum annual rainfall is received during the south-west monsoon which is about 95.00% and an amount of rainfall is received from non monsoon season (5.00%). The cold weather commences towards the end of November when the temperature begins to fall rapidly. The number of rainy days in the year is 33.3 and the average annual rainfall is 740.6mm.

As per Environmental Impact Assessment Notification, 2006 and its amendment 2009; the Project will fall under Category A and would require prior Environmental Clearance from MoEF, Govt. of India and hence an EIA study will be required to be carried out for the purpose. For carrying out the EIA study the Terms of Reference (TOR) has been proposed.

3.0 SCOPE OF THE STUDY

The Scope of Surveys and studies for the project including all engineering aspects, environmental and socio-economic aspects of the projects are included in the ToR for feasibility studies. The salient features of the scope are given hereunder:

- i. The Consultant will also make suitable proposals for widening/improvement of the existing 4-lane road to 6- lane with provision of capacity augmentation etc. and strengthening of the carriageways, as required at the appropriate time to maintain the level of service over the design period. The consultant will also review the alignment based on the IRC codal provisions and propose realignments and bypasses as required.
- ii. The Consultant will study the possible locations and design of toll plaza. Wayside amenities required on tolled highway shall also be planned. The local and slow traffic may need segregation from the main traffic and provision of service roads and fencing may be considered, wherever necessary to improve efficiency and safety.
- iii. Consultant will prepare land acquisition proposals for the additional land required for widening the existing carriageway, forming bypasses etc. The Consultant will furnish land acquisition details as per revenue records / maps for further processing.
- iv. The Consultants will prepare documents for BOT/EPC contracts for the contract packages based on the mode of execution approved by client.

- v. Environmental Impact Assessment and Environmental Management Plan shall be carried out by the Consultant meeting the requirements of the Government of India or lending agencies like ADB/ World Bank/ JBIC etc.
- vi. Wherever required, consultant will liaise with all concerned Govt. agencies including but not limited to Electricity dept., Irrigation Dept., Water Resources Dept., District Development Authority, PWD, Municipality Department, Police Department, Revenue Department, Traffic Police, and secure all clearances and also incorporate the estimates for shifting of utilities of all types involved from concerned local authorities in the Feasibility Study.
- vii. Consultant will also obtain 'NO Objection Certificate' from Ministry of Environment and Forest.
- viii. Consultant is required to prepare all Land Acquisition Plans (i.e. all necessary schedules as per National Highway, 1956 Act) for acquisition of land required for the project under National Highways Act.