CHAPTER 11: SUMMARY & CONCLUSIONS

11.1 PROJECT BACKGROUND

National Highways Authority of India (NHAI) has taken up the task of developing various National Highway Corridors where the intensity of traffic has increased significantly requiring, augmentation of capacity for safe and efficient movement of traffic. Golden Quadrilateral connecting four metros namely Delhi, Mumbai, Chennai and Kolkata and North-South and East-West Corridor connecting Srinagar (Jammu & Kashmir) to Kanyakumari (Tamil Nadu) and Silchar (Assam) to Porbander (Gujarat) respectively for a total length of about 13,000 km has already been taken up.

NHAI has also been entrusted to implement the development, maintenance and management of National Highways under NHDP Phase-IV Programme for rehabilitation and upgrading of National highways to 2 lanes with paved shoulder standards. The NHAI has accordingly taken up detailed project preparation of NH-218 from Bijapur-Gulbarga-Homnabad.

The existing Project road starts from Bijapur at junction of NH-218 (km 195.000) and NH-13 (km 99.200) at the outskirts of Bijapur city and ends at Homnabad junction of NH-218 (km 418.000) and NH-9 (km 383.400) in Karnataka State. On project road, kilometre stones along with chainage were generally observed from km 195 to km 348 (i.e Bijapur to start of Gulbarga Ring Road). After that, in some of locations, kilometre stones were available without NH-218 chainage details. During the detailed survey, consultant continued the chainage as from km 349, km 350 etc for correlating the existing features from plan. In few stretches kilometer stones were not available at site. The project road is mainly connecting two National Highways viz., NH-13 and NH-9. There are many State Highways viz., SH-41, SH-16, SH-19, SH-51 and SH-32 meeting the proposed project road at different sections of NH-218. It traverses generally through 60% plain and 40% rolling terrain with some sharp horizontal curves. Mixed land use of agricultural/barren land and forest can be seen at some locations along the project road corridor. The project road passes through urban/semi urban and rural areas such as Bijapur, Devar Hippargi, Sindgi, Jevargi, Haldikeda and Gulbarga.

NHAI has been entrusted to implement the development project for this selected stretch/corridor on Built Operate and Transfer (BOT) basis/Annuity/EPC sources. The NHAI has entrusted the work of preparation of the Feasibility study, Environmental and Social Impact Assessment and Detailed Project Report for the above project to M/s Mott MacDonald Private Ltd., vide letter no. KNT/DPR/NHDP-IV02/10663 dated 22nd March 2010. The contract agreement signed on 09th April 2010. However, contract agreement finalized on 8th Sept 2010.

THE PROJECT ROAD & AREA

The project road connecting Bijapur-Gulbarga-Homnabad section does not passes through any eco-sensitive areas. However, for a stretch of about 3.81km at different chainages, there exist Reserved/Protected forests in patches adjacent all along the project Alignment. The proposed ROW is passing through the patches of Reserved Forest like Uploan (km 366.100 to km 367.200 on LHS & km 366.100 to km 366.110 on RHS), Bhimnal(km 393.400 to km 394.800 on both sides), Margutti (km 398.400 to km 398.800 on RHS) & Dongargaon (km 403.000 to km 403.200 on LHS) in Gulbarga district, and Hallikheda RF(km 409.600 to km 409.800 on LHS), Kallur Open forest(km
PROPOSED IMPROVEMENTS

The existing project highway is presently a 2-Lane undivided carriage. The project proposes to:

- Developing the carriageway with paved shoulders and strengthening the existing carriageway by overlays / rehabilitation / reconstruction.
- In addition to strengthening the existing carriageway, the project would improve the geometric deficiencies through curve improvements and the improvement of the various Intersections.
- The proposed improvement includes repair / rehabilitation of existing cross-drainage (CD) Structures on the highway and provision of new CD structures.
- The project highway passes through many settlements.
- To minimise the adverse impacts on the various settlements and to minimize land acquisition, short realignments at two locations to reduce adverse impacts. The proposed works shall be limited to a proposed ROW of 30/45m. It is also proposed to have concentric widening to the extent possible to remove discrimination and local conflicts.
- Service roads are also proposed to be provided at a number of locations. These locations were proposed based on the proximity to cultural properties, educational and health units, and size of Settlements.
- Proper drainage, grade-separation, road furniture, utilities and amenities wherever required shall also be provided.

11.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) STUDY IN THE PROJECT

The Environmental Impact Assessment study of the project road has been carried out as per terms of reference of NHAI and guidelines given by the Ministry of Environment & Forests, Govt. of India.

The study methodology for the PPR stage EIA employs a simplistic approach in which the important environmental receptors were identified during the Environmental Screening phase. Based on the identification baseline data was generated and then analyzed to predict the impacts and quantify them. Avoidance, Mitigation and Enhancements measures were then developed and these have been incorporated in the Environmental Management Plan (EMP), design drawings and / or Bills of Quantities as appropriate. Implementation arrangements including responsibilities of all the factors have been streamlined and documented for future guidance.

11.3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

11.3.1 Institutional Setting
The project has been initiated by the GOkr and is being carried out by the NHAI. The primary responsibility of the project rests with the NHAI in providing encumbrance free ROW to the contractor, who shall implement the project.

11.3.2 Clearances

As part of the project preparations, NHAI shall seek forest diversion for 2.81 ha and tree felling permission from the respective Divisional Forest Officer, who is the designated officer under the WALTA act by GOkr. The application for Forest diversion has also been processed and submitted to the Nodal Officer in the Forest Department.

As additional right of way requirement for improvement of the project road is less than 10-15m, this project come under the purview of the MoEF Notification (Sept 2006). The assessment of the additional right of way has been made considering the average additional land width requirement over the length of the corridor.

The contractor shall seek the following clearances, NOCs & licenses from the authorities prior to his work initiation:

- NOC under Hazardous Waste (Management and Handling) Rules, 1989 from SPCB
- PUC certificate for use of vehicles for construction from Department of Transport
- Quarry lease deeds and license and Explosive license from Dept. of Geology and Mines & Chief controller of explosives
- NOC for water extraction for construction and allied works from Ground Water Authority
  Apart from the above clearances, the contractor also has to comply with the following:
- Clearance of Engineer for location and layout of Worker’s Camp, Equipment yard and Storage yard.
- Clearance of Engineer for Traffic Management Plan for each section of the route after it has been handed over for construction.
- An Emergency Action Plan should be prepared by the contractor and approved by the Engineer for accidents responding to involving fuel & lubricants before the construction starts.
- Submit a Quarry Management Plan to the Engineer along with the Quarry lease deeds

11.4 BASELINE ENVIRONMENTAL PROFILE

11.4.1 Physical Environment

Meteorology

The study of Meteorological and micro meteorological parameters is significant in a road project as these parameters regulate transport and diffusion of pollutants released into the atmosphere.

Climate
The state of Karnataka is part of two well-defined regions of India, namely the Deccan Plateau and the Coastal Plains and Islands and it can be further divided into four physiographic regions—the Northern Karnataka Plateau, Central Karnataka Plateau, Southern Karnataka Plateau, Karnataka Coastal Region.

**Northern Karnataka Plateau**

The Northern Karnataka Plateau, at an elevation of 300 to 600 meter, is largely composed of the Deccan Trap. It represents a monotonous, treeless extensive plateau landscape rich in black cotton soils. Northern Karnataka Plateau comprises of the districts of Belgaum, Bidar, Bijapur and Gulbarga and is largely composed of the Deccan Trap. However the river plains of the Krishna, the Bhima, the Ghataprabha and the Malaprabha with the intervening watersheds, the step like landscapes, lateritic scarpments, residual hills and ridges break the monotony of this extensive plateau. The general slope is towards the east. This region is largely covered with rich black cotton soils.

**Central Karnataka Plateau**

The Central Karnataka Plateau is the area between the Northern and Southern Karnataka Plateaus, which results in the general elevation varying between 450 and 700 meter. This region represents the area of the Tungabhadra basin. Central Karnataka Plateau covers the districts of Bellary, Chikmagalur, Chitradurga, Dharwad, Raichur and Shimoga. The general slope of this region is towards the east.

**Southern Karnataka Plateau**

The Southern Karnataka Plateau covers the area of the Cauvery river basin lying in Karnataka and is encircled by the Western Ghats in the west and south. In the east the valleys of the Cauvery and its tributaries open out to form undulating plains. The region is situated between 600 and 900 meter above sea level. However, residual heights of 1,500 to 1,750 metres are found in the Biligirirangan hills of Mysore district and the Brahmagiri range of Kodagu district. The Southern Karnataka Plateau covers the districts of Bangalore, Bangalore Rural, Hassan, Kodagu, Kolar, Mandya, Mysore and Tumkur. It is bounded by 600 metres contour and is characterised by a higher degree of slope.

**Karnataka Coastal Region**

The Karnataka Coastal Region, which extends between the Western Ghats, edge of the Karnataka Plateau in the east and the Arabian Sea in the West, covers Dakshina Kannada and Uttara Kannada districts. This region is traversed by several ridges and spurs of Western Ghats. It has difficult terrain full of rivers, creeks, waterfalls, peaks and ranges of hills. The coastal region consists of two broad physical units, the plains and the Western Ghats. The Coastal plains, represent a narrow stretch of estuarine and marine plains. The abrupt rise at the eastern flanks forms the Western Ghats. The northern parts of the ghats are of lower elevation (450-600 metres) as compared to Southern parts (900 to 1,500 metres). The Coastal belt with an average width of 50 to 80 km covers a distance of about 267 km. from north to south.

The Tropical Monsoon climate covers the entire coastal belt and adjoining areas. The climate in this region is hot with excessive rainfall during the monsoon season i.e., June to September.
Southern half of the State experiences hot, seasonally dry tropical savana climate while most of the northern half experiences hot, semi-arid, tropical while most of steppe type of climate. The climate of the State varies with the seasons.

The winter season from January to February is followed by summer season from March to May. The period from October to December forms the post-monsoon season. The period from October to March, covering the post-monsoon and winter seasons, is generally pleasant over the entire State except during a few spells of rain associated with north-east monsoon which affects the south-eastern parts of the State during October to December.

The months April and May are hot, very dry and generally uncomfortable. Weather tends to be oppressive during June due to high humidity and temperature. The next three months (July, August and September) are somewhat comfortable due to reduced day temperature although the humidities continue to be very high.

**Temperature**

Both day and night temperatures are more or less uniform over the State, except at the coastal region and high elevated plateau. They generally decrease south-westwards over the State due to higher elevation and attain lower values at high level stations. April and May are the hottest months. In May, mean maximum temperature shoots upto 40°C. over the north-eastern corner of the State, decreasing south-westwards towards the Western Ghat region and the Coastal belt.

The highest temperature recorded at an individual station in the State is 45.6°C at Raichur on 1928 May 23, which is 6 deg.higher than the normal for the warmest months. December and January are the coldest months. The lowest temperature at an individual station was 2.8°C on 1918 December 16 at Bidar.

**Rainfall**

The annual rainfall in the State varies roughly from 50 to 350 cm. In the districts of Bijapur, Raichur, Bellary and southern half of Gulbarga, the rainfall is lowest varying from 50 to 60 cm. The rainfall increases significantly in the western part of the State and reaches its maximum over the coastal belt. The south-west monsoon is the principal rainy season during which the State receives 80% of its rainfall. Rainfall in the winter season (January to February) is less than one per cent of the annual total, in the hot weather season (March to May) about 7% and in the post-monsoon season about 12%.

South-West monsoon normally sets in over the extreme southern parts of the State by about 1st of June and covers the entire State by about 10th of June. The rainy months July and August account individually to about 30% and 18% of annual rainfall. There are about 26 rainy days (with daily rainfall of atleast 2.5 mm) in the south-west monsoon begins from the northern parts of the State around 2nd week of October and by the 15th October monsoon withdraws from the entire State.

The retreating monsoon current i.e. the north-east monsoon (October to December) effects the eastern parts of South Interior Karnataka and accounts for about 30% of rainfall in this region. Out of
the 14 heavy rainfall stations in India, with annual rainfall of more than 500 cm. Four stations are situated in Karnataka. They are Agumbe in Tirthahalli taluk of Shimoga district (annual rainfall-828 cm) and Bhagamandala (603 cm), Pullingoth (594 cm) and Makut (505 cm) in Kodagu district.

Wind

Based on Meteorological Data collected from various secondary sources, it reveals that (i) the predominant wind direction was observed to be blowing from West, WSW, WNW, NW (ii) the wind speeds were mostly in the ranges of 6-16 Kmph (iii) the maximum temperature recorded was 36°C to 39°C and the minimum was 21°C to 23°C and (iv) the average relative humidity recorded was in the range of 28% to 42%.

Relative Humidity

The relative humidity is generally high during the southwest monsoon. The pre-monsoon is the driest part of the year with relative humidity below 25%. The mean monthly maximum and minimum relative humidity are 73% and 23%, respectively.

Evaporation

A steep increase in evaporation is observed from January through May followed by an equally steep fall during the first half of the southwest monsoon season. During the rest of the year, the monthly variation is minimal.

Seismicity

India has most tectonically active as well as most stable landmasses. India is divided into 5 zones according to the probability of the earthquake occurrence. Zone 1 is the least active and zone 5 is the most active zone. The project road falls in Seismic Zone II and has very low rates of seismic activity. The area is depicted in the following Figure in the map of India.

Air Quality

The air quality in the project area is generally pristine. The PM10, PM2.5 levels were found well within the prescribed standards of CPCB. The gaseous concentration such as SO2, NOX & CO were also within CPCB prescribed limits.

Noise Quality

It has been observed that noise levels exceed prescribed limits of CPCB in major locations, as normally observed in other State highways. The noise levels are below the stipulatory standards near rural and forest sections.

Water Hydrology and Drainage

To facilitate the cross-drainage at water crossings, cross-drainage structures are proposed. The water quality of the surface water bodies like Bheema river, Chinna mergi stream and Open canal, when tested, indicates no biological contamination, making water from these sources suitable for drinking & bathing.
11.4.2 Biological Environment

Forest Resources

The project road does not pass through any eco-sensitive areas. However, for a stretch of about 3.81km, there exist Reserved/Protected forests adjacent all along the project alignment. That is passing through the patches of Reserved Forest like Uploan (km 366.100 to km 367.200 on LHS & km 366.100 to km 366.110 on RHS), Bhimnal (km 93.400 to km 394.800 on both sides), Margutti (km 398.400 to km 398.800 on RHS) & Dongargaon (km 403.000 to km 403.200 on LHS) in Gulbarga district and Hallikheda RF (km 409.600 to km 409.800 on LHS), Kallur Open forest (km 411.500 to km 411.600 on RHS) and Kallur RF (km 413.400 to km 413.800 on both sides) in Bidar district. There is no endangered flora and fauna found in these Reserved Forests. There is no endangered flora and fauna found in this Reserved and Protected Forest. Even at 10 m buffer on either side of the ROW the forest trees are found to be very less and there is no endangered species of animals are found.

Trees within ROW

Tree survey is being carried out along the proposed alignment. Most of the trees were planted along the roads in the past. From the environmental point of view there exists numbers of big trees on either side of the Existing Road. There are as many as 34,964 trees in revenue & private land and 731 trees in forest land likely to be impacted.

Fauna

Domesticated animals mainly constitute the faunal population within the project area. Wild animals are not reported in the project vicinity. No endangered species of flora and fauna are found in the project area.

11.4.3 Social Environment

Settlement

There exist settlements varying in size and populations along the project corridor.

Cultural Properties

The project highway traverses through a number of settlements and there are some religious and cultural properties which though not of archaeological significance are nevertheless, significant to the community.

Census Profile

According to the 2001 census of India, the total population of Karnataka is 52,850,562, of which 26,898,918 (50.9%) are male and 25,951,644 (49.1%) are female, or 1000 males for every 964 females. This represents a 17.3% increase over the population in 1991. The population density is 275.6 per km² and 34.0% of the people live in urban areas. The literacy rate is 66.6% with 76.1% of males and 56.9% of females being literate. 83% of the population are Hindu, 11% are Muslim, 4% are Christian, 0.8% are Jains, 0.7% are Buddhist, and with the remainder belonging to other religions.
Public Consultation

Public consultations were conducted during the project preparations. The main purpose of these consultations was to know the community’s reaction to the perceived impact of proposed project on the people at individual and settlement level. The issues of the most concern were related to rehabilitation and resettlements and have been dealt in social assessment report. It was also felt during the public consultation process that most of the people are aware about the project but they did not appreciate environmental problems associated with road projects. However, some people were concerned about environmental issues, mainly air and noise pollution. The other concerns raised at during public consultation were demand for submergence of project road and safety problems. The issues raised by the public have been duly incorporated in project design.

11.5 POTENTIAL ENVIRONMENTAL IMPACTS

The environmental components are mainly impacted during the construction and operational stages of the project and have to be mitigated for and incorporated in the engineering design. Environmental mitigation measures represent the project’s endeavour to reduce its environmental footprint to the minimum possible. These are conscious efforts from the project to reduce undesirable environmental impacts of the proposed activities and offset these to the degree practicable. Enhancement measures are project’s efforts to gain acceptability in its area of influence. They reflect the pro-active approach of the project towards environmental management.

11.5.1 Impacts on Climate

Impact on the climate conditions from the proposed road project widening will not be significant as no major deforestation and / or removal of vegetation is involved for the project.

11.5.2 Impact on Air Quality

There will be rise in SPM levels during the construction activities, which shall again be within prescribed limit after the construction activities are over.

11.5.3 Impact on Noise Levels

The impact of noise levels from the proposed project on the neighbouring communities is addressed. It has been concluded that both day and nighttimes equivalent noise levels are within the permissible limits right from start of project life. Noise sensitive receptors have been identified along the project road.

11.5.4 Impact on Water Resources and Quality

The construction and operation of the proposed project roads will not have any major impacts on the surface water and the ground water quality in the area. Contamination to water bodies may result due to spilling of construction materials, oil, grease, fuel and paint in the equipment yards and asphalt plants. This will be more prominent in case of locations where the project road crosses rivers, canals distributaries, etc. Mitigation measures have been planned to avoid contamination of these water bodies.
11.5.5 Impact on Ecological Resources

There is no major loss of vegetation hence adverse impact in terms of availability of nesting sites for the bird doesn’t arise. Furthermore, there is no sensitive ecological area along the existing project roads, so the impact will be insignificant during construction period. But on the long run the project shall have a positive impact due to the compensatory forestation and avenue plantation.

11.5.6 Impact on Land

During the construction of the proposed project, the topography will change due to excavation of borrow areas, stone quarrying, cuts and fills for project road and construction of project related structures etc. Provision of construction yard for material handling will also alter the existing topography. The change in topography will also be due to the probable induced developments of the project. Benefits in the form of land levelling and tree plantations in the vicinity of the project road shall enhance the local aesthetics.

11.5.7 Impact on Human Use Values

The PAPs shall be compensated as per the RAP. Accidents are bound to increase coupled with ribbon development. There shall also be some impacts on cultural or religious properties along the corridor.

11.6 ANALYSIS OF ALTERNATIVES

Detailed analyses of the alternatives have been conducted taking into account both with and without project scenario and the available alignment options. The analysis also dealt with the justification of selections of the proposed alignment and the modifications on it due to environmental considerations, realignment and bypasses and the minimization of negative impacts. Based on all these alternative studies the present alignment was proposed.

Due to non-availability of land width for construction of service roads at the dense built-up area of Jevargi town, bypass has been proposed at this location.

11.7 MITIGATION AVOIDANCE AND ENHANCEMENT MEASURES

Both generic and site specific mitigation and enhancement measures have been planned for identified adverse environmental impacts. The construction workers camp will be located at least 500m away from habitations. The construction yard, hot mix plants, crushers etc. will be located at 500m away from habitations and in downwind directions. Adequate cross drainage structures have been planned to maintain proper cross drainage. In order to compensate negative impacts on flora due to cutting of trees the project plans compensatory plantation in the ratio of 1:2 i.e. for every tree to be cut, two trees will be planted. The project shall also witness the plantation of trees for providing aesthetic beauty and shade. As the space for compensatory afforestation might not be adequate along the project road, this plantation shall be taken up by the forest department, after payment of the cost for raising and maintaining the saplings for three years. The project will take an opportunity to provide environmental enhancement measures to improve aesthetics in the project area. The planned environmental enhancement measures include plantation in available clear space in ROW, enhancement of water bodies, enhancement of cattle market etc. In order to avoid contamination of
water bodies during construction sedimentation chambers, oils and grease separators, oil interceptors at storage areas and at construction yard have been planned.

**11.8 INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN**

The responsibility of implementing the mitigation measures and all activities under environmental management plan (EMP) lies with the contractor (selected through International Competitive Bidding) through the contractor. All construction activities being taken up by the contractor and shall be scrutinised by NHAI.

The implementation of RAP shall be as per the details given in the RAP report. In the pre-construction phase of the project the consultant as appointed by NHAI shall review the EMP and RAP to identify environmental and social issues and arrive at a suitable strategy for implementation.

For effective implementation and management of the EMP, The Contractor shall establish a Safety, Health and Environment (SHE) Cell headed by an Environment Officer to deal with the environmental issues of the project. This officer shall interact with the contractor, NHAI and other departments to ensure that the mitigation and enhancement measures mentioned in the EMP are adhered. The Environmental officer of the contractor shall be the interface between the Environmental Specialist of IC and the Environmental Officer of the contractor. His prime responsibility shall be to appraise the Environmental Specialist about the ground conditions. He shall also procure the requisite clearances and the NOCs for the project and shall also strictly supervise that the contractor adheres to the EMP. The officer shall also participate in training programmes and assist NHAI in preparing documentation for good practices in environmental protection.

The reporting system will operate linearly – contractor who is at the lowest rung of the implementation system reporting to the Contractor, who in turn shall report to NHAI. All reporting by the contractor shall be on a quarterly basis, while the reporting time of the contractor shall be decided upon by the contractor. The NHAI Site Office will be responsible for setting the targets for the various activities anticipated during construction phase and obtaining agreement from the Contractor after mobilisation but before beginning of works on site. The contractor will report from then on regarding the status on each of these. The NHAI Site Office will monitor the activities through its own staff or the consultant’s Environmental Specialist after it has obtained the Contractor’s report with the Consultant’s remarks on it during the construction phase. During the operation phase, the supervision as well as reporting responsibilities will lie with the NHAI Site Office.

**11.9 ENVIRONMENTAL MANAGEMENT PLAN**

Project specific environmental management plan have been prepared for ensuring the implementation of the proposed measures during construction phase of the project, implementation and supervision responsibilities, sufficient allocation of funds, timeframes for anticipated activities etc. has been dealt with in this document, which will eventually form a part of the Contract documents between the NHAI and the Contractor.
11.10 CONCLUSIONS

Based on the EIA study and surveys conducted for the Project, it can be safely concluded that associated potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the measures as stated in the EIA Report. Adequate provisions shall be made in the Project to cover the environmental mitigation and monitoring requirements, and their associated costs as suggested in environmental budget. The proposed project shall improve Road efficiency and bring economic growth. In terms of air and noise quality, the project shall bring considerable improvement to possible exposure levels to population.