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Public Works Department

Uttar Pradesh Core Road Network Development Program

Part – A: Project Preparation

DETAILED PROJECT REPORT

Volume - VIII: Draft Environmental Impact Assessment Report and Environmental Management Plan

Gola – Shahjahanpur Road (SH-93)

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ABBREVIATIONS

ASI	Archaeological Survey of India
AADT	Annual Average Daily Traffic
CFE	Consent for Establishment
CFO	Consent for Operation
CoI	Corridor of Impact
CPCB	Central Pollution Control Board
CO	Carbon Monoxide
CSC	Construction Supervision Consultants
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPIU	Environmental Management Plan Implementation Unit
EO	Environmental Officer
EC	Environmental Clearance
EPA	Environment (Protection) Act
EMMP	Environmental Monitoring and Management Plan
FGD	Focus Group Discussion
GoI	Government of India
GM	General Manager
IEE	Initial Environmental Examination
IRC	Indian Road Congress
MoEFCC	Ministry of Environment Forests and Climate Change
MFI	Multilateral Financing Institutions
NO2	Oxides of Nitrogen
PM	Particulate Matter
PIU	Project Implementing Unit
PHC	Primary Health Centre
PPE	Personnel Protective Equipments
PIs	Performance Indicators
RoW	Right of Way
R&R	Resettlement and Rehabilitation
SPS	Safeguard Policy Statement
SEIAA	State Level Environment Impact Assessment Authority
SEAC	State Level Environmental Appraisal Committee
SO2	Sulphur-dioxide
SIA	Social Impact Assessment
WB	World Bank

0 EXECUTIVE SUMMARY

A project specific Environmental Assessment study has been carried out for proposed upgradation and improvement of Gola-Shahjahanpur section of state highway No.-93 (SH-93) in accordance with the Environmental and Social Management Framework (ESMF) developed for UPCRNDP Projects, guidelines and operational manual of World Bank and guidelines of Ministry of Environment, & Forests and Climate Change (MOEFCC), Government of India.

The project section is a part of SH-93. The proposed project section starts from Gola Market at existing Chainage Km 1+280 and ends at Shahjahanpur at Km 58+580 in the state of Uttar Pradesh. As per design the total length of the project is 58.100 Km.

The major objective of this study is to establish present environmental conditions along the project corridor through available data and information supported by field studies to evaluate the impacts on relevant environmental attributes due to the construction & operation of the proposed project, to recommend adequate mitigation measures to minimize /reduce adverse impacts and to prepare an Environmental Management Plan (EMP) for timely implementation of the mitigation measures to make the project environmentally sound and sustainable. The EMP will be part of the bid document for construction of the project.

The specific environmental issues considered are physiography and soils, topography, climate, borrow area and quarry sites, water resources, air, noise, soil quality, biological characteristics, social environment and other sensitive environmental sites.

0.1 Environmental Regulations and Policy

Various environmental regulations and policies of Government of India, state Government as well as World Bank's safeguard policies have been reviewed with respect to the proposed project activities. Based on the study, the requirements of various clearances and permits for different activities have been identified for the project as listed below.

Table 0-1: Summary of Statutory Clearance Requirement of the Project

S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility
1	Forest Clearance for land diversion	For acquisition of forest land	Pre Construction	PIU, UP PWD
2	Tree felling permission	For roadside tree cutting	Pre construction	PIU, UP PWD
3	NOC (Consent to Establish and Consent to Operate) under Air and Water Act from SPCB	For siting, erection and operation of stone crusher, Hot Mix Plant, batching plant, WMM Plant etc.	Construction Stage	Contractor
4	Explosive License from Chief Controller of Explosives,	For storing fuel oil, lubricants, diesel etc.	Construction stage (Prior to storing fuel, lubricants and Diesel, etc.)	Contractor
5	Permission for storage of hazardous chemical from CPCB	Manufacture storage and Import of Hazardous Chemical	Construction stage (Prior to initiation of any work)	Contractor

S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility
6	Quarry Lease Deed and Quarry License from State Department of Mines and Geology	Quarry operation	Construction stage (Prior to initiation of Quarrying)	Contractor
7	Environmental Clearance for stone quarry from State environmental Impact Assessment Authority, U.P.	Opening of new Quarry and Borrow area for earth material	Construction stage (Prior to initiation of Quarrying)	Contractor
8	Permission for extraction of ground water for use in road construction activities from State Ground Water board	Extraction of ground water	Construction stage (Prior to initiation of installation of Bore wells and abstraction of water from such source)	Contractor
9	Permission for use of water for construction purpose from irrigation department	Use of surface water for construction	Construction stage (Prior to initiation of abstraction of water from such source)	Contractor
10	Labour license from Labour Commissioner Office	Engagement of Labour	Construction stage (Prior to initiation of any work)	Contractor

0.2 Current Environmental Conditions

The baseline data on various physical, biological and social aspects were collected, analyzed and compiled in order to get the picture of the existing environment conditions in the project area. The data on different environmental components were collected and collated based on secondary data from authentic sources, ground verification followed by actual field surveys to identify a general environmental condition within the project catchment area and major environmental issues to be taken care off during the design as well project implementation phase. The focus of the study was on the areas within and directly adjacent to the corridor of impact and ROW.

0.2.1 Physical Environment

Physiography and Soil

The project section falls in the administrative jurisdiction of Lakhimpur Kheri district and Shahjahanpur district of Uttar Pradesh. The project starts at Gola Market at Km 1+280 and ends at Shahjanpur at Km 58+580.

Lakhimpur Kheri is a tarai District of Uttar Pradesh bordering Nepal. Headquarter of the District is situated in the city of Lakhimpur. The total geographical area of the district is 7680 Sq.km. The District is the largest district of U.P. in terms of area. This district is surrounded by Baharaich district in east, Sahjahnpur & Pilibhit districts in west and Hardoi & Sitapur districts in South.

Shahjahanpur is bounded on north west by Bareilly district, on north by Pilibhit district, in the east by Lakhimpur Kheri and Hardoi districts in the sourth, Farrukhabad district in the south west and Badaun district in the west. The total geographical area of the district is 4575 Sq.km.

The entire section of the project road lies over flat terrain having gentle country slope from northwest to southwest direction. The project road passes through mainly agriculture fields and

built-up areas. The geographical extension of the project stretch is $28^0$04'47.20" N latitude and $80^0$28'47.34" E longitude at Gola and $27^0$51'12.05" N Latitude and $79^0$55'23.60" E longitude at Shajahanpur. General elevation of the area varies between 158 m to 164 m above mean sea level.

The district of Lakhimpur Kheri is drained by several rivers namely Sharda, Ghagra, Koriyala, Ull, Sarayan, Chauka, Gomti, Kathana, Sarayu and Mohana whereas the Shahjahanpur district is drained by Ramganga, Garrah & Gomti rivers.

In Lakhimpur Kheri mainly sandy, alluvial soil, smooth & Domat soil are found. The major soils in Shahjahanpur District are sandy loam soils, Loam soils, Clay loam soils and silt loam soils

Climate

The weather, in general, can be said to be dry and moderate.The maximum temperature in Lakhimpur Kheri district reaches upto 44°C in summer while the minimum temperature is 4.2°C in winter. Relative humidity is about 73% and average annual rainfall is 1069 mm.

The average maximum temperature in Shajahanpur districts is 40.3°C, while the average minimum temperature is 9.3°C. Relative humidity is about 80% while average annual rainfall is 1058.4 mm.

The rainy season is generally observed from middle of June to end of September.

The winter season commences from middle of November and ends by the end of the January followed by dry hot summer from February to middle of June. Summers are in general full of gusty winds.

Water Environment

There are two rivers namely Kathina River and Gomti River crosses the project alignment at Km 12.000 and Km 24.900 respectively. In addition to these rivers, 5 numbers of irrigation canals cross the project alignment. As many as 12 nos. of ponds located along the existing road, some of them are located close to the road edge.

The water table along project area ranges between 5 m to 15 m below ground level.

Ambient Air Quality

To study the baseline ambient air quality scenario within the project area, ambient air quality monitoring was carried out in the month of November, 2014 at Kanja Gola, Mohammadi and Shahjanpur with respect to PM_{10}, $PM_{2.5}$, SO_2, NOx, Carbon monoxide (CO) and Hydrocarbons (HC). The mean concentration of PM_{10} in ambient air was found in the range of 109 µg/m^3 at Kanja Gola, 99.00 µg/m^3 at Mohamadi and 177.0 µg/m^3 at Shahjahanpur. The mean concentration of $PM_{2.5}$ in the ambient air was found in the range of 62 µg/m^3 at Kanja Gola, 52 µg/m^3 at Mohamadi and 91 µg/m^3 at Shahjahanpur. The Kanja Gola showed slightly higher concentrations of PM10 and PM2.5 than the National Ambient Air Quality Standards i.e. 100 µg/m^3 for PM10 and 60 for PM2.5. The Kanjagola is a congested area with commercial activities (market area). There is major junction near the monitoring location. Congested traffic movement and activities in the market area result into generation of dust.

The concentration of PM_{10} and $PM_{2.5}$ in the air at Shahjahanpur at Km 57.900 exceeded the National Ambient Air Quality Standard significantly. At Shahjahanpur presently construction of ROB is in progress which has caused damage to the road surface, moreover the movement of construction vehicles and materials result into generation of fugitive dust around the construction area. This may be attributed to the significant rise in fine dust around the area.

The concentration of other air quality parameters studies was observed well within standard limit at all the locations.

Water Quality

To assess the surface water quality along the project area, water samples were collected from Gomti River at Km 24.900 and from Pond at Machecha at Km 42.800. The analysis result reflects that all the surface water bodies from which the water samples were taken, meet the quality criteria for Class C (Drinking water source after conventional treatment and disinfection) and Class D (Propagation of Wildlife and Fisheries) of surface water.

To assess the ground water quality along project area, water samples were collected from hand pumps at Gola, Mohammadi and Shahjahanpur. The pH of the ground water samples varied between 7.19 to 7.61, which are within the permissible level. The total dissolve solid (TDS) varied between 320.00 mg/l to 618.00 mg/l, which are within the maximum permissible level as per IS:10500. The Total hardness (as $CaCO_3$) ranged from 250.8 mg/l to 450.8 mg/l at different locations along the project road. At Gola and Mohammadi, the Total hardness was more than the desirable limit of 300 mg/l but within maximum permissible limit as per IS: 10500. The concentration of Fluoride (as F) is below the permissible limit in all the samples taken along the project road.

Ambient Noise Levels

The ambient noise level was monitored along project corridor at four locations to assess the noise pollution levels. The average daytime equivalent noise level was recorded in the range of 53.8 Leq dB(A) to 72.1 Leq dB(A) whereas the same varied from 45.3 Leq dB(A) to 59.2 Leq dB(A) during night time. The noise level were observed within permissible level for commercial and mixed area at all the locations except at Shahjahanpur. At Shahjahanpur daytime equivalent noise was recorded to 72.1 Leq dB(A) which is higher than permissible limit for Commercial and mixed rea (65 Leq dB(A)) but within permissible level for industrial area . The higher noise level at Shahjahanpur may be attributed to due to congested built-up area located along the project road on both the side and congested traffic movement, sugar factory and construction of ROB around the area at Shahjahanpur. The nighttime equivalent noise levels were within the permissible level at all the location with their respective to land use zone.

0.2.2 Natural Environment

The Project area is devoid of wildlife sanctuary, national park or notified ecologically sensitive areas or any other significant area of ecological interest, neither these features are located within 10 km of radius of the project. No threatened or endangered flora or fauna exists along the project corridor. About 5289 trees falls within ROW which are likely to be affected due to widening. The predominant tree species are Eucalyptus, Siris, Neem, Sheesham, Mango, etc.

Pockets of reserved forest is located along the project section at two locations covering a total length of about 2.900 Km. The predominant tree species in the reserved forest are teak, sal and shisham. The boundary of the forest pockets are 15 m on either side of the centerline of the existing road.

The roadside tree plantation within ROW is declared as Protected Forest; hence the felling of roadside tree shall attract the provisions of Forest (Conservation) Act and will require forest clearance for diversion of forest area.

Domesticated animals constitute the faunal density in the area surrounding the project road. Neelgai, Fox, jackals, etc are spotted in the project area. Damages to the crop by Neelgai are reported by the local public.

0.2.3 Socio-economic Environment

The project stretch is located in Lakhimpur Kheri and Shahjahanpur districts of Uttar Pradesh districts. It crosses 34 villages.

Demographic Profile

As per census of India 2011 the Lakhimpur Kheri and Shahjahanpur districts has a population of 527501 persons and 745077 persons respectively. The population density in Lakhimpur Kheri and Shahjahanpur districts are 382 persons and 858 persons per square Km, respectively. The sex ratios of Lakhimpur Kheri and Shahjahanpur district are 871 and 894 females respectively for every 1000 males, which is lower than the state's ratio of 912. The literacy rates in the districts are mere 49.58 percent in Lakhimpur Kheri and 50.58 percent in Shahjahanpur district which is below the literacy rate in the state of Uttar Pradesh (57.25%).

Agriculture Pattern

Agriculture remains the main occupation of the people of the project concerned district and about 80% of the population depends on agriculture for its livelihood. The distribution of area of land irrigated by different sources of irrigation is Canals and bore wells.

Industries

The project corridor lacks any major industrial establishment except few Rice Mills and Brick Kiln units have been recorded along the project road..

Cultural Properties

A total number of 22 religious/cultural structures are located along the road. There is no archaeological structure/monument located in the proximity of project corridor. There are 12 numbers of educational institutions located along the ROW. They constitute sensitive receptor and will require adequate attention during construction. Apart from these a number of other community features such as well, hand pumps, bus shelters, etc. are situated which has been detailed in R&R section.

0.3 Public Consultation

Public consultation has been conducted as an integral part of social and environmental assessment process of the project with an objective to inform and educate stakeholders about

the proposed action and to receive the public perception about the project. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted. This participatory process helps in reducing the public resistance to change and enabled the participation of the local people in this development process.

0.4 Potential Environmental Impacts

Sufficient Right of way is available in the entire section of the project road to accommodate the proposed widening of the existing highway section to standard two lane with paved shoulder and the project work would mostly be limited within ROW. Little adverse impacts on environmental components are anticipated due to the project. Most of these adverse environmental impacts are related to construction works which are inevitable but are manageable through certain environmental friendly practices. These negative environmental effects can be taken care of at an early stage through proper engineering designs and through best construction practices.

- **Impacts during Design/Preconstruction Phase**

  The environmental impacts associated with the pre construction stage mainly includes impacts due to design and location of the project as well as site preparation for construction. The main issues involve in the preconstruction stage are acquisition of land and properties, tree felling, diversion of forest land, encroachment of water tanks & ponds, acquisition of common property resources, relocation of public utilities etc. Most of the impacts of preconstruction stage are permanent in nature. The anticipated impacts associated with the preconstruction stage and their mitigation measures have been presented in the **Table 0.2.**

Table 0-2: Anticipated Environmental Impacts due to Proposed Project and their Mitigation Measures during Design/ Pre-construction Stage

S. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
1.	Acquisition of Properties and Resettlement and Rehabilitation issues	A number of encroachers and squatters have been recorded within the existing Right of Way. The structures will need to be acquire for accommodating the proposed widening.	Acquisition of properties of encroachers and squatters will be carried out in accordance with the World Bank's policy and RAP of the project. Early identification affected persons will be done for Resettlement And Rehabilitation Action Plan to Compensate the Losses. The loss will be compensated in accordance with the R&R Policy adopted for the project. All the compensation/assistance to the affected persons will be paid before commencement of Construction works
2.	Cutting of Roadside Trees	A total number of 5289 trees will required to be felled due to the proposed widening.	All efforts will be made to safe the trees by restricting tree cutting within the formation width only. Compensatory plantation will be carried out within available space within the ROW as per Forest Act.
3.	Diversion of Forest Area	The roadside plantation within ROW has been declared by the state government as Protected	Forest Clearance for diversion of forest area will be obtained prior to cutting of roadside trees. Compensatory afforestation will be carried out as

S. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
		Forest, therefore felling of roadside tree will attract the provision of Forest (Conservation) Act.	per stipulation under forest clearance.
	Diversion of Reserved Forest area	About 0.098 Ha of Reserved forest area will require to be diverted due to proposed approach to the new proposed bridge at Km 12.900 across Kathina River.	• Diversion of forest land from reserved forest pocket will attract the provision of Forest (Conservation) Act and hence forest clearance would be required for acquisition of reserve forest land. • All the conditions stipulated in the forest clearance will be complied with during construction. • No construction Plants, construction camp or borrow area will be located in the project stretch long the Reserved Forest. A minimum distance of 1.000 Km from the reserved forest patch will be maintained for siting these features. • The contractor will take all precautionary measures in the forest stretch to avoid any incidence of forest fire.
4.	Water body	7 nos. ponds have been saved by providing toe wall	Toe wall protections have been provided to avoid impact on these water bodies.
5.	Religious/Cultural Features	A total number of 4 Religious/Cultural Features, which are located very close to the road edge, are likely to be affected due to proposed widening.	Adjustment in alignment to avoid impact on structure of these temples The safe entry to these structures needs to be provided to avoid accidents and interruption in traffic movement.
6.	Flooding	Damage to the road due to overtopping	It is proposed to raise the vertical profile of the road in the overtopping sections at one location. Additional 11 numbers of balancing culverts have been proposed in such sections to allow passage of water during any flood. These will have positive impacts on drainage in this section.
7.	Traffic Safety	Accident Hazards	Geometric corrections, scientifically designed bus stand, traffic signals, zebra crossings, junction improvements, bus bays and truck laybyes, traffic lightings and caution, regulatory and informative signboards have been provided in the project as per IRC codes.

- **Impact during Construction and Operation Phase**

  During construction period the major environmental issues will be related to dust generation, emission of gaseous emissions, borrow area and quarry operations, pollution due to operation of plants and equipments, contamination of land and soil, contamination of water bodies and

public as well as workers health and safety. These anticipated impacts will be mainly temporary and localised in nature and are likely to persist for short duration till the construction activities are over in a particular area. However there are some long term adverse impacts due to construction. The likely impacts due to construction activities and operation of the project are explained along with the mitigation measures and institutional responsibility of implementation of environmental safeguards measures in **Table 0.3**.

Table 0-3: Matrix of Potential Environmental Impacts and Mitigation Measures during Construction and Operation Stage

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Loss of Top Soil	Excavation will be done only to the pegged area for constructing the road.	Throughout the stretch	Contractor	PMC/ PIU-UPPWD
	Agricultural areas will be avoided for borrowing of materials, unless requested by the land owner.	Borrow areas	Contractor	PMC/ PIU-UPPWD
	The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles of height not exceeding 2m.	Borrow sites, Quarry , Plant site and construction zone	Contractor	PMC/ PIU-UPPWD
	The stored topsoil will be spread back to maintain the soil physico-chemical and biological Characteristics.	Borrow areas, Quarry, Plant site and construction zone	Contractor	PMC/ PIU-UPPWD
Compaction of Soil	Construction vehicles, machinery and equipment will move, or be stationed in the designated area, to avoid compaction of soil.	Construction site and all ancillary sites	Contractor	PMC/ PIU-UPPWD
	If operating from temporarily hired land, it will be ensured that the topsoil for agriculture remains preserved & not destroyed by storage, material handling or any other construction related activities.			

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Borrowing of Earth	• Finalizing borrow areas for borrowing earth and all logistic arrangements are well as compliance to environmental requirements, as applicable, will be the sole responsibility of the Contractor. • The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between the land owner and the Contractor and a copy is submitted to the PMC/PIU-UPPWD. • All the borrow areas will be approved by the Engineer based on both material and environmental considerations. • The Contractor will obtain environmental clearance for the borrow area as per MoEFCC circular and the conditions stipulated under the environmental clearance will be binding on the contractor. The Contractor will submit the copy of clearance letter to the Engineer and PIU before commencement of material extraction. • All the borrow area will be operated in accordance with IRC specification and MoEFCC guidelines. • No earth will be borrowed from within the RoW. • Non-productive, barren lands, raised lands, river beds, waste lands are recommended for borrowing earth. • The unpaved surfaces used for the haulage of borrow materials will be maintained properly • To avoid any embankment slippages, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer. • Each borrow area will be rehabilitated within one month after completion of extraction of materials to the satisfactions of the land owner and the Engineer.	Borrow Areas	Contractor	PMC/ PIU-UPPWD
Stone Quarry	• The quarry material will be obtained from licensed sites only, which operate with proper environmental clearances, including clearances under the Air Act. • If the Contractor wants to open a new Quarry, then he has to obtain necessary environmental clearance from MoEFCC and lease license from Directorate of Geology and Mines. • All the quarries will be approved by the Engineer based on both	Quarry sites	Contractor	PMC/ PIU-UPPWD

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	material and environmental considerations. • The quarry operations will be undertaken within the rules and regulations in force. All safety and environmental concerns will be addresses adequately during quarry operations and transportation of materials as per prevailing rules. • Only controlled blasting shall be carried out, if necessary for extraction of stone materials in strict compliance with the statutory norms and specification • The restoration of Quarry will be done as per the conditions of the owner before handing over the site back to the owner.			
Soil Contamination from Fuel and lubricants	Impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform will be appropriately provided at construction camp, servicing area and liquid fuel and lubes at storage areas.	Construction Camp, Vehicle and Equipment Servicing Centre and Construction site	Contractor	PMC/ PIU-UPPWD
Soil Contamination from Construction waste and spoils	All spoils will be disposed off as desired and the site will be fully cleaned before handing over.	Construction site throughout the project stretch	Contractor	PMC/ PIU-UPPWD
	The non-usable bitumen spoils will be disposed off in a deep trench providing clay lining at the bottom and filled with soil at the top (for at least 0.5 m)			
Community water Source	Any community water source as wells, tube-wells, etc., lost incidentally will be replaced immediately	Throughout the project stretch	Contractor	PMC/ PIU-UPPWD
Drainage and run off	Earth, stones, wastes and spoils would be properly disposed off, to avoid blockage of any drainage channel.	Throughout the project stretch	Contractor	PMC/ PIU-UPPWD
	All necessary precautions will be taken to construct temporary or permanent devices to prevent inundation or ponding.			
Contamination of water from construction and allied activities	All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity.	Throughout the project stretch and allied sites including Construction camp and labour camp	Contractor	PMC/ PIU-UPPWD
	All wastes arising from the project will be disposed off, as per SPCB norms, so as not to block the flow of water.			
	Wastes must be collected, stored and taken to approved disposal site.			
Sanitation and waste disposal in construction camps	Garbage collection and disposal as well as sanitation facilities will be provided at camps	Construction Camp	Contractor	PMC/ PIU-UPPWD
	The construction camps will be located away from water sources.			
	Efforts will be made to provide good sanitary and sewage disposal			

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	facilities at camp to avoid epidemics			
	The workplace will have proper medical approval by local medical, health or municipal authorities.			
Use of water for construction	The Contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.	Campsites and Plant sites	Contractor	PMC/ PIU-UPPWD
	If a new tube-well is to be bored, prior sanction and approval by the Ground Water Department will be obtained			
	Wastage of water during construction will be minimized.			
Emissions from Vehicles and Equipments	All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the statutory norms.	Plant sites	Contractor	PMC/ PIU-UPPWD PMC; UP State Pollution Control Board,
	The asphalt plants, crushers and the batching plants will be sited at least 1.0 km in the downwind direction from the nearest human settlement and forest area			
Dust Generation	The hot-mix plants, crushers and batching plants will be sited at least 1.0 km downwind from the nearest habitation. The hot mix plant will be fitted with dust suppression system.	Plant sites and Construction site	Contractor	PMC/ PIU-UPPWD UP State Pollution Control Board,
	Water will be sprayed in the lime/cement and earth mixing sites, asphalt mixing site and temporary service and access roads.			
	After compacting, water will be sprayed on the earthwork regularly to prevent dust.			
	Material transportation will be carried out in covered vehicles			
	Vehicles and machinery will be regularly checked to conform to the CPCB Standards			
	Mixing equipment will be well sealed and equipped with dust control removal devices			
	Fly ash will be handled and transported as per IRC specifications to avoid dust generation due to fly ash			
	Workers at mixing sites will wear nasal masks to reduce the chances of exposure to fine dusts (PM_{10} & $PM_{2.5}$)			
	Regular monitoring of PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO and /HC will be carried out as mentioned in the Environmental Monitoring Plan			

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Noise Pollution from Construction vehicles and Machinery	The plants and equipment used for construction will strictly conform to CPCB noise standards.	Plant sites and Construction site	Contractor	PMC/ PIU-UPPWD UP State Pollution Control Board,
	Vehicles and equipments used will be fitted with silencer and maintained accordingly.			
	Noise standards of industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts.			
	Noise to be monitored (for 24 hrs.) as per monitoring plan			
Noise Pollution from Blasting Operation	Blasting as per Indian Explosives Act will be adopted.	Quarry site	Contractor	PMC; PIU-UPPWD, UP State Pollution Control Board,
	People living near such blasting sites will have prior information of operational hours.			
	Workers at blasting sites will be provided with earplugs			
Loss or Damage to Vegetation	Apart from trees earmarked for felling, no additional tree clearing within the RoW will be carried out.	Throughout the stretch	Contractor	PMC; PIU-UPPWD and Forest Dept.
	Area of tree plantation cleared will be replaced according to compensatory Afforestation Policy under Forest Conservation Act-1980.			
Compaction of Vegetation	Construction vehicles, machinery and equipment will move or be stationed in the designated area only to prevent compaction of vegetation outside the RoW	Throughout the stretch	Contractor	PMC/ PIU-UPPWD
	While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil and damage to naturally occurring herbs and grasses is avoided.	Throughout the stretch		
Occupational Health & Safety	The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms of safety during construction.	At Work sites, camp sites and other allied sites	Contractor	PMC/ PIU-UPPWD
	Adequate drainage, sanitation and waste disposal will be provided at workplaces.			
	Proper drainage will be maintained around sites to avoid water logging leading to various diseases.			
	Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc.			
	A health care system will be maintained at construction camp for routine checkup of workers and avoidance of spread of any			

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	communicable disease			
	Safety of workers undertaking various operations during construction will be ensured by providing appropriate Personnel Protective Equipments (PPEs) such as helmets, masks, safety goggles, safety belts, ear plugs etc			
	The electrical equipment will be checked regularly			
	At every work place, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), nursing staff and an attending doctor will be provided.			
	The Contractor will organize awareness program on HIV aids and sexually transmitted diseases (STDs) for workers on periodic basis.			
Public Safety	The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms of safety during construction.	At all work zones, borrow areas and other allied sites	Contractor	PMC/ PIU-UPPWD
	To ensure safe construction in the temporary accesses during construction, lighting devices and safety signal devices will be installed.			
	Traffic rules and regulations will be strictly adhered to.			
	Road safety education will be imparted to drivers running construction vehicles.			
	Adequate signage, barriers and persons with flags during construction to control the traffic will be provided.			
	Proper barricading will be provided at all the work sites, borrow areas near habitation areas and camp sites will be			
	At all time safe access for public movement near habitation area will be ensures			
Clean-up Operations, Restoration and Rehabilitation	• Contractor will prepare site restoration plans, which will be approved by the Engineer. • The cleanup and restoration operations are to be implemented by the Contractor prior to demobilization. • The contractor will clear all the debris material at site, temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by the Engineer (PMC).	Construction zones, Camp and other allied sites After Completion of Construction and before demobilization of Construction Team	Contractor	PMC/ PIU-UPPWD

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	• All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by the PMC in a layer of thickness of 75 mm-150 mm. • All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant • sites, crushers, batching plant sites and any other area used/affected by the project will be • Left clean and tidy, at the contractor's expense, to the entire satisfaction of the Engineer (PMC).			
Operation Phase				
Monitoring of Operation Performance	• The PIU-UPPWD will monitor the operational performance of the various mitigation/enhancement measures carried out as a part of the project. • The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated utilities, hand pumps and other relocated structures if any; status of rehabilitation of borrow areas etc.	Throughout the project stretch		
Maintenance of Drainage	• PIU-UPPWD will ensure that all drains (side drains, cross drains etc.) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding. • PIU-UPPWD will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.	Throughout the project Stretch	Contractor till Defect liability period, then PIU-UPPWD	PIU, UPPWD
Pollution Monitoring	• The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in environmental monitoring plan will be the responsibility of Contractor. • PIU-UPPWD will appoint MOEFCC/NABL/UPPCB approved pollution monitoring agency/Laboratory for this purpose.	Especially major settlement areas	PIU, UPPWD	PIU, UPPWD

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Contamination of Surface Water due to Traffic Movement & Accidents	Contingency Plans will be developed for cleanup of oil spills, fuel and toxic chemicals	Throughout the project stretch	PIU, UPPWD	PIU, UPPWD
Noise Pollution	• Noise pollution will be monitored as per monitoring plan at different zones. • Noise attenuating Tree Species to be planted along the road • Noise control programs are to be enforced strictly. Monitoring the effectiveness of the pollution attenuation barriers, if there is any, will be taken up.	Specially inhabitant location	Contractor / PIU, UPPWD through approved laboratory	PIU, UPPWD

0.5 Analysis of Alternatives

An analysis of "With" and "Without" Project scenario reveals that the positive impacts outnumbered the negative impacts due to the proposed development. The negative impacts are envisaged only during the construction period which will be temporary in nature and of short duration. Further mitigation measures will be adopted to limit the impacts during the construction phase. The proposed expansion will add in infrastructure development and will act as a catalyst to boost the economic progress. It was revealed during discussions with various stakeholders that safety is a major concern along the existing highway section. The safety aspect will be enhanced considerably with the provision of pedestrian crossings, additional designed bus stands, bus bays and truck lay byes, which are the significant part of the project.

0.6 Environmental Management Plan

Environmental Management Plan (EMP) is the key to ensure effective implementation of environmental safeguard measures during different stage of the project. The project specific EMP has been formulated for mitigating and offsetting the anticipated adverse impacts arising out of the project activities. The EMP also includes provision of environmental enhancement of the proposed project road. The Environmental Management Plan includes implementation Framework, supervision, monitoring and reporting requirements. Based on identified potential environmental impacts due to the projects, an Environmental Management Action plan has been develop for implementing the mitigation measures at different locations as well as different stages of the project. The institutional responsibility and timeframe have also been established in the EMP.

Institutional Arrangement for Implementation of EMP

During Preconstruction stage the responsibility of the implementation of mitigation measures is mainly with Project Implementation Unit of UPPWD. During Construction the primary responsibility of implementing environmental safeguards measures is with Contractor. The PMC's role is supervisory role and they have to ensure the compliance with the provision of environmental safeguards by the Contractor. The UPPWD will be overall responsible for EMP implementation.

The UPPWD has established at Environmental and Social Development Cell at both PMU and PIU level to deal with environmental issues of the project. The PMU has appointed Project Management Consultant to assist with project preparation and support implementation as Engineer in-charge who will supervise the Contractors activities, compliances and monitor the overall progress of work. There is provision of Environmental Specialist in PMC. The Contractor team will also include Environment and Safety Officer. The Roles and responsibility of implementation and Supervision Agencies at different levels have been defined in table below.

Table 0-4: Roles and Responsibilities of Environmental Personnel at Different Levels

	Roles & Responsibilities
PMU's Environmental and Social Nodal Officer (ESD Cell)	• Finalize the EIA and EMP for individual sub-project with inputs from PMC • Confirm integration of EMP provision related to works in the contract documents • Provide guidance on environmental issues to PIUs Environmental and

	Roles & Responsibilities
	Social officers as requested. • Coordinate with regulatory agencies like Forest Departments, and at request of PMC and/or Contractor, UPPCB • Prepare regular reports on progress on EMP implementation across the project with inputs from the PMC's environmental specialist • Document experiences of developing and implementing environmental mitigation measures an convert it into training material for internal and external capacity building • Facilitate interaction between environmental teams of different sub-projects to allow cross-fertilization of ideas, successes and learnings
Environmental and Social Nodal Officer at PIU (Division Office)	• Coordinate with PMC's environmental specialist to monitor and report on progress on EMP implementation as part of works contracts • Participate in and facilitate consultations with stakeholders • Participate in project meetings and report on the issues related to environmental management to provide for any mid-course corrections that may be required based on situation on the ground • Coordinate on the training and capacity building initiatives
Environmental Specialist, PMC	• Lead the development of the sub-project specific EIA and EMP for the entire project • Review contract documents to ensure that EMP provisions related to works are included in the contract documents • Assist the Environmental Specialist in the PMU to follow-up with state government departments • Oversee and report to the PMU on implementation of EMP provisions included in the works contract for each sub-project • Act as a resource person in trainings based on experience on implementing this project and previous relevant work
Contractors' Environmental and Safety Officer	• Lead the implementation of EMP measures included in the Contract • Report on progress and shortcomings of the measures implemented to Environmental Specialist of PMC

Environmental Monitoring Plan

Monitoring of environmental quality during construction and operation stages reflects the success of implementation of the mitigation measures. Also it provides a chance to review the suggested measure and improve upon the measures. To ensure the effective implementation of the Environmental Management Plan (EMP), it is essential that an effective monitoring plan be designed and carried out. The environmental monitoring plan covering various performance indicators including periodic monitoring of environmental quality in terms of Air, water, noise and soil quality, frequency and institutional arrangements for the project in the construction and operation stages has been formulated for the project. Environmental Monitoring of performance indicators will be conducted by the project authority. The monitoring plan has been suggested with performance indicators to be monitored, locations, frequency and timeframe of monitoring. Periodical monitoring of air, water, noise quality and survival rate of plantations also has been suggested.

Environmental Enhancement

Enhancement measures for community properties located adjacent to the road has been proposed in consultation with the local population. The locations identified for enhancements are at Bagchan Village at Km 9+300, Mohammadi Village at Km 28+000 and at Piperiya Sadak Village at Km 52+000.

Grievance Redressal Mechanism (GRM)

An integrated system will be established with Grievance Redressal Cells (GRCs), with necessary officers, officials and systems, at the state as well as sub project levels. Grievances if any, may be submitted through various mediums, including in person, in written form to a noted address, through a toll free phone line or through direct calls to concerned officials, and online. PWD will appoint a person to receive such calls and online messages. A timeframe will be decided for disposal of redressal. A record will be maintained for action taken to resolve the issues.

Environmental Budgeting

A budgetary provision of Rs. 8.73 Crores has been proposed for implementation of EMP in the project, which includes various mitigation costs during preconstruction, construction and operation stages, environmental enhancement measures, as well as environmental monitoring cost.

0.7 Conclusions

The proposed expansion will add in infrastructure development and will act as a catalyst to boost the economic progress of the state. It was revealed during discussions with various stakeholders that after the widening the existing road will ensure smooth flow of traffic thereby will increase the public safety and comfort. Benefits of the project will be the reduction in air pollution due to better service levels of the road, reduction in travel time and accidents and better connectivity. This will definitely encourage the economic along the project stretch, thereby improvement of socio-economic condition of the area along the project corridor.

With best management practices and a proper environmental management & monitoring plan in place during construction and operation stages, the proposed project is not expected to cause any significant adverse effects on the surrounding environment.

1 INTRODUCTION

1.1 Purpose of the Report

Road projects are meant for improving the quality of life for people and developing the country's economy. For all positive impacts of the road projects, there may be also some significant detrimental impacts on nearby communities and natural environment. There may be impact on properties of people, their livelihood and other social components. Similarly, there can be direct or indirect impact on flora, fauna, water resources, land use etc. The environment has a limited carrying capacity and it can only sustain a negative impact up to a level without further degradation. Several systems, however, temporarily disturb it leading to a new balance in order to re-establish the equilibrium between human activity and nature. But sensitive systems are not so resilient to cope up with changes in physical and natural Environment, thus not only leading to negative impact on them but also, socio-economic losses may occur. To account for all these issues, environmental and social impact assessment is utmost necessary. These concerns for environmental and social issues in road projects have also become a part of legal requirements and for obtaining financial support. Environmental considerations are therefore of prime importance in road projects.

The EIA study has been conducted for the Gola-Shahjahanpur section of State Highway no. 93 (SH-93) in the district of Lakhimpur Kheri and Shahjahanpur of Uttar Pradesh in accordance with ESMF prepared for UPCRNDP. The main objective of the study is to incorporate the environmental consideration in project planning and designing and formulating the Environmental Management Plan for implementing the environmental safeguards at different states of the project. The Environmental Management Plan will be part of the bidding document for construction.

1.2 Project Background

The Government of Uttar Pradesh has requested the World Bank through Government of India to provide assistance for improvement of the Core Road Network of the state.

The state has a road network of 299,604 km, out of which 174,451 km are under Uttar Pradesh Public Works Department (PWD). The roads under PWD comprise 7,550 km of National Highways (NHs), 7,530 km of State Highways (SHs), 5,761 km of Major District Roads (MDRs), 3,254 km of Other District Roads (ODRs) and 138,702 km of Village Roads (VRs). Only about 60% of SHs are two-lane (7 m). In the entire state 62% of MDRs and 83% of ODRs have widths less than 7 m.

With a view to improve the transport network system, UPPWD has identified 24,095 km of Core Road Network for the development. This network comprise NH, SH, MDR, ODR and the details are presented in the table below.

Road Category	Length (km)
National Highway (NH)	7.550
State Highway (SH)	7,530
Major District Road (MDR)	5.761
Other District Road (ODR)	3,254
Total	**24,095**

The Government of Uttar Pradesh has a long-term program to improve the Core Road Network (CRN) and, as part of this program, has applied for a financial assistance from the World Bank for developing the Uttar Pradesh Core road Network Development Project (UPCRNDP). The Public Works Department (PWD) on behalf of Government of Uttar Pradesh engaged Egis India Consulting Engineers Pvt. Ltd. to carry out Consultancy Services for Uttar Pradesh Core Road Network Development Plan.

The UPCRNDP will have three Components:

i) Upgrading/reconstruction/widening as well as rehabilitation of selected roads from the Core Road Network (CRN) including construction of a new Sharda Bridge at Pachpheri Ghat in Lakhimpur district.

ii) Road Safety Component: A comprehensive and coordinated package of road safety sub-components to be delivered by the Transport, Home, Public Works and Health Departments

iii) Road Sector and Institutional Reform Component: This component is likely to include a program to strengthen PWD asset management of SHs, MDRs and ODRs, to support the application of IT systems for human resource management and works budgeting and management across the PWD organization

The improvement works shall primarily consist of raising the formation level, widening to a full two lanes from the existing single and intermediate lane widths, and/or pavement rehabilitation/strengthening. Road sections with high volumes of non-motorised traffic will be widened to 10m with 1.5m full paved shoulders. Roads in urban areas may also require further widening for provision for drains, sidewalks, accommodate local traffic and parking where required.

1.3 The Project Road

The proposed project is up-gradation and maintenance of Gola-Shahajahanpur section of SH-93. from Km 1+280 to Km 58+580, covering a design length of 58.100 km. The road section falls in two districts namely Lakhimpur Kheri (Km 1+280 to Km 49+000) and Shahjahanpur (Km 49+000 to Km 58+580) in the state of Uttar Pradesh. The project stretch passes through major settlement areas namely Gola, Mamri, Maheshpur, Mohammadi, Mohamadpur, and Shahjahanpur. **Figure 1.1** illustrates the location of the project road.

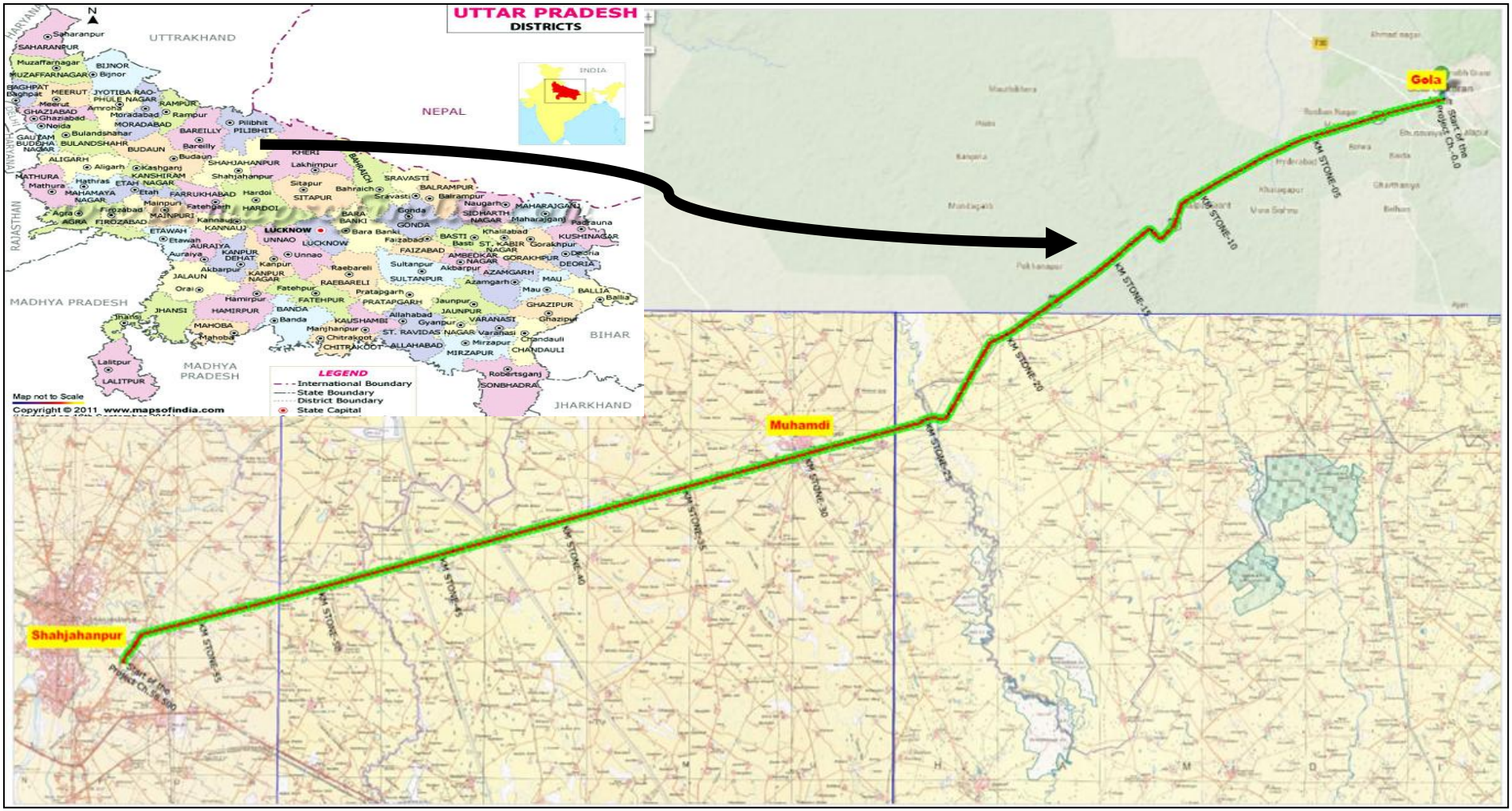


Figure 1.1: Location Map

1.4 Environmental Impact Assessment Study of Project Road

The environmental assessment preparation led to identification of potential environmental hazards and their feasible remedial measures, based on which the environmental mitigation measures have been prepared.

1.5 Objectives of the Study

The major objective of this study is to establish present environmental condition along the project corridor through available data / information supported by field studies to evaluate the impacts on relevant environmental attributes due to the construction & operation of the proposed project; to recommend adequate mitigation measures to minimize / reduce adverse impacts and to prepare an Environmental Management Plan (EMP) for timely implementation of the mitigation measures to make the project environmentally sound and sustainable. An Environmental Impact Assessment (EIA) study basically includes:

- Establishment of the present environmental scenario;
- Study of the specific activities related to the project;
- Evaluation of the probable environmental impacts;
- Recommendations of necessary environmental control measures; and
- Preparation of Environmental Management Plan.

1.6 Scope of the Study

Environmental assessment is a detailed process, which starts from the conception of the project and continues till the operation phase. The steps for environmental assessment are therefore different at different phases. The present report details the environmental setting of the project zone, collects the baseline data and then identifies the anticipated environmental impact and finally suggests appropriate mitigation measures and mechanism for ensuring effective implementation of the environmental safeguard measures at different stages of the project.

1.7 Structure of the Environmental Assessment Report

Chapter 1 Introduction

Chapter 2 Project Description

Chapter 3 Methodology

Chapter 4 Environmental Regulatory Framework

Chapter 5 Current Environmental Conditions

Chapter 6 Environmental Impacts and Mitigation Measures

Chapter 7 Analysis of Alternatives

Chapter 8 Public Consultation

Chapter 9 Environmental Management Plan

2 PROJECT DESCRIPTION

2.1 Introduction

The Government of Uttar Pradesh has requested the World Bank through Government of India (GoI) to provide assistance for improvement of the Core Road Network (CRN) of the state.

The Government of Uttar Pradesh has a long-term program to improve the Core Road Network (CRN) and, as part of this program, has applied for a financial assistance from the World Bank for developing the Uttar Pradesh Core road Network Development Project (UPCRNDP). The Public Works Department (PWD) on behalf of Government of Uttar Pradesh engaged Egis India Consulting Engineers Pvt. Ltd. to carry out Consultancy Services for Uttar Pradesh Core Road Network Development Plan.

The improvement works shall primarily consist of raising the formation level, widening to a full two lanes with paved shoulder from the existing single and intermediate lane widths and/or pavement rehabilitation/ strengthening. Roads in urban areas may also require further widening for provision for drains, sidewalks, accommodate local traffic and parking where required.

2.2 Need for the Project

Road projects are generally undertaken to improve the economic and social welfare of those using the road or served by it. Increased road capacity and improved pavements can reduce travel times and lower the costs of vehicle use. Benefits include increased access to markets, jobs, education and health services, and reduced transport costs for both freight and passengers, reduce fuel consumption and exhaust emissions from the vehicle plying on the road. It became imperative to improve the connectivity by widening the road section for overall socio-economic growth in the area.

2.3 Project Objective

The key objective of PWD is to improve "Core Road Network" and the consultant's services should deliver and manage the identified road through scientific tools for planning, programming and budgeting; enhancing safety and capacity of existing roads.

On completion and/ or during progress of the proposed services, the UPCRNDP will able to:

- upgrade/ reconstruct/ widen as well rehabilitate selected roads:
- carry out road safety enhancement work;
- do planning, budgeting and programme to strengthen PWD project, asset and financial management;
- use Information Technology and integrated IT systems efficiently and effectively;
- have trained staff for new processes and procedures; and
- improve public and external stakeholder support and awareness.

2.4 Project Approach for Environmental Studies

The basic approach adopted for conducting the environmental study for the project is to strongly pursue the prevailing institutional and legislative setup of the Government of India (GoI) and World Bank Safeguard Policies on this subject. The main approaches for the study are:

- Identification, appraisal and division between positive and negative impacts, direct and indirect impacts, and instant and long-term impacts likely to result from project road;
- Identification of unavoidable or irreversible impacts;
- Identification of un-mitigated negative impacts;
- Exploration towards the opportunities for environmental enhancement; and
- Identification of feasible and cost effective mitigation measures to minimize negative impacts and enhance positive impacts by incorporating in the preliminary engineering design.
- Preparation of Environmental Management Plan for effective implementation of environmental mitigation measures at different stages of the project.

2.5 Project Location

The project road is part of of State Highway No. 93 (SH-93), which is located in the districts of Lakhimpur Kheri and Shahajahanpur. The project section of SH-93 starts from Gola Market at Km 1.280 and ends at Shahjahanpur at Km 58.580, covering a design length of 58.100 km. The key location of project road is indicated in **Figure 2.1**.

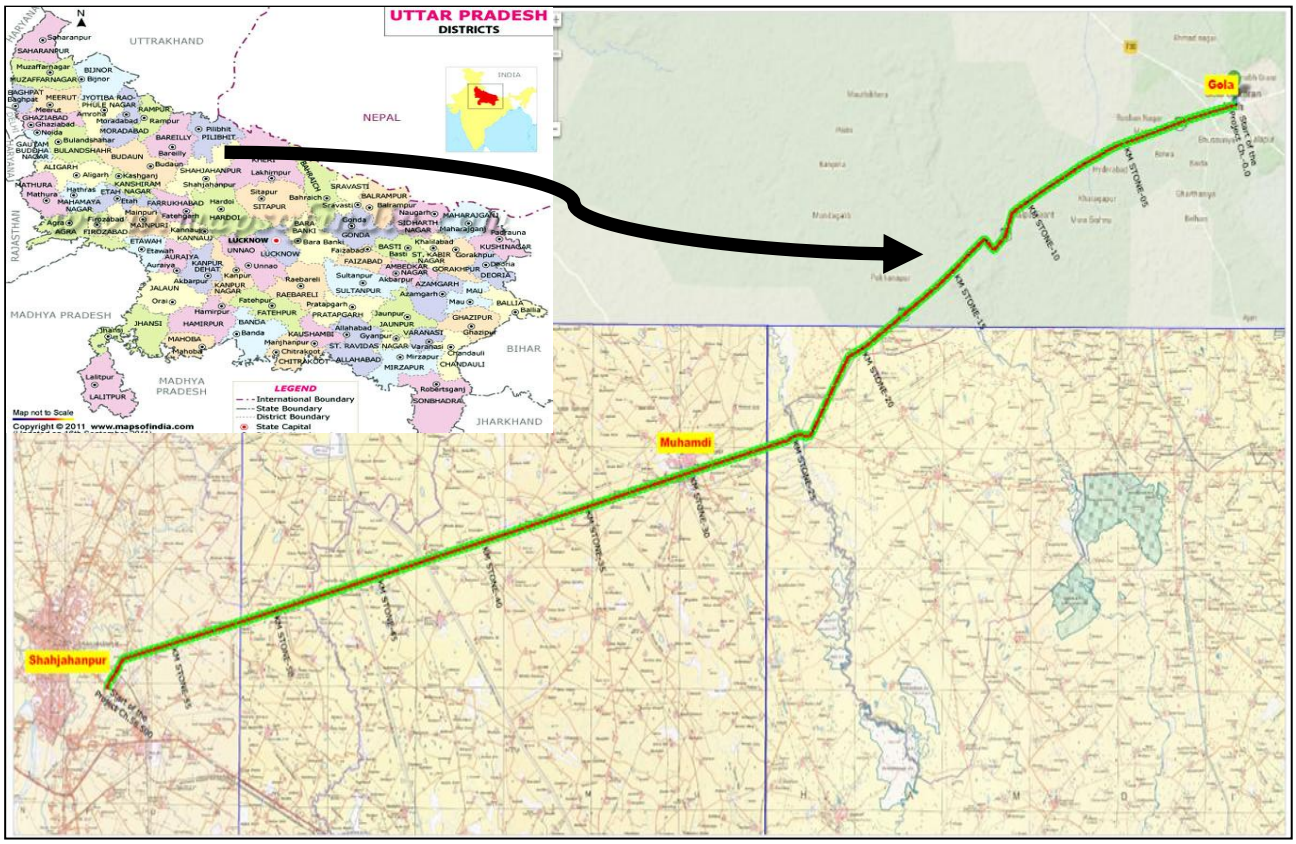


Figure 2.1: Project Location

2.6 Proposed Development

The proposed project is Up-gradation and maintenance of the existing Gola-Shahjahanpur section of SH-93 from Km 1+280 to Km 58+580 from existing two lanes to 7 m black top pavement and 1.5 m full paved shoulders on each side to facilitate motorized and non-motorized users. Apart from it there will be provision for drains, sidewalks, bus shelters, truck laybyes, road safety provisions and other facilities at different locations.

The objective is to enhance operational efficiency of highway and safety of the traffic & the road users. The salient feature of the project is presented in **Table 2.1**.

Table 2-1: Salient Features of the Project

S. No.	Project Components	Details
A. General Information		
1.	Location of Project	Km 1.280 to Km 58.580
2.	Administrative locations	Lakhimpur Kheri and Shahjahanpur districts
3.	State	Uttar Pradesh
4.	Length of the project section	58.100 Km
5.	Terrain	Plain
6.	Major Settlement along the Project Stretch	The major settlement areas along the project road are Gola, Mamri, Maheshpur, Mohammadi, Mohamadpur, and Shahjahanpur
7.	Rivers	Kathina river located at Km 12.000 and Gomti river at Km 24.900. Apart from the river, five number of canals/stream cross the project stretch
8.	Ponds/Lakes/Wetland	12 nos. of ponds located in project vicinity.
9.	Forest area	Road side plantation declared as Protected Forest (PF) along the project section
10.	Wildlife Sanctuary/ National Park/ Notified Ecosensitive zone within 10 Km from project alignment	Nil

2.7 Project Proposal

2.7.1 Right of Way (ROW)

The ROW details are being furnished as per revenue records/maps for further processing. The ROW of project road varying from 24 m-36 m.

2.7.2 Traffic Volume

A detailed traffic surveys and analysis for the project roads have been conducted in the year 2014, hereinafter called, "Base Year". Detailed traffic projections over the design life and growth rates obtained for different types of vehicles are discussed in traffic chapter. For the purpose of pavement design, commercial vehicles of gross vehicle weight more than 3 ton have been considered. Such vehicles consisted of buses, LCVs, 2 axle trucks, 3 axle trucks and multi axle trucks.

From total projected base year AADT and estimated traffic growth rates, vehicle category-wise traffic volume projections have been made for various design periods. **Table 2.2** gives the total projected base year (2014) traffic volumes in terms of AADT for each of the identified traffic homogeneous section and has been used for the estimation of design traffic in terms of MSA for pavement design.

Table 2-2: Base Year Traffic Volumes

Vehicle Type		Near Mamri at Km 5+900 (Gola-Gomtimore)	Near Mohmmadpur at Km 47+000 (Gomti More to Shahjahanpur)
Two Wheeler		4513	3035
Three Wheeler		302	384
Car/Van/Jeep		696	737
Mini Bus		83	87
Standard Bus		83	90
LCV		39	138
2 Axle Truck		51	100
3 Axle Truck		57	261
MAV		15	68
Agricultural Tractor		8	11
Agricultural Tractor & Trailor		53	45
Non Motorised Vehicles	Cycle	5578	1374
	Cycle Rickshaw	16	7
	Animal Drawn Vehicles	72	68
	Hand Cart	2	3
	Others	0	0
Vehicles	Motorised	5900	4956
	Non Motorised	5668	1452
	Total	**11568**	**6408**
PCU	Motorised	4329	4854
	Non Motorised	3115	982
Total		**1883**	**5836**

2.7.3 Structures

As per inventory survey, the project road has 13 bridges out of which 12 are minor bridges and 1 major bridge. There are 73 culverts. Based on condition survey, hydraulic studies, size of pipe culverts, revised profile of the road; it is revealed that a few additional cross-drainage structures (culverts) shall need to be constructed. The summary of existing and improvement proposals is as follows:

Table 2-3: Summary of Improvement of Culverts

Particulars		Type of Culverts					
		Pipe Culverts	Arch Culverts	Slab	Box	Stone Slab	Total
Existing culverts		8	42	23	-	-	73
Improvement proposals							
To be retained with repairs		-	3	7	-	-	10
To be retained with widening		1	22	13	-	-	36
To be Replaced	Box culverts	-	10	3	-	-	13
	HP culverts	6*	7	-	-	-	13
Additional Construction		4	-	-	7	-	11
Total		**11**	**42**	**23**	**7**	**0**	**83**

**Pipe culvert at km 58+907 not considered*

Improvement proposals category-wise for culverts, minor bridges and major bridges are detailed hereunder.

Table 2-4: Summary of Improvement of Bridges

Particular	Minor Bridge	Major Bridge	Total
Existing Structures	12	1	13
To be retained with repairs	5	-	5
To be retained with widening	3	-	3
To be Replaced	4	1	5
New additional construction	-	-	-
Total	**12**	**1**	**13**

2.7.4 Bus Bays and Bus Shelters

Bus stops with bus shelters would be provided at locations of settlements. Bus lay byes will be provided on both side (LHS & RHS). The detail locations are provided in **Table 2.5**.

Table 2-5: List of Proposed Bus bays

S. No.	Design Chainage (Km)		Remarks
	Start	End	
1	1+575	1+603	Gola Bypass Road
2	6+250	6+060	Mamri Village
3	9+430	9+530	Baga Chana Village
4	11+000	11+120	Maheshpur Village
5	16+860	16+720	Reharia Village
6	19+010	19+110	Pipraiya Dhani Village
7	26+970	26+800	Doon Public School 27.100 /Politechnical College 27.450
8	29+760	29+870	Mohammadi Village
9	31+700	31+540	Dhrampur Village
10	41+270	41+010	BHS Village Road
11	44+260	44+100	Machhechha (Sangasthan Inter College)
12	47+700	47+810	Mohamadpur Village
13	57+970	58+070	Hathora Bajra Village

2.7.5 Truck Lay-byes

The list of proposed truck lay-byes is given **Table 2.6.**

Table 2-6: List of Proposed Truck Lay-byes

S. No.	Design Chainage (Km)	Remarks
1	24+200	RHS
2	26+250	LHS

2.7.6 Road Safety Measures

The following safety aspects have been incorporated in project design:

1Table 2-7: Road Safety Measures

<table>
<tr><th>S. No.</th><th>Design Aspect</th><th>Proposed Locations along the project road</th></tr>
<tr><td>1.</td><td>The toe wall of varying height</td><td>
<table>
<tr><th colspan="2">Chainage (Km)</th><th rowspan="2">Length (m)</th><th rowspan="2">Side</th><th rowspan="2">Height</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>24+920</td><td>25+110</td><td>190</td><td>LHS</td><td>3.0</td></tr>
<tr><td>25+130</td><td>25+300</td><td>170</td><td>RHS</td><td>2.0</td></tr>
<tr><td>33+675</td><td>33+750</td><td>75</td><td>RHS</td><td>1.0</td></tr>
<tr><td>35+530</td><td>35+850</td><td>320</td><td>RHS</td><td>1.5</td></tr>
<tr><td>36+430</td><td>36+690</td><td>260</td><td>RHS</td><td>1.0</td></tr>
<tr><td>49+185</td><td>49+385</td><td>200</td><td>LHS</td><td>1.0</td></tr>
<tr><td>49+430</td><td>49+445</td><td>15</td><td>LHS</td><td>1.5</td></tr>
<tr><td>24+920</td><td>25+110</td><td>190</td><td>LHS</td><td>3.0</td></tr>
<tr><td>25+130</td><td>25+300</td><td>170</td><td>RHS</td><td>2.0</td></tr>
<tr><td>33+675</td><td>33+750</td><td>75</td><td>RHS</td><td>1.0</td></tr>
<tr><td colspan="2">Total</td><td>1.665</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>Crash Barriers (W beam metal crash barrier) provided at curves and at the locations where the embankment is greater than 3 meter, narrow Bridge and at curves less than 300 m radius.</td><td>
Location of Provision of Crash Barriers
<table>
<tr><th colspan="3">Embankment Height>3m (Left)</th></tr>
<tr><th>From (Design CH)</th><th>To (Design CH)</th><th>Length (Km)</th></tr>
<tr><td>5+480</td><td>5+560</td><td>0.080</td></tr>
<tr><td>12+500</td><td>12+730</td><td>0.230</td></tr>
<tr><td>12+780</td><td>12+800</td><td>0.020</td></tr>
<tr><td>24+990</td><td>25+050</td><td>0.060</td></tr>
<tr><td>25+090</td><td>25+100</td><td>0.010</td></tr>
<tr><td>25+350</td><td>25+540</td><td>0.190</td></tr>
<tr><td>25+660</td><td>25+770</td><td>0.110</td></tr>
<tr><td>35+200</td><td>35+240</td><td>0.040</td></tr>
<tr><td>46+870</td><td>46+955</td><td>0.085</td></tr>
<tr><td>46+991</td><td>47+120</td><td>0.129</td></tr>
<tr><td colspan="2">Total</td><td>0.954</td></tr>
</table>
<table>
<tr><th colspan="3">Embankment Height>3m (Right)</th></tr>
<tr><th>From (Design CH)</th><th>To (Design CH)</th><th>Length (Km)</th></tr>
<tr><td>5+450</td><td>5+590</td><td>140</td></tr>
<tr><td>25+140</td><td>25+283</td><td>143</td></tr>
<tr><td>43+537</td><td>43+650</td><td>113</td></tr>
<tr><td>43+690</td><td>43+820</td><td>130</td></tr>
<tr><td>5+450</td><td>5+590</td><td>140</td></tr>
<tr><td>25+140</td><td>25+283</td><td>143</td></tr>
<tr><td>43+537</td><td>43+650</td><td>113</td></tr>
<tr><td>43+690</td><td>43+820</td><td>130</td></tr>
<tr><td colspan="2">Total</td><td>0.526</td></tr>
</table>
Curve < 300m Radius(outer Edge)
<table>
<tr><th colspan="2">Design CH.</th><th rowspan="2">Length (Km)</th><th rowspan="2">side</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>11+267</td><td>11+407</td><td>Built up</td><td>Right</td></tr>
<tr><td>12+167</td><td>12+374</td><td>0.208</td><td>left</td></tr>
<tr><td>12+937</td><td>13+104</td><td>0.167</td><td>left</td></tr>
<tr><td>13+454</td><td>13+728</td><td>0.274</td><td>Right</td></tr>
<tr><td>21+309</td><td>21+488</td><td>0.178</td><td>Right</td></tr>
<tr><td>25+283</td><td>25+472</td><td>0.189</td><td>Right</td></tr>
<tr><td>25+738</td><td>25+884</td><td>0.146</td><td>Right</td></tr>
<tr><td>25+885</td><td>26+037</td><td>0.153</td><td>left</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>S. No.</th><th>Design Aspect</th><th>Proposed Locations along the project road</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>43+467</td><td>43+537</td><td>0.070</td><td>left</td></tr>
<tr><td>43+548</td><td>43+618</td><td>Covered in embankment height</td><td>Right</td></tr>
<tr><td>58+108</td><td>58+160</td><td>0.052</td><td>Right</td></tr>
<tr><td colspan="2">Total</td><td>1.437</td><td></td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Roadway delineators</td><td>(a) Roadway indicators
Metal roadway indicators with circular cross-section are proposed. These are generally proposed in non-urban sections especially in curved sections of radius less than 360m.
(b) Road Reflector Pavement Markers (RRPM)
The road reflective pavement markers (RRPM) i.e. road studs are proposed to improve the visibility in night time and wet weather conditions.
Their use is restricted on locations like on approach to narrow bridge and culverts and adjacent to bridge parapet on traffic side, built-up areas and approaches to major intersections.
(c) Hazard Markers
Type 2 Stripped markers consisting of alternatively black and yellow stripes are proposed where the objects close to the road constitutes an accident hazard. The locations are all bridge and culvert (primarily narrow) abutments.</td></tr>
<tr><td>4</td><td>Rumble Strips / Table tops / Speed hump</td><td>These are proposed in advance of sharp curves, traffic calming zones, and village/urban approaches. These are also provided at some hazard locations or accident black spots like approach to temples/ schools etc. Proper sign boards and marking would be provided to advise the drivers in advance of these speed reducing devices.</td></tr>
<tr><td>5</td><td>Traffic Calming Measures proposed
• Gateway Signs
• Gateway Markings
• Speed Calming
• Night time Visibility</td><td>Traffic calming Measures have been proposed at following eleven locations:
<table>
<tr><th>Built-up Area</th><th>From CH. (Km)</th><th>To CH. (Km)</th></tr>
<tr><td>Gola</td><td>1+281</td><td>3+100</td></tr>
<tr><td>Mamri</td><td>5+800</td><td>6+500</td></tr>
<tr><td>Baga Chana</td><td>9+300</td><td>10+000</td></tr>
<tr><td>Maheshpur</td><td>10+500</td><td>11+700</td></tr>
<tr><td>Reharia</td><td>16+600</td><td>17+300</td></tr>
<tr><td>Pipraiya Dhani</td><td>18+500</td><td>20+700</td></tr>
<tr><td>Mohammadi</td><td>28+700</td><td>31+800</td></tr>
<tr><td>Dhrampur</td><td>31+900</td><td>32+770</td></tr>
<tr><td>Mohamadpur</td><td>46+780</td><td>48+200</td></tr>
<tr><td>Hathora Bajra</td><td>57+800</td><td>58+470</td></tr>
<tr><td>Hathora Bajra</td><td>59+035</td><td>59+377</td></tr>
</table>
</td></tr>
<tr><td>6</td><td>Road Signs: Cautionary, Mandatory and Informatory Signs</td><td>• Provided all along the project section</td></tr>
</table>

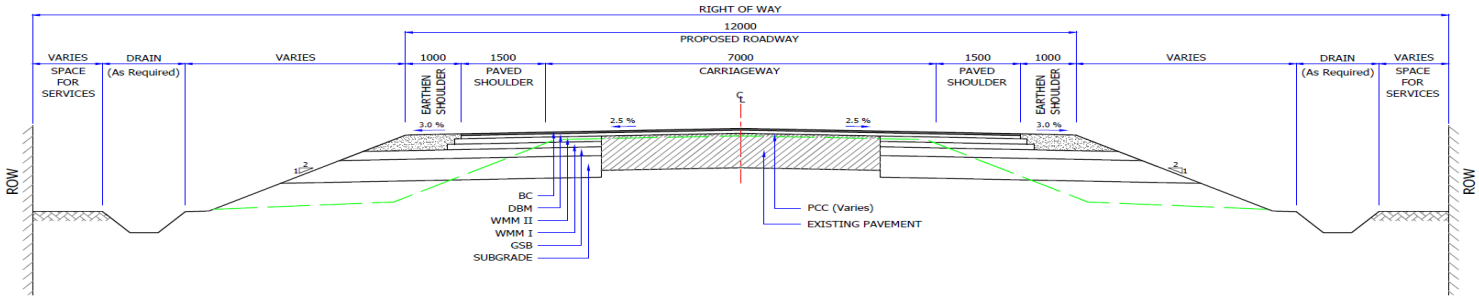
2.8 Material Requirements

The requirement of different materials for construction of roads including bridges and culverts is given below:

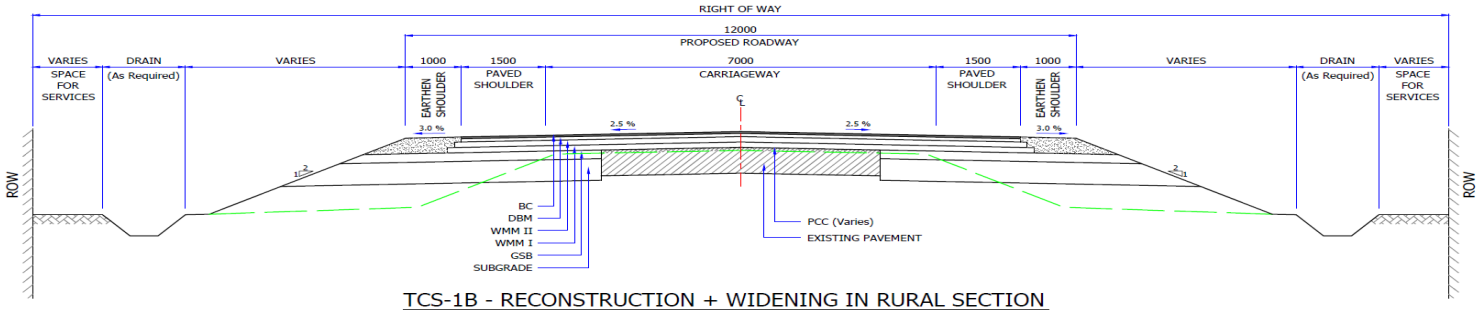
S.N.	Materials	Quantity
1	Aggregate	554500 cum
2	Earth	419000cum
3	Sand	16100cum
4	Bitumen	10100 MT
5	Fly ash	24180 Cum
6	Cement	12600 MT
7	Steel	1474.100 MT

2.9 Typical Cross Section

The typical cross-sections are shown in **Figure 2.2**.



TCS-1A - OVERLAY + WIDENING IN RURAL SECTION

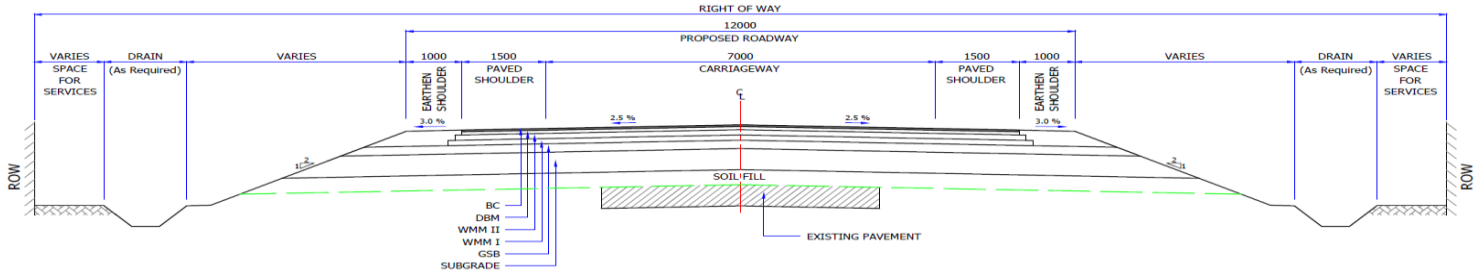


TCS-1B - RECONSTRUCTION + WIDENING IN RURAL SECTION

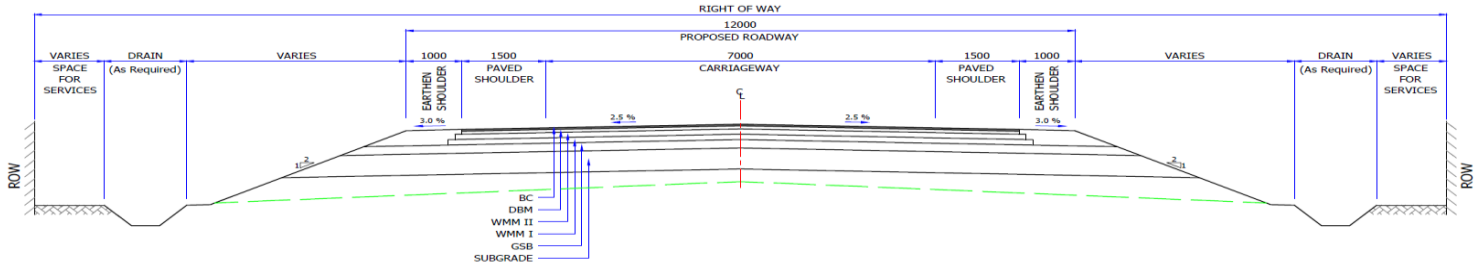
Notes: —
1. Not to Scale.
2. All dimensions are in mm unless otherwise mentioned.
3. Safety Barrier as per Standard Drawing.
4. Toe Wall as per Standard Drawing.

TCS 1 - 2 LANE WITH PAVED SHOULDERS (RURAL SECTION)

CLIENT:- Government of Uttar Pradesh, Public Works Department	CONSULTANT:- egisIndia consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Gola-Shahjanpur Section of SH93)	SCALE:- N.T.S	Prepared by: Maninder Vashisth; Designed by: Jyoti Kumar; Checked by: Sanjay Kumar; Approved by: Rajeev Gupta; Date: Oct 2014	Revisions: Rev. R0, Date Oct 2014, Description FIRST DRAFT-DPR	TITLE: TYPICAL CROSS SECTIONS; DRG. NO.: EGIS/DPR/EIRH1UP020/DPR/TCS- 001



TCS-1C - WIDENING + NEW CONSTRUCTION DUE TO RAISING

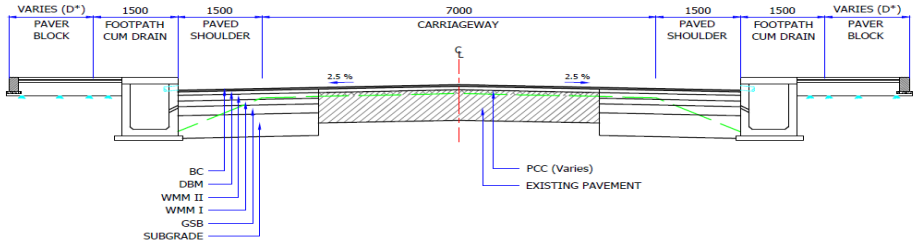


TCS-1D - NEW CONSTRUCTION / REALIGNMENT / BYPASS

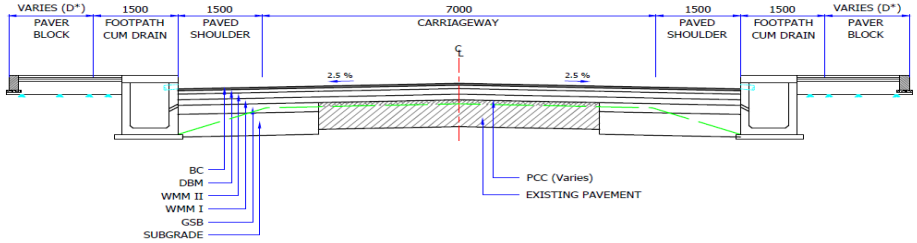
Notes: –
1. Not to Scale.
2. All dimensions are in mm unless otherwise mentioned.
3. Safety Barrier as per Standard Drawing.
4. Toe Wall as per Standard Drawing.
5. For use of fly ash in TCS–1C refer Standard Drawing.

TCS 1 - 2 LANE WITH PAVED SHOULDERS (RURAL SECTION)

CLIENT:- Government of Uttar Pradesh Public Works Department	CONSULTANT:- egisIndia consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Gola-Shahjanpur Section of SH93)	SCALE:- N.T.S	Prepared by: Maninder Vashisth; Designed by: Jyoti Kumar; Checked by: Sanjay Kumar; Approved by: Rajeev Gupta; Date: Oct 2014	Revisions: Rev. R0, Date Oct 2014, Description FIRST DRAFT-DPR	TITLE : TYPICAL CROSS SECTIONS	DRG. NO. : EGIS/DPR/EIRH1UP020/DPR/TCS- 002	



TCS-2A - OVERLAY + WIDENING IN URBAN SECTION

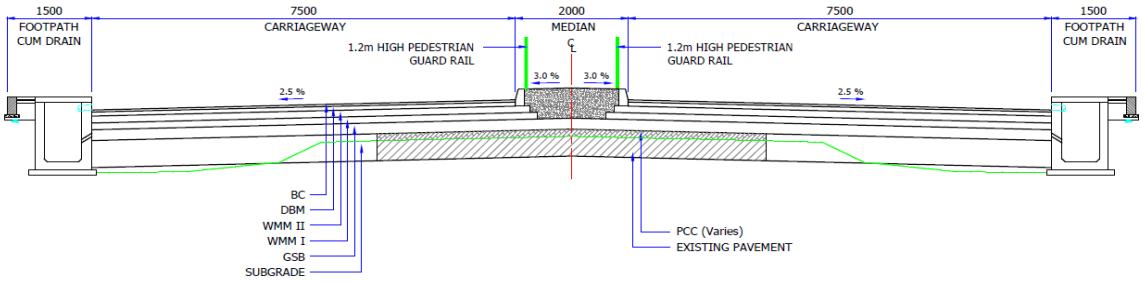


TCS-2B - RECONSTRUCTION + WIDENING IN URBAN SECTION

Notes: –
1. Not to Scale.
2. All dimensions are in mm unless otherwise mentioned.
3. D*=3.0m or Building Line Which ever is lesser.
4. Safety Barrier as per Standard Drawing.
5. Toe Wall as per Standard Drawing.

TCS 2 - 2 LANE WITH PAVED SHOULDERS & RAISED FOOTPATH CUM DRAIN (URBAN)

CLIENT:-	CONSULTANT:-	PROJECT:-	SCALE:-			Revisions			TITLE :
Government of Uttar Pradesh Public Works Department	egisIndia consulting engineers pvt. ltd.	Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Gola-Shahjanpur Section of SH93)	N.T.S	Prepared by	Maninder Vashisth	Rev.	Date	Description	TYPICAL CROSS SECTIONS
				Designed by	Jyoti Kumar	R0	Oct 2014	FIRST DRAFT-DPR	
				Checked by	Sanjay Kumar				DRG. NO. :
				Approved by	Rajeev Gupta				EGIS/DPR/EIRH1UP020/DPR/TCS- 003
				Date	Oct 2014				



(4 LANE SECTION)

Notes: –
1. Not to Scale.
2. All dimensions are in mm unless otherwise mentioned.
3. Safety Barrier as per Standard Drawing.
4. Toe Wall as per Standard Drawing.

TCS 3 - 4 LANE WITH FOOTPATH
CUM DRAIN CUM UTILITY DUCT (URBAN / SEMI URBAN)

T:-	CONSULTANT:-	PROJECT:-	SCALE:-			Revisions			TITLE :
Government of Uttar Pradesh Public Works Department	egisIndia consulting engineers pvt. ltd.	Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Gola-Shahjanpur Section of SH93)	N.T.S	Prepared by: Maninder Vashisth Designed by: Jyoti Kumar Checked by: Sanjay Kumar Approved by: Rajeev Gupta Date: Oct 2014		Rev.	Date	Description	TYPICAL CROSS SECTIONS
						R0	Oct 2014	FIRST DRAFT-DPR	DRG. NO. : EGIS/DPR/EIRH1UP020/DPR/TCS- 004

Figure 2.2: Typical Cross-section

3 METHODOLOGY

3.1 Introduction

A project specific Environmental Assessment study has been carried out for proposed upgradation and improvement of Gola-Shahjahnpur section of State Highway No.-93 in accordance with the Environmental and Social Management Framework (ESMF) developed for UPCRNDP Projects, guidelines and operational manual of World Bank and guidelines of Ministry of Environment, Forests and Climate Change (MOEFCC), Government of India.

The approach to carry out site specific EIA study was organized in four tasks and is based on the field investigations and reconnaissance surveys in the project area, collection, collation and analysis of secondary data and discussions with key stakeholders on the potential impacts of the project. Information on various environmental components were collected through survey oriented screening, collection of data using questionnaire, monitoring of air, water and soil quality and collection of secondary data.

The Screening exercise along the existing road pinpointed the environmental constraints. The hot spots identified during the screening exercise were further assessed for their criticality and impacts jointly by teams of environmental specialist, social impact specialist, design engineers and surveyors. The proposed alignment has been examined in detail for any direct, indirect or cumulative impact on environmental characteristics during feasibility report preparation. A variety of mitigation measures have been included in road design to minimize the adverse effects of road widening on environmental components. During screening following screening matrix was used to assess the extent of potential impacts on different environmental components.

Table 3-1: Environmental Screening Matrix for Gola-Shahjahanpur of SH-93 Project

S. No.	Environmental Feature	Category Assigned (High/Medium / Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
A. Physical Environment				
1	Drainage Conditions	Low	Nil	Drainage has been proposed along the project section
2	Surface Water Resources	Low	2 River and 5 nos. of canals are located in the project corridor, apart from these 12 nos. of ponds are located along the project road	Suitable protection measures in design like provision of toe wall/ retaining wall/ widening on opposite side has been recommended.
3	Erosion Prone stretches	Medium	2 locations for 500 m at High embankment near bridge across Kahthani River at Km 12.000 and at Gomti River at Km 24.900.	Slope Protection has been recommended.
4	Construction Material	Medium	It has been estimated that due to roadway cutting and drain excavation huge	Sufficient borrow/quarry areas are available along the project road. Appropriate Mitigation measures will be required during

S. No.	Environmental Feature	Category Assigned (High/Medium / Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
			quantity of earth work materials will be generated, which can be reused for sub-grade and earthen shoulder to reduce the additional quantity requirement.	extraction and transportation of materials and rehabilitation of the area to minimise the impact. Exploration of use of flyash is required to reduce the required earth quantity for construction. The Impact will be temporary in nature till material extraction and completion of restoration work.
5	Topography	-	-	No Impact on topography is envisaged.
B. Biological Environment				
1	National Park / Wildlife Sanctuary	Nil	-	There is no Wildlife Sanctuary /National Park or eco-sensitive zone within 10 Km radius of project road
2	Non-NP/WLS areas	Nil	-	-
3	Migratory routes	Nil	-	Not any within the project corridor
4	Reserved Forests	Nil	-	Not any within the project corridor
5	Green Tunnels/ Large Trees	Nil	-	Not any within the project corridor
6	Protected Forests	Medium	Though out the project section (around 5300 trees are located within ROW, which are likely to be impacted)	Road side plantation within existing ROW has been declared as Protected forest throughout the project road.
C. Human Environment				
1	Settlement	Medium	Few encroachers and squatters have been recorded within RoW which are likely to be affected. In the section of junction improvement, ROB, bridge approach and 4-laning will attract acquisition of land and structures beyond ROW especially between Km 12.300 to Km 13.050; Km 25.100 to Km 25.900; Km 43.400 to Km 44.050; Km 46.800 to Km 47.200; and Km 52.000 to Km 52.550.	The project activities will be confined mostly to the available Right of Way (ROW) except at 5 sections where the widening would require additional land acquisition. As per baseline survey on social features within 10 m corridor, it has been revealed that there are number of squatters and encroachers within the existing ROW. So even though the widening is proposed within the existing ROW, the project envisages acquisition of various commercial and residential structures and displacement of Non titleholders (NTH). For assessment of affected titleholders, impact on land and properties as well as persons will be estimated after detailed survey. The compensation will be paid as per defined R & R Policy in the project.

S. No.	Environmental Feature	Category Assigned (High/Medium / Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
2	Sensitive Receptors	Medium	There are 12 numbers of educational institutions/ hospitals/ heath centres located along ROW.	Sensitive receptors are located adjacent to ROW and during construction period there will be temporary impact due to dust emission/noise pollution, which will be minimised with proper mitigation measures. No plant and equipment will be erected in the vicinity of these sensitive receptors. During night time, no construction activity will be performed near sensitive receptors.
3	Drinking Water sources	Low	About 107 hand pumps are located within ROW.	This is temporary impact on drinking water source, till relocation. The relocation of hand pumps will be ensured with shortest possible time before commencement of construction activities. Alternative arrangement of drinking water will be made till completion of the relocation of water sources.
4	Physical cultural Resources – Religious	Medium	There are about 22 numbers of religious structures located in the project corridor.	Adjustment in the alignment to avoids impact on religious structures. Wherever it is unavoidable the impacted religious structures will be shifted in consultation with local public before demolition during construction stage of the project road
5	Physical cultural resources – community	Medium	-	Adjustment in the alignment to avoids impact on Community structures. Wherever it is unavoidable the impacted structures will be compensated in accordance with the R&R Policy adopted for the project.
6	Utilities like electricity lines, pipelines for gas, etc	Medium	Water supply line is observed at Mohammadi at RHS covering a total length of about 3 Kms. About 95 electric poles, 32 transformers, 11 telephone poles and 107 hand pumps are likely to be impacted.	The impact will be temporary. The water supply lines will be shifted during construction stage of the project road. The relocation of hand pumps will be ensured with shortest possible time before commencement of construction activities. Alternative arrangement of drinking water will be made till completion of the relocation of water sources.

The analysis of location of environmental features with respect to the project alignment and extent of identified impacts due to project, reflect that most of the impacts are of low and medium extent and mainly related to construction activities which are mostly temporary in nature. Based on the environmental screening the project is Classified as Category-B project in accordance with World Bank's Policy (OP 4.01 Environmental Assessment) and therefore it warrants site specific Environmental Impact Assessment.

For Environmental Impact Assessment study the task wise activities undertaken is presented below:

3.2 Task 1: Collection of Baseline Environmental Data

3.2.1 Secondary Baseline Data

Secondary data of the project area were collected from secondary sources like publishes literatures from various government agencies, or institutions on physical, biological and social components of environment. The data were reviewed and verified for establishing existing environmental and ecological status within the project area. Following documents from different sources were consulted for collection of baseline environmental data.

Table 3-2: Sources of Secondary Data

S. No.	Information	Source
1.	Toposheets, District Planning Maps	Survey of India, Govt. of India
2.	Meteorological data	Directorate of Economics and Statistics, Govt. of Uttar Pradesh, Indian Meteorological Department, Govt. of India
3.	Geological data	Geological Survey of India, Directorate of Mines and Geology, Government of Uttar Pradesh
4.	Reserve Forests, Protected Forests and Wildlife Sanctuaries	Department of Forests, Govt. of Uttar Pradesh and State of Forest report, Forest Survey of India
5.	Landuse Pattern	Department of Economics & Statistics, Government of Uttar Pradesh,
6.	Forests Statistics	Department of Forests, Govt. of Uttar Pradesh
7.	Air & Water Quality	UP Pollution Control Board and MoEFCC
8.	Wildlife Sanctuary/ National Parks/Tiger Reserves	Wildlife Department/ Forest department, U.P.
9.	Wetland Atlas	MoEFCC, Govt. of India
10.	Demographic Profile	District Census Handbook, Govt. of India,
11.	Archeological Monuments/Sites	Archaeological Survey of India
12.	Legislative Acts and Rules	Department of Economics & Statistics, Government of Uttar Pradesh, Ministry of Environment and Forest, Govt. of India
13	Census Data of 2011	Census of India, Government of India
14	Statistical Abstract of Uttar Pradesh 2012	Government of Uttar Pradesh

3.2.2 Primary Baseline data

The primary baseline information on different environmental components were collected through field survey. Field survey were carried out to collect information on the major environmental features such as settlement facilities, drainage pattern of the area, forest, trees within RoW of the alignment, water bodies, river crossing, sensitive receptors, air, water, noise and soil quality etc.

and were studied in detail, which helped in identifying areas of concern along the stretch and critical issues. Consultation with the local officials and public were carried out also on the salient environmental features of the project area, etc

Further primary samples surveys for the environmental components, such as air, surface water, noise and soil characteristics that are critical in the context of the project were carried out. The post-monsoon monitoring was carried out in the month of November, 2014.

Ambient Air Quality

Ambient air monitoring stations were established at various locations along the project section accessing the ambient air quality in the project area. The air quality parameters considered for the study included Particulate Matter (PM_{10}), Particulate Matter ($PM_{2.5}$), Nitrogen oxides (NOx), Sulphur dioxide (SO_2), Carbon Monoxide (CO) and Hydro Carbons (HC). The criteria for the selection of sampling sites were based on type of activity, residential, commercial, traffic congestion, urban centres, location of sensitive receptors etc. Monitoring was done 20-30 m away from the central line of the existing road. 24 hourly monitoring was carried out for 3 consecutive days at each locations.

Water Quality

Grab samples were collected from 2 sources , i.e., from Gomti river and Pond at Macchecha to assess the surface water quality in the project area. Ground water samples were collected from handpums at 3 locations at Gola, Mohammadi and Shahjahanpur. The water samples were tested for different physico-chemical parameters such as dissolved oxygen, total alkalinity, pH, conductivity, TDS, BOD, COD, etc. using standard methods (APHA, 1998). Bacteriological quality of the water was tested using the membrane filter method (APHA, 1998).

Soil Quality

The composite soil samples were collected from 3 locations along the project road. They were analyzed for relevant physico-chemical parameters using standard analytical methods (Allen, 1989; Anderson and Ingram, 1993; Rowell, 1994) to assess the soil quality of the area.

Noise Level

24 hourly ambient noise level was measured using noise level meter at 4 locations along the entire stretch of road during day and night time. The selection of sampling locations was based of land use. The noise levels have been expressed as an equivalent noise level (Leq), which is the measurement of sound pressure level as the averaging time.

The sampling locations for all the above attributes are depicted in **Figure 3.1** and the photo clips of sampling of environmental quality attributes at site is given in **Annexure 5.1**.

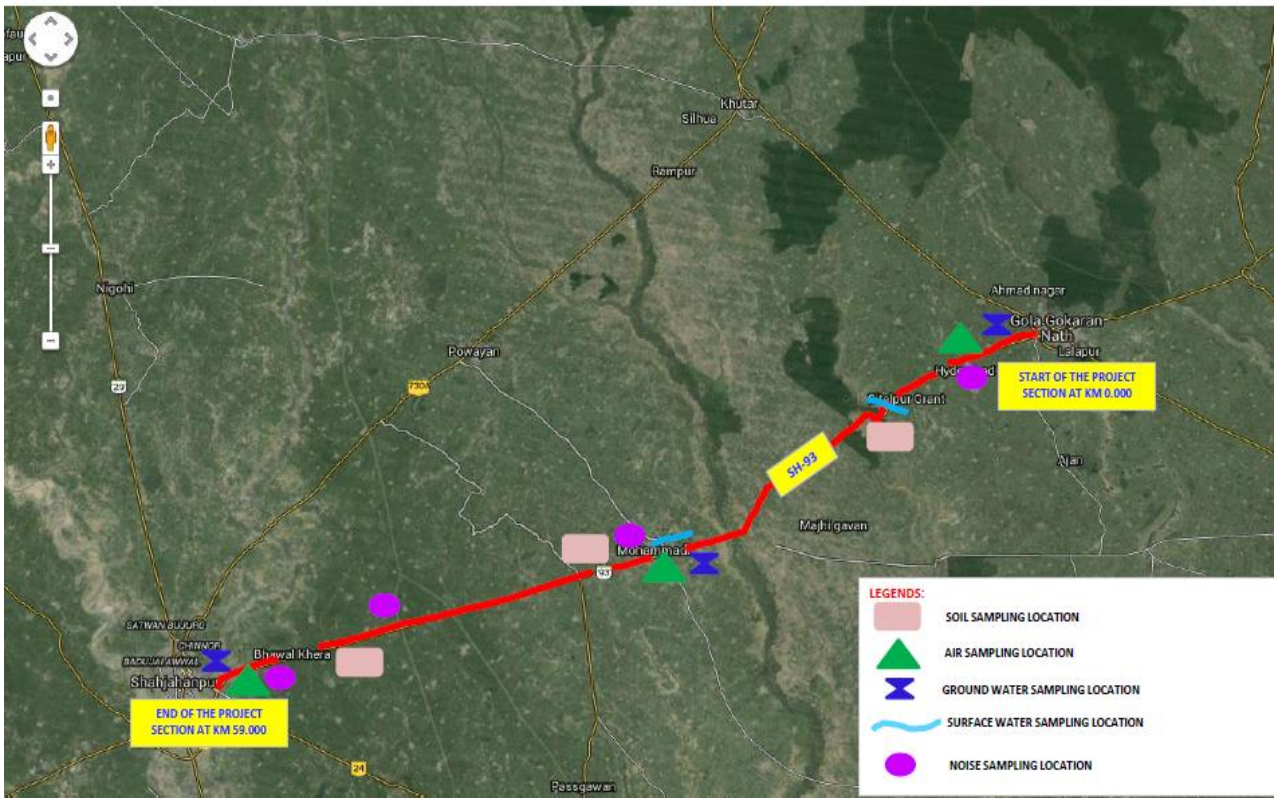


Figure 3.1: Environmental Monitoring Location along Gola-Shahjahanpur section of SH-93

3.3 Task 2: Review of Policies, Regulations and Institutional Arrangements

A review of all applicable operational policies / directives of MoEFCC, State government, the World Bank and environmental laws / regulations in India, were carried out in this task. In addition to the above, the following key environmental regulations / policies in India that may affect / influence the project environment both during preparation and implementation stages were also reviewed.

- World Bank safeguards Policies
- EIA Notification, 2006 and amendment thereafter
- Environment (Protection) Act, 1986
- Water (Prevention & Control) Act, 1974
- Air (Prevention & Control) Act 1981
- Forest (Conservation) Act, 1980
- Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
- The Motor Vehicle Rule, 1983
- The Explosives Act, 1984

3.4 Task 3: Identification of Potential Environmental Impacts

Based on the baseline environmental profile of the project area and proposed improvement and project activities, impacts of the proposed project on various environmental components were identified. The impacts were also analyzed with respect to pre-construction, construction and operation phases and were categorized in terms of magnitude and significance.

The environmental impacts identified through the earlier tasks were used in the design formulation process to integrate environmental issues and for identification of suitable mitigation measures.

Public consultations through informal interviews and focus group discussions were held at various stages of the project to assess community perceptions towards the projects and assess the concerns. These were incorporated in the design of the proposed alignment of the project section and were included in the mitigation measures suggested.

3.5 Task 4: Preparation of Environmental Management and Monitoring Plan

Based on the nature and type of environmental impacts anticipated, mitigation measures for preventing / minimizing the same were identified and an Environmental Management Plan has been formulated both for the project execution and operation phases. Monitoring requirements and institutional responsibilities for the implementation of the suggested management plan has also been identified as part of this task. The cost for implementing the proposed environmental mitigation measures has been worked out and presented in the report for necessary budgetary allocations as part of the project cost.

4 ENVIRONMENTAL REGULATORY FRAMEWORK

4.1 Introduction

The increase of environmental concerns has necessitated appropriate tools to protect the environment. India has developed a fairly comprehensive regulatory framework to address environmental and social concerns in relation to development projects. Its wide ranging enactments cover almost all major issues that need to be addressed in the course of development of infrastructure from a social and environmental perspective. The following section describes the institutional set-up and key legislation pertaining to environmental issues.

4.2 Institutional Framework

As a result of Stockholm Conference, first exclusive environmental act, Water (Pollution Prevention and Control) Act was enacted in 1974. In accordance with this act Central and State Boards for Prevention and Control of Water Pollution were set up. Later these boards were renamed into Central Pollution Control Board and respective State Pollution Control Boards. Department of Environment was set up in 1980. Subsequently in 1985, it was upgraded to a full-fledged Ministry of Environment and Forest (MoEF) to serve as the focal point in the administrative structure for the planning, promotion and coordination of environmental and forestry programmes. The Ministry of Environment and Forests (MoEF) has been renamed recently in the year 2014 as Ministry of Environment and Forest and Climate Change (MOEFCC). The MoEFCC has overall authority for the administration and implementation of government policies, laws and regulations related to the environment, including conservation, environmental assessment, sustainable development and pollution control. MOEFCC identifies the need to enact new laws and amend existing environmental legislation when required, in order to continue to conserve and protect the environment. At the state level, the MOEFCC authority is implemented by the Department of the Environment and the Department of Forest.

In 1976, the 42nd Constitutional Amendment created Article 48A and 51A, placing an obligation on every citizen of the country to attempt to conserve the environment. As a result, a number of laws related to environmental conservation were passed to strengthen existing legislation. Environment (Protection) Act, 1986 is the landmark legislation as it provides for the protection of environment and aims at plugging the loopholes in the other related acts.

The Government of India through specific legislations regulates the environmental management system in India. The Ministries / Statutory Bodies responsible for ensuring environmental compliance by project proponents include:

- The Ministry of Environment & Forests and Climate Change (MOEFCC)
- Central Pollution Control Board (CPCB)
- Uttar Pradesh Pollution Control Boards (UPPCB)
- Ministry / Department of Environment in the States

4.3 Key Environmental Laws and Regulation

Table 4.1 presents Environmental regulations and legislations relevant to this project, which are the responsibility of a number of government agencies.

Table 4-1: Summary of Relevant Environmental Legislations

Acts/Rule/Policy	Year	Objective	Applicability to this project	Responsible Agency
Environmental (Protection) Act	1986	To protect and improve the overall environment.	Yes, all environmental legislation is covered in this umbrella Act	MOEFCC. GoI; CPCB; UP State Pollution Control Board
Environment Impact Assessment Notification	2006	To provide environmental clearance to new development activities following environmental impact assessment	No. Applicable only for State Highways located in Eco-sensitive Zone and hilly terrain above 1000m amsl	State Environmental Impact Assessment Authority(SEIAA)
Indian Forest Act The Forest (Conservation) Act The Forest (Conservation) Rules	1927 1980 1981	To check deforestation by restricting conversion of forested areas into non forested areas.	Yes, Diversion of Protected Forest is required as Roadside Plantation has been declared as Protected Forest	Forest Department, Govt. of UP, MOEFCC, Regional Office and MOEFCC.
WildLife (Protection) Act	1972	To protect wildlife through certain of National Parks and Sanctuaries.	No. Only for the project either located inside the boundary of Wildlife Sanctuary or National Park/Tiger reserves. State Highways passing through Eco-sensitive zone outside the boundary of Wildlife Sanctuary/National Parks will also need recommendation of NBWL.	Chief Conservator. Wildlife, Wildlife Wing, Forest Department, Gov. of U.P. and National Board For Wildlife, GoI.
National Forest Policy National Forest Policy (Revised)	1952 1988	To maintain ecological stability through preservation and restoration of biological diversity.	Yes For clearing of forest/ felling of Trees	Forest Department, GoI and Govt. of U.P.
Water (Prevention and Control of Pollution) Act	1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards.	Yes. Forest establishment and operation of Hot Mix/ Stone crusher/WMM/Batching Plants during construction, etc	UPPCB
Air (Prevention and Control of Pollution) Act	1981	To control air pollution by controlling emission of air pollutants as per the prescribed standards.	Yes. Forest establishment and operation of of Hot Mix/ Stone crusher/WMM/Batching Plants during construction, etc	UPPCB.
Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989	To check vehicular air and noise pollution.	Yes. For construction vehicles	Transport Department & UPPCB.
Ancient Monuments and Archaeological Sites and Remains Act	1958	Conservation of cultural and historical remains found in India.	Yes. For the project located within 300 m from such features	Archaeological Dept. GOI, Indian Heritage Society and Indian National Trust for Art and Culture Heritage (INTACH).

Acts/Rule/Policy	Year	Objective	Applicability to this project	Responsible Agency
Right to fair compensation and transparency in land acquisition, rehabilitation and Resettlement Act	2013	Fair compensation for acquisition of immovable assets; Resettlement of displaced population due to LA and economic rehabilitation of all those who are affected due to land acquisition.	Yes. In case of acquisition of land	Revenue Department. Govt. of U.P.

A brief description of relevant laws is given below:

EIA Notification, 2006

This is the Indian Government's Guidelines for environmental impact assessment governing all of the development interventions that takes place within the boundaries of India. EIA notification was issued by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2006 . Under this EIA Notification, the projects listed in Schedule-1 of the Notification require prior environmental clearance. The objective of the notification is to formulate a transparent, decentralized and efficient regulatory mechanism to:

- Incorporate necessary environmental safeguards at planning stage
- Involve stakeholders in the public consultation process
- Identify developmental projects based on impact potential instead of the
- investment criteria

As per EIA Notification, 2006 and amendment thereafter, the Expansion of State Highway does not require environmental clearance except for the State highways expansion project in hilly terrain (above 1000 m above mean sea level) and/or in eco-sensitive areas . As per Hon'ble Supermen court's direction, 10 km radius from the boundary of wildlife sanctuary will be considered as eco-sensitive zone till the actual radius of the eco-sensitive zone around the wildlife sanctuary boundary is notified by the state government.

The MDR and ODRs do not come in the purview of EIA Notification, 2006.

Forest (Conservation) Act: This Act is of particular significance in case the project corridors require acquisition of forest land outside the RoW of the road corridors as a result of the rehabilitation work proposed.

The Indian Forest Act (1927) was amended in 1980 in an attempt to check the rapid deforestation occurring throughout India and the Forest (Conservation) Act, 1980 came into existence. At the state level, the government was empowered to declare reserves and protected forest and was also given the authority to acquire land for extension and preservation of the forests. An advisory Committee was formed to supervise compliance, within other government departments. In December 1996, a Supreme Court Judgment further defined the types of forests to be protected. The Ministry of Environment and Forests in their Corrigendum to Part II, Section 3, Sub-section (i) of Forest (Conservation) Amendment Rules, 2004 issued vide G.S.R. 107(E) dated 9th February, 2004, which explains the procedure for application for diversion of forests land depending on the area involved as follows:

- The proposal involving forest land upto 40 hactares shall be forwarded by the concerned State Government along with its recommendations, to the Chief Conservator or Forests or the Conservator of Forests of the Regional Office of the Ministry of Environment and Forests Government of India.
- The Chief Conservator of Forests/ Conservator of Forests of the Regional Office shall within a period of 45 days of the receipt of the proposal from concerned, decide the diversion of proposal upto 5 Ha.

- If the forest land is more than 5 and upto 40 hectare, The Chief Conservator of Forests/ Conservator of Forests of the Regional Office process, scrutinize and forward diversion proposal along with the recommendations, if any, to Ministry of Environment and Forests, New Delhi for obtaining decision of the Central Government and inform the State Government and the User Agency concerned.

- The proposal involving more than 40 ha of forest area, shall be forwarded by the concerned State Government along with its recommendations, to the Ministry of Environment and Forests, New Delhi

Guidelines For Diversion of Forest Land for Widening or Realignment of Road

As per Forest (Conservation) Act, the roadside plantation within the ROW notified as protected forests for management purposes will need approval from the Central Government under Forest (Conservation) Act, 1980.

The Regional Offices shall be competent to finally dispose of all such proposals irrespective of the area, preferably within 30 days from the date of receipt of the proposal. While the approval, in place of normal provisions for compensatory afforestation, the Regional Offices will stipulates a condition that for every tree cut at least two trees should be planted.

However, if the decision is not ordered by the concerned Regional Office within 30 days of the receipt of fully completed application, the Central Government / State may proceed with the widening/modernization under intimation to the local State Forest Department and Central Government.

All the cases for forest clearance are now required to be applied online on the MoEFCC website. From there the application will be forwarded to the Nodal Officer of respective state for further processing of application. The user agency will submit the proposal in the prescribed format through the State Forest Department to the concerned Regional Office of the Ministry.

Wild Life Protection Act: The Wildlife Protection Act, **1972** has allowed the government to establish a number of National Parks and Sanctuaries over the past 25 years, to protect and conserve the flora and fauna of the state.

The Water (Prevention and Control of Pollution) Act, 1974 resulted in the establishment of the Central and State level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of any facility. This will include generation of liquid effluent during construction of road from civil engineering activities or from domestic

activities in workers colony. There are specific penalties for violation, which include imprisonment for responsible officials.

The Air (Prevention and Control of Pollution) Act, 1981 empowers Central and State Pollution Control Boards for managing air quality and emission standards, as well as monitoring air quality, prosecuting offenders and issuing licenses for construction and operation of any facility. Air quality includes noise level standards. There are specific penalties for violation, which include imprisonment for responsible officials. This act has notified National Ambient Air Quality Standard for different regions e.g. Industrial, Residential and Sensitive. Air quality during construction and operation phases will be guided by this specific act.

Environment (Protection) Act, 1986: This act was passed as an overall comprehensive act "for protection and improvement of environment" Under this act rules have been specified for discharge/emission of effluents and different standards for environmental quality. These include Ambient Noise Standard, Emission from Motor Vehicles, Mass Emission standard for Petrol Driven Vehicles, General Effluent Standards etc. especially important for road project.

U.P. Roadside Land Control Act, 1945: This is intended to regulate the development along the roads/highways in the state of UP. For the road sections 220 ft (67.056 m) either side of the existing National Highways and 55ft (16.76m) has been declared as protected area by the State Government and no further development is allowed after its notification in that area.

Fly ash Notification, 2009: According to the Notification No. S.O. 763 (E), dated 14.09.1999 and its amendment thereafter on 27.08.2003 and notification S.O. 2804 (E) dated 3rd November 2009 by Ministry of Environment and Forests, it is mandatory to use fly ash within a radius of 100 kilometres of Thermal Power Plant. No agency, person or organization shall within a radius of 100 kilometre of Thermal Power Plant undertake construction or approve design for construction of roads of flyover embankments in contravention of the guidelines/ specification issued by the Indian Road Congress (IRC) as contained in IRC specification No. SP: 58: 2001. Any deviation from this direction can only be agreed to an technical reasons if the same is approved by Chief Engineer (Design) or Engineer-in-chief of the concerned agency or organization or on production of certificate of "Pond ash not available" from the Thermal Power Plant(s) located within 100 kilometres of the site construction. This certificate shall be provided by TPP within two working days from the date of making request for fly ash.

Soil required for top or side cover of embankment of roads or flyovers shall be excavated from the embankment site and it is not possible to do so, only the minimum quantity of the soil required for the purpose shall be excavated from soil borrow area. In either case, the topsoil should be kept or stored separately. Voids created due to soil borrow area shall be filled up with ash with proper compaction and covered with top soil kept separately as mentioned above.

No agency, person or organization shall within a radius of 100 kilometres of coal or lignite based Thermal Power Plant allow reclamation and compaction of low lying areas with soil. Only pond ash shall be used for compaction. They shall also ensure that such reclamation and compaction is done in accordance with the bye-laws, regulation and specification laid down by Authorities.

All agencies undertaking construction of roads or fly over bridges including Ministry of Shipping Road Transport and Highways (MoSRTH), National Highways Authority of India (NHAI), Central Public Works Department (CPWD), State Public Works Department and other State Government

Agencies, shall within three months from the 1st day of September 2003 make provision in their documents, schedules of approved materials and rates as well as technical documents; including those related to soil borrow area or pits.

Make necessary specifications/guidelines for road or fly over embankments that are not covered by the specification laid down by the Indian Road Congress (IRC).

There is one coal based Thermal Power Plant namely Reliance Thermal Power Plant at Rosa located within 10 Km from Shahjahanpur, which is within 100 km radius of the project road. Therefore use of fly ash in the project is warranted in the project as per above notification.

4.4 Statutory Clearance for Borrow area and stone quarry

Mining of minor minerals such as sand, gravel, clay, marble and other stones will not be allowed in the country without the approval of the Central government. The Hon'ble Supreme Court, vide its order dated 27.02.2012 in I.A.No.12-13 of 2011 in SLP (C) No.19628-19629 of 2009 titled Deepak Kumar etc. Vs. State of Haryana & Ors. has inter alia ordered that leases of minor mineral including their renewal for an area less than 5 ha be granted by the State / Union Territory only after getting environment clearance (EC) from the Ministry of Environment,Forests and Climate Change (MoEFCC). In order to ensure compliance of the aforesaid order of the Hon'ble Supreme Court, MoEFCC issued an OM No.L-11011/47/2011-IA.II(M) dated 18.05.2012 stating inter alia that all mining projects of minor minerals including their renewal, irrespective of the size of the lease would require prior EC and that the projects of minor minerals with lease area less than 5 ha would be treated as Category "B" as defined in EIA Notification, 2006 and will be considered by the respective State Environment Impact Assessment Authorities (SEIAAs) notified by MoEFCC and following the procedure prescribed under the EIA Notification, 2006. The mining projects having more than 5 Ha of lease area will be categorised as Category A project and will be appraised by Central Committee of MoEFCC.

Regarding the borrow area for ordinary soil, the Contractor has to obtain environmental clearance from State Environmental Impact Assessment Authority (SEIAA) of MoEFCC in compliance to the Supreme Court's order and MoEFCC conditions vide their circular no. L-11011/47/2011-IA.II(M) dated 20th June, 2013. If the area of a borrow area is less than 5 Ha then this will be treated as Category-B-2 Project and will be appraised and approved based of only Form-1. No EIA study will be required for such area. However if the size of the borrow area is more than 5 Ha then it will be categorized as "Category-B1" and therefore will require EIA study, based on which the SEIAA will give clearance for the same.

4.5 Other Legislation Applicable to Road Construction Projects

Environmental issues during road construction stage generally involve equity, safety and public health issues. The road construction agencies require complying with laws of the land, which include inter alia, the following:

- **Workmen's Compensation Act 1923** (the Act provides for compensation in case of injury by accident arising out of and during the course of employment);
- **Payment of Gratuity Act, 1972** (gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years);

- **Employees PF and Miscellaneous Provision Act 1952** (the Act provides for monthly contributions by the employer plus workers);
- **Maternity Benefit Act, 1951** (the Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.);
- **Contact Labor (Regulation and Abolition) Act, 1970** (the Act provides for certain welfare measures to be provided by the contractor to contract labour);
- **Minimum Wages Act, 1948** (the employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the);
- **Payment of Wages Act, 1936** (it lays down as to by what date the wages are to be paid, when it will' be paid and what deductions can be made from the wages of the workers);
- **Equal Remuneration Act, 1979** (the Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees);
- **Payment of Bonus Act, 1965** (the Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages);
- **Industrial Disputes Act, 1947** (the Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment);
- **Industrial Employment (Standing Orders) Act, 1946** (the Act provides for laying down rules governing the conditions of employment);
- **Trade Unions Act, 1926** (the Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities);
- **Child Labour (Prohibition and Regulation) Act, 1986** (the Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry);
- **Inter-State Migrant Workmen's** (Regulation of Employment and Conditions of Service) Act, 1979 (the inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home to the establishment and back, etc.);
- **The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996** (all the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act; the employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc.);
- **The Building And Other Construction Workers' Welfare Cess Act, 1996**

  Under the Act 2% labour cess is applicable in Uttar Pradesh while obtaining Labour License.
- **The Factories Act, 1948** (the Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours and rendering information-regarding accidents or dangerous occurrences to designated authorities);
- **Hazardous Wastes (Management and Handling) Rules, 1989**;
- **Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.**

4.6 World Bank Safeguard Policies

Projects financed with IDA resources normally need to comply with World Bank Operational Policies. The World Bank has Environmental and Social Safeguard Policies to reduce or eliminate the adverse effects of development projects. The safeguard policies of World Bank are provided in the **Table 4.2**.

Table 4-2: Safeguard Policies of World Bank

World Bank Safe Guard Policies	Objective	Applicability	Safeguard Requirements
OP 4.01: Environmental Assessment	The objective of this policy is to ensure that Bank financed projects are environmentally sound and sustainable (Refer analysis part in text below for details)	The environmental issues will be addressed adequately in advance an integrated Environmental Screening and Environmental assessment (EA) with an Environmental Management Plan (EMP) will be developed to manage environmental risks and maximize environmental and social benefits wherever it is applicable.	EIA and/or EMP required.
OP 4.04: Natural Habitats	The policy recognizes that the conservation of natural habitats is essential for long-term sustainable development. The Bank, therefore, supports the protection, maintenance and rehabilitation of natural habitats in its project financing, as well as policy dialogue and analytical work. The Bank supports and expects the Borrowers to apply a precautionary approach to natural resources management to ensure environmentally sustainable development	This policy may be triggered by The Project due to improvement activity of road requiring forest/ wildlife lands, locating close to the natural habitats with the potential to cause significant adverse impact or degradation of natural habitats whether directly (through construction) or indirectly (through human activities induced by the project).	EIA and EMP requires specialised surveys, which will be conducted at the locations wherever wildlife sanctuary, national park or any other eco-sensitive area is encountered in the project.
OP 4.36: Forests	This policy focuses on the management, conservation, and sustainable development of forest ecosystems and resources. It applies to project that may have impacts on (a) health and quality of forests; (b) Affect the rights and welfare of people and their level of dependence upon forests and projects that aim to bring about changes in the management, protection or utilization of natural forests or plantations, whether they are publicly, privately or community owned. The Bank does not support the significant conversion or degradation of critical forest areas or related critical natural habitats.	Impact of widening /construction activities on Forest areas required to be taken care of.	Forest land diversion Application has to be prepared and submitted to forest department

World Bank Safe Guard Policies	Objective	Applicability	Safeguard Requirements
OP 4.09: Pest Management	The objective of this policy is to promote the use of biological or environmental control methods and to reduce reliance on chemical pesticides.	Pest / Vector management involvement in UPCRNDP is not likely.	Not Applicable
OP 4.12: Involuntary Resettlement	The objective of this policy is to avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs. Furthermore, it intends to assist displaced person in improving their former living standards; community participation in planning and implementing resettlement; and to provide assistance to affected people, regardless of the legality of title of land	No relocation of people is expected due to this project. However, there may be need for limited land acquisition for some project activity under UPCRNDP. (This policy is triggered not only when physical relocation occurs, but also by any loss of land resulting in: relocation or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihood, whether or not the affected people must move to another location).	Resettlement Action Plan
OP 4.10: Indigenous People	This policy aims to protect the dignity, right and cultural uniqueness of indigenous people; to ensure that they do not suffer due to development; that they receive social and economic benefits	This policy may be triggered if there are indigenous people in the project area; when potential adverse impacts on indigenous people are anticipated; and if indigenous people are among the intended beneficiaries.	Indigenous people development Plan
OP 4.11: Physical Cultural Resources	This policy aims at assisting in the preservation of cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features, as well as in the protection and enhancement of cultural properties encountered in Bank-financed project.	This policy may be triggered by sub-projects under UPCRNDP in those areas where cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features may be affected during widening and strengthening work of the sub-projects.	Application has to be prepared and submitted to Archeological department

As per the World Bank's Environmental Safeguard policy, the project coordinating entity or implementing institution carries out Environmental Assessment (EA) during the preparation of each proposed subproject according to country requirements and the requirements of this policy. The Bank appraises and recommends to strengthen the capabilities of the coordinating entity or the implementing institution to (a) screen subprojects, (b) obtain the necessary expertise to carry out EA, (c) review all findings and results of EA for individual subprojects, (d) ensure implementation of mitigation measures (including, where applicable, an EMP), and (e) monitor environmental conditions during project implementation. If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A sub-projects and, as appropriate, Category B sub-projects -including any EA reports are subject to prior review and approval by the Bank.

The purpose of conducting an environmental assessment (EA) is to identify environmental and social consequences of the proposed sub-projects or components, in order to:

- Ensure the identification of potential environmental issues and social concerns early in the implementation of a proposed project to incorporate necessary safeguards in project design in order to prevent potential adverse impacts by determining appropriate mitigation and compensation measures;
- Minimize risks and enhance positive impacts/benefits;
- Avoid delays and extra costs which may subsequently arise due to unanticipated environmental problems;
- Identify the potential for maximizing environmental resources management and socio-economic benefits to local communities within the scope of the subproject.
- The EA should cover physical-chemical, biological, socio-economic and cultural issues that are likely to arise during upgrading and widening of roads safety risks and appurtenance structures and associated activities as appropriate.

The World Bank has classified the type of projects into following categories depending on the extent of the impact on environment:

(i) **Category A**: A proposed project is classified as Category A, if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. Such project requires full EA study.

(ii) **Category B**: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.

(iii) **Category C**: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

(iv) **Category FI:** A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

Thus for Category-A project detail Environmental Assessment would be required. For the project requiring Environmental Clearance from the MOEFCC, detailed Environmental Impact Assessment would be required in accordance with the Environmental Impact Assessment Notification, 2006 and amended thereafter. For Category-B projects site specific EA is required and a generic environmental management plan (EMP) would be required to be prepared for such project. For Category C projects no study beyond environmental screening is required.

4.7 Summary of Statutory Clearance/Permits Requirement

The project requires a number of statutory clearances under different Acts and Rules at different stage of the project. These are listed in **Table 4.3.**

Table 4-3: Summary of Statutory Clearance Requirement of the Project

S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility	Time Required
1	Forest Clearance for diversion of Protected Forest Area	For diversion of Protected Forest area as Roadside Plantation within ROW for the project stretch has been declared as Protected Forest	Pre Construction	PIU, UP PWD	6-8 months
2	Tree felling permission	For roadside tree cutting	Pre construction	PIU, UP PWD	1-2 months
3	NOC (Consent to Establish and Consent to Operate) under Air and Water Act from SPCB	For stone crusher plant, Hot Mix plant, WMM plant and Batching Plant, etc.	Construction Stage	Contractor	2-3 months
4	Explosive License from Chief Controller of Explosives,	For storing fuel oil, lubricants, diesel etc.	Construction stage (Prior to storing fuel, lubricants and Diesel, etc.)	Contractor	2-3 months
5	Permission for storage of hazardous chemical from CPCB	storage and Import of Hazardous Chemical	Construction stage (Prior to initiation of any work)	Contractor	2-3 months
6	Quarry Lease Deed and Quarry License from State Department of Mines and Geology	Quarry operation	Construction stage (Prior to initiation of Quarrying)	Contractor	2-3 months
7	Environmental Clearance for stone quarry and Soil borrow area from State environmental Impact Assessment Authority, U.P.	Opening of new Quarry and Borrow area for earth material	Construction stage (Prior to initiation of Quarrying)	Contractor	5-6 months
8	Permission for extraction of ground water for use in road construction activities from State Ground Water board	Extraction of ground water	Construction stage (Prior to initiation of installation of Bore wells and abstraction of water from such source)	Contractor	1-2 months
9	Permission for use of water for construction purpose from irrigation department	Use of surface water for construction	Construction stage (Prior to initiation of abstraction of water from such source)	Contractor	1-2 months
10	Labour license from Labour Commissioner Office	Engagement of Labour	Construction stage (Prior to initiation of any work)	Contractor	2-3 months

5 CURRENT ENVIRONMENTAL CONDITIONS

This chapter reviews the existing conditions of the natural, cultural, economic and social environments within the project area. The extent of study is within 10 Km on both sides from the project road. However, the focus of the study was on the areas within and directly adjacent to the corridor of impact and ROW. The review of the environmental status within the project corridor is based on the secondary information collected from various sources followed by field surveys of the project area. All the data have been collected and collated to identify a general environmental condition within the project area and major environmental issues to be taken care off during the design as well project implementation phase.

5.1 Physical Environment

5.1.1 Physiography

The project area is located in the districts of Lakhimpur Kheri and Shahjahanpur in state of Uttar Pradesh. The project location starts at near Gola Market at Km 1+280 and ends at Shahjanpur at Km 58+580. Lakhimpur Kheri is a tarai District of Uttar Pradesh bordering Nepal. Headquarter of the District is situated in the city of Lakhimpur. The total geographical area of the district is 7680 Sq.km. The District is the largest district of U.P. in terms of area. This district is surrounded by Baharaich district in east, Sahjahnpur & Pilibhit districts in west and Hardoi & Sitapur districts in South**.** Shahjahanpur district is bounded on North West by Bareilly district, on north by Pilibhit district, in the east by Lakhimpur Kheri and Hardoi districts in the sourth, Farrukhabad district in the south west and Badaun district in the west. The total geographical area of the district is 4575 Sq.km.

The entire section of the project road lies over flat terrain having gentle country slope from northwest to southwest direction. The project road passes through mainly agriculture fields and built-up areas. The geographical extension of the project stretch is $28^0$04’47.20” N latitude and $80^0$28’47.34” E longitude at Gola and $27^0$51’12.05” N Latitude and $79^0$55’23.60” E longitude at Shajahanpur. General elevation of the area varies between 158 m to 164 m above mean sea level. The project districts lie over Ruhilkhand and Sarjupar Plains.

The district of Lakhimpur Kheri is drained by several rivers namely Sharda, Ghagra, Koriyala, Ull, Sarayan, Chauka, Gomti, Kathana, Sarayu and Mohana whereas the Shahjahanpur district is drained by Ramganga, Garrah & Gomti rivers.

Physiographic map and Physical map of Uttar Pradesh is given in **Figure 5.1** and **Figure 5.2** respectively.

Figure 5.1: Physiographic Map of Uttar Pradesh

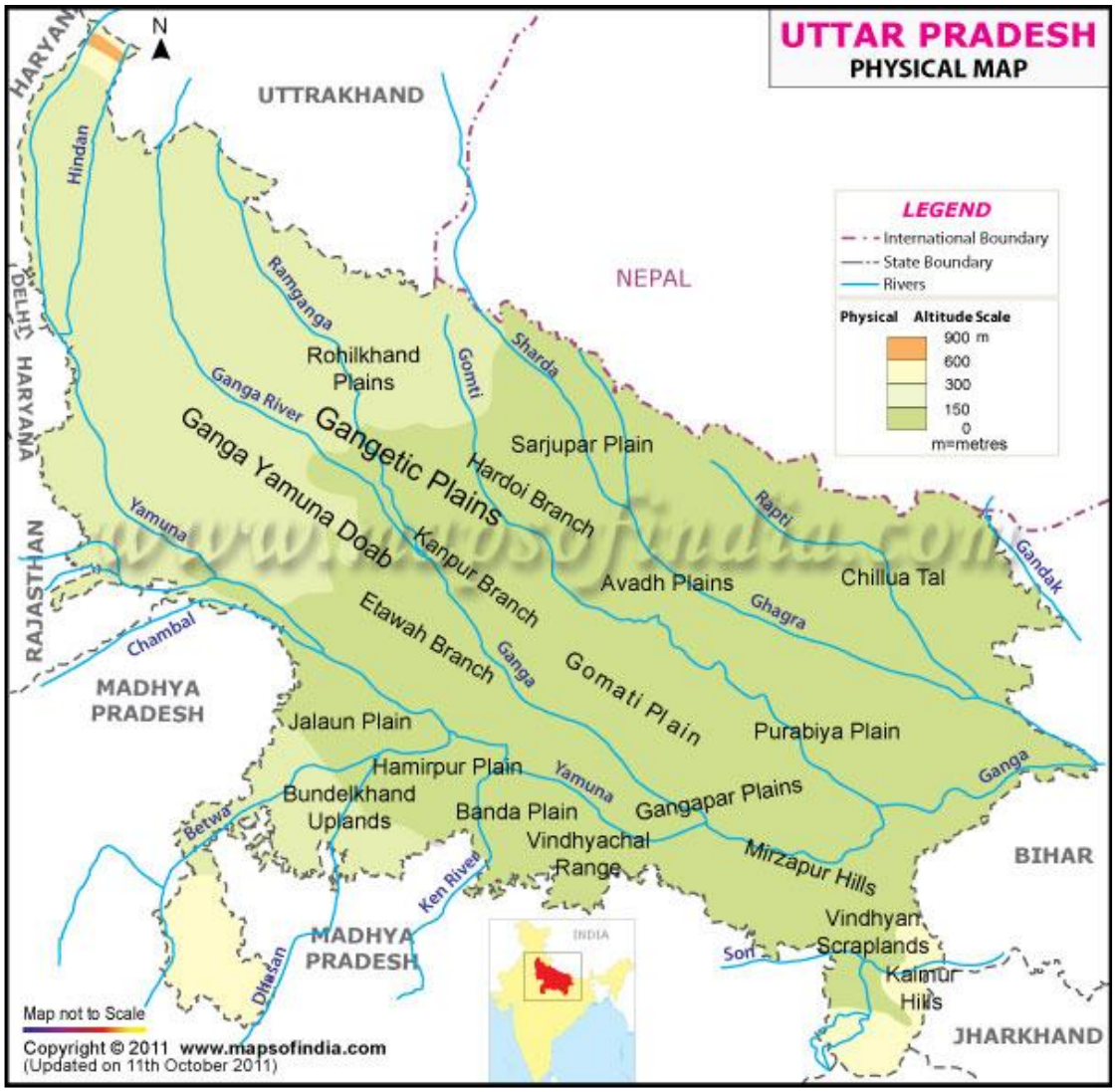


Figure 5.2: Physical Map of Uttar Pradesh

5.1.2 Geology and Soil

The entire project area is spread in Gangetic plain. The geological formation of both the districts is river fill sediment of recent origin and younger alluvial plain. The soils found in the project area are mainly alfisols composed of red sandy and red loamy soil. In Shahjahanpur District there are sandy loam soils, Loam soils, Clay loam soils and silt loam soils

District Lakhimpur comprises mainly four types of soils are found which are sandy, alluvial soil, smooth & Domat. Geographically District can be divided in to two parts-(i) Low land (Tarai) and (ii) Upper Land (uparhar). Sandy soil is met in the bank of rivers and nearby areas. Soil of Tarai areas is clay and is dark in color, which is very suitable for growing of Rice & Sugar cane. Soil of Bankeganj, Mohammadi, Kumbhi (Gola), Mitauli, Behjam & Lakhimpur Blocks is normally Domat.

Land of district Shahjahanpur is generally plain and fertile. Land on the side of the river bank is low (is called Khadar) and other side it is comparatively higher and is called Bangar. Domat type

land can be found on the north side of tehsil Puvayan. Land on the west side is comparatively very low due to erosion. Due to this reason at the time of rainfall the area become flooded. In the Kaur, Khutar, Nigohi & Jaitpur block areas, the land is domat and matiyar.

The geological map of Uttar Pradesh is given in **Figure 5.3**.

Figure 5.3: Geological Map of Uttar Pradesh

Soil analysis has been carried out for soil samples collected from two locations along the proposed project alignment covering agriculture field and human activities area especially near habitation area to understand the Soil characteristics along the project road. The post monsoon soil samples were collected from fields within 10-15 meter from road edge in the month of Novemebr, 2014. The locations for Soil sampling is presented in **Table 5.1**. The physico-chemical characteristics of the soil samples is presented in **Table 5.2**.

Table 5-1: Identified Soil Sampling Location along the Project Road

Sample Code	Locations	Chainage (Km)	Description of Site
SQ-1	Reserved Forest Area	13+000	Forest Land
SQ-2	Dhewra	34+300	Agriculture Land
SQ-3	Mukrampur	51+200	Agriculture Land

The soil quality analysis shows that at all the locations soil quality are basic in nature and the moisture retention capacity is less than 17%. The soil texture along the project corridor is varies between sandy loam to clay with good amount of nitrogen content.

Table 5-2: Physico-chemical Characteristics of Soil

S. No.	Parameters	Unit	Sampling Locations		
			SQ-1	SQ-2	SQ-3
1	pH (1:2.5) at26^{0}C		6.16	8.46	8.26
2	Electrical Conductivity at 25^{0}C	µS/cm	44.2	163	133
3	Sand	% (w/w)	56.7	29.8	30.4
4	Silt	% (w/w)	28.1	12.3	19.4
5	Clay	% (w/w)	15.2	57.9	50.2
6	Texture		Sandy Loam	Clay	Clay
7	Moisture Retention Capacity	%	5.56	15.08	16.23
8	Bulk Density	g/c.c	1.21	1.25	1.21
9	Porosity	%	49.37	50.79	52.73
10	Organic matter	%	1.64	1.14	0.84
11	Nitrogen	mg/kg	197.96	250.38	186.34
12	Phosphorous	mg/kg	163.78	231.64	172.59
13	Potassium	mg/kg	40	40	179.98
14	Pb	mg/kg	<0.1	4.4	0.4
15	Fe	mg/kg	<1.4	3.88	5.08
16	TOC	%	0.95	0.66	0.49
17	Cd	mg/kg	<0.04	<0.04	<0.04
18	Mn	mg/kg	281.58	178.38	148.84
19	Cu	mg/kg	7.69	16.88	13.19
20	Ni	mg/kg	9.15	8.86	9.08
21	Zn	mg/kg	24.96	105.18	99.65
22	Co	mg/kg	5.81	7.94	6.1

Source: Primary Data collected from site

5.1.3 Seismology

According to **Global Seismic Hazard Assessment Program** (**GSHAP**) data, the state of Uttar Pradesh falls in a region of moderate to high seismic hazard. The districts Lakhimpur Kheri and Shahjahanpur lie in Zone III (moderate Hazard zone) which is comparatively stable zone. No epicenter of earthquake within the district area has been observed during last 200 years. The district has, however experienced on few occasions earthquakes originating in the Himalayan boundary fault zone, Moradabad fault zone and Narmada-Tapti fault zone. The seismic hazard zone of Uttar Pradesh is given in **Figure 5.4**.

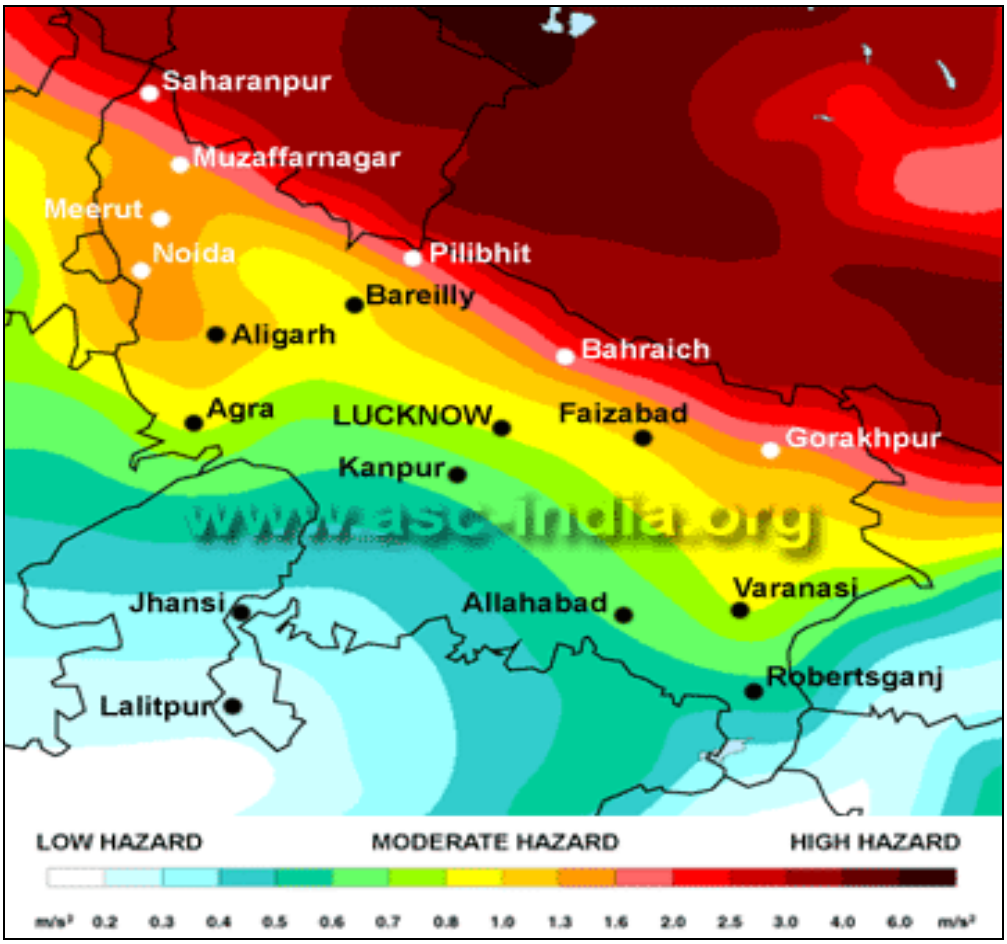


Figure 5.4: Seismic Hazard Zone of Uttar Pradesh

5.1.4 Quarry Site and Borrow Areas

Quarry Areas

Road construction requires earth, stones and sand. These raw materials are to be obtained from surrounding areas, which are suitable for the project road. The stone materials including sand and granular ones are needed in large quantities for the pavement construction. The other area of requirement is concrete structures, which call for a good quality stone.

The potential source for stone aggregates, sand and gravels along the project section has been identified. Sufficient quantities of construction materials are available in these quarries. The sand quarries are mainly riverbed sand quarries.

Borrow Areas

The soils to be used, as sub-grade, select sub-grade and shoulder materials need to be hauled from designated borrow areas. The borrow area along the project section with relevant consent/NOC from individual land owner will be obtained before operation of borrow area during construction stage. Location Chart from showing Borrow Areas between Km 1.281 to Km 58.580 is given in **Table 5.3** and shown in **Figure 5.5**.

Table 5-3: Description of Soil Borrow Sources

BA No.	Chainage	Side	Lead (Km)	Area (Acre)	Village
1	1+000	LHS	8.000	5.0	Simarai
2	1+000	LHS	4.500	7.0	Rasoolpur
3	10+800	RHS	1.200	2.5	Bagachan
4	13+800	RHS	0.150	5.0	Grant Sahabganj
5	20+030	RHS	0.070	8.0	Padriya
6	25+500	RHS	0.200	15.0	Dilawarpur
7	31+500	LHS	0.800	2.0	Garbapur
8	36+800	RHS	0.200	1.0	Kakraua-Dhakia
9	39+900	LHS	1.200	2.0	Barenchi
10	44+400	LHS	0.200	5.0	Dohak
11	50+800	RHS	2.500	5.0	Bhatpura-Rasoolpur
12	54+200	RHS	1.000	2.0	Salliya
13	57+200	RHS	1.500	4.5	Hitaudia

There is no stone quarry located in nearby area of the project. As enquired from the U.P. Dept. of Mines and Geology, at present, there are many licensed quarries in Lalkuwan, which is located about 208 Kms from the project road. Natural sand is also available for concrete works at Lalkuwan.

Table 5-4: Aggregate and crushed stone Quarry Location along the Project Road

S. No.	Source Location	Lead (Km)	Chainage (Km)
1	Lalkuwan Quarry	208	30+000

Fly ash

Use of Fly ash in construction of embankment is mandatory as per environmental regulations if the Thermal Power Plant producing fly ash is situated within 100 km radius of the project road. There is one thermal power plant namely "Reliance Thermal Power" is located at Rosa, which is situated within 100 km range from the project road (10 km from Shajahanpur). Since the present road project is to widen the current road to two lanes along the existing alignment, substantial use of fly ash is not anticipated in this project. Only limited use of fly ash is expected at few locations, where the road profile has been raised due to HFL criteria/ and or approach embankments to structures.

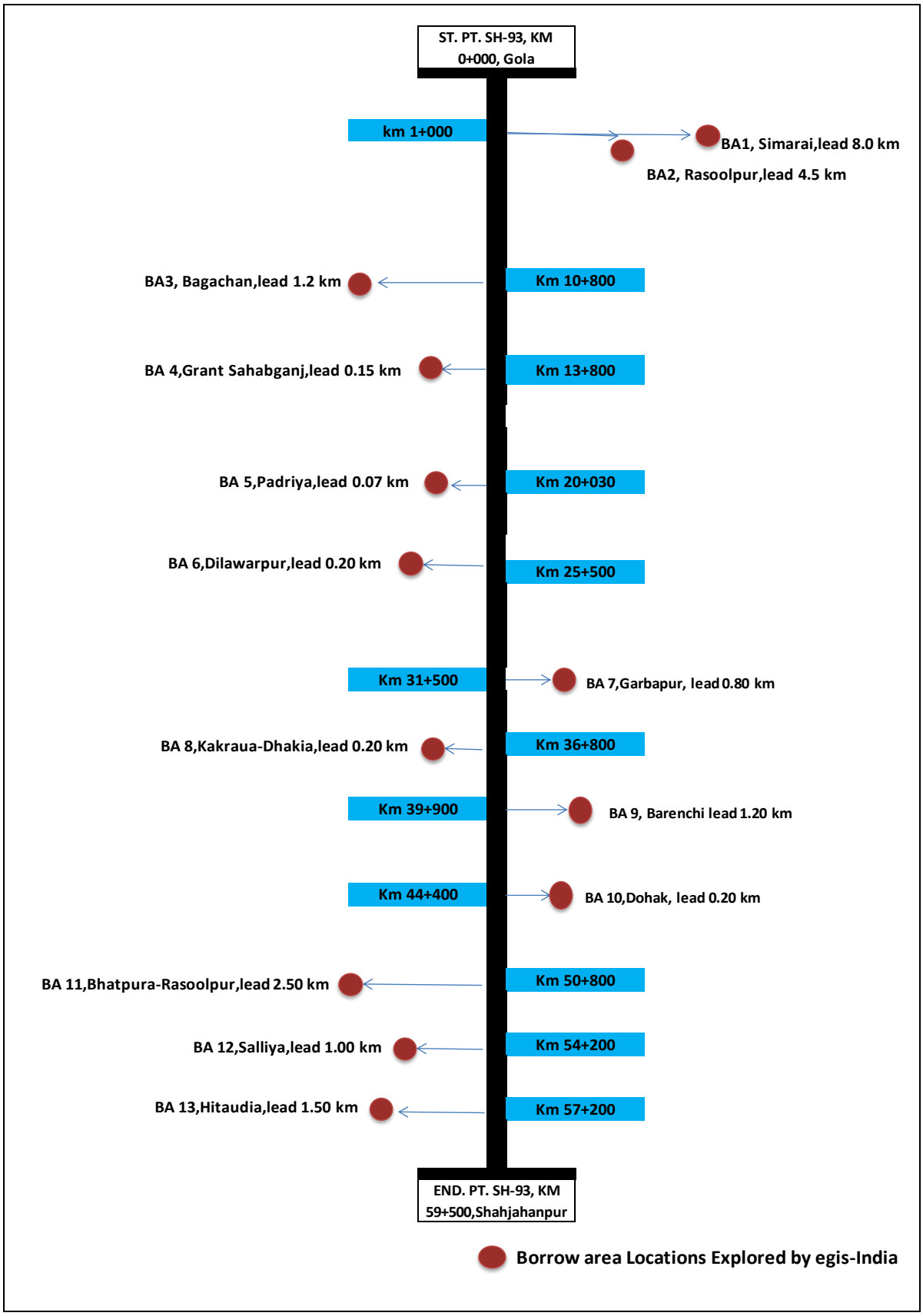


Figure 5.5: Borrow Area Location Chart

5.1.5 Climatic Conditions

The weather, in general, can be said to be dry and moderate.The maximum temperature in Lakhimpur Kheri district reaches upto 44°C in summer while the minimum temperature is 4.2°C in winter. Relative humidity is about 73% and average annual rainfall is 1069 mm.

The average maximum temperature in Shajahanpur districts is 40.3°C, while the average minimum temperature is 9.3°C. Relative humidity is about 80% while average annual rainfall is 1058.4 mm.

The rainy season is generally observed from middle of June to end of September.

The winter season commences from middle of November and ends by the end of the January followed by dry hot summer from February to middle of June. Summers are in general full of gusty winds.

5.1.6 Land Use Pattern

The landuse along the project corridor is predominantly agriculture. The landuse pattern in Lakhimpur Kheri and Shahjahanpur district are presented in **Table 5.5**.

Table 5-5: Land use pattern of Lakimpur Kheri and Shahjahanpur District (Area in '000 ha.)

S. No.	Land Classification	Lakhimpur Kheri District	Shahajahanpur District	Uttar Pradesh
1.	Total Area reported for Land Utilization	**772.8 (100%)**	**437.77 (100%)**	**24170 (100%)**
2.	Forest	164.8 (21.33%)	10.50 (2.42%)	1658 (6.86%)
3.	Barren and Uncultivated land	3.6 (0.46%)	6.99 (1.61%)	486 (2.01%)
4.	Land under non agriculture uses	78.7 (10.23%)	40.27 (9.26%)	2835 (11.73%)
5.	Waste land unfit for Agriculture	3.2 (0.42%)	3.80 (0.87%)	426 (1.76%)
6.	Permanent pastures and grazing land	0.9 (0.12%)	0.97 (0.22%)	66 (0.27%)
7.	Area under trees and grooves	5.9 (0.77%)	3.92 (0.91%)	354 (1.46%)
8.	Current fallow land	31.8 (4.13%)	14.0 (3.22%)	1215 (5.03%)
9.	Other fallow land	4.1 (0.53%)	7.07 (1.64%)	538 (2.23%)
10.	Net area sown	524.8 (68.22%)	349.96 (80.5%)	16592 (68.65%)

Source: Statistical Abstract, Uttar Pradesh, 2012, Govt. of Uttar Pradesh

As per site inventory, the land use along the highway is predominantly agriculture followed by built-up area, and water bodies. The land use pattern along the project road is given in **Table 5.6** and **Figure 5.6**.

Table 5-6: Land use along the project road

S. No.	Chainage (Km)		Terrain	Land use	Total Length (Km)
	From	To			
1	1+280	2+600	Plain	Built up	1.320
2	2+600	2+900	Plain	Agriculture	0.300
3	2+900	3+000	Plain	Built up	0.100
4	3+000	3+400	Plain	Agriculture	0.400
5	3+400	3+600	Plain	Built up	0.200
6	3+600	5+800	Plain	Agriculture	2.200

S. No.	Chainage (Km)		Terrain	Land use	Total Length (Km)
	From	To			
7	5+800	6+700	Plain	Built up	0.900
8	6+700	6+740	Plain	Water body	0.040
9	6+740	9+600	Plain	Agriculture	2.860
10	9+600	9+900	Plain	Built up	0.300
11	9+900	10+700	Plain	Agriculture	0.800
12	10+700	11+600	Plain	Built up	0.900
13	11+600	12+000	Plain	Agriculture	0.400
14	12+000	12+040	Plain	Water body	0.040
15	12+040	13+400	Plain	Forest	1.360
16	13+400	14+000	Plain	Agriculture	0.600
17	14+000	15+500	Plain	Forest	1.500
18	15+500	16+550	Plain	Agriculture	1.050
19	16+550	17+150	Plain	Built up	0.600
20	17+150	19+200	Plain	Agriculture	2.050
21	19+200	19+500	Plain	Built up	0.300
22	19+500	19+700	Plain	Agriculture	0.200
23	19+700	20+500	Plain	Built up	0.800
24	20+500	24+900	Plain	Agriculture	4.400
25	24+900	25+000	Plain	Water body	0.100
26	25+000	29+100	Plain	Agriculture	4.100
27	29+100	32+700	Plain	Built up	3.600
28	32+700	34+000	Plain	Agriculture	1.300
29	34+000	34+050	Plain	Water body	0.050
30	34+050	34+300	Plain	Agriculture	0.250
31	34+300	34+600	Plain	Built up	0.300
32	34+600	39+800	Plain	Agriculture	5.200
33	39+800	39+850	Plain	Water body	0.050
34	39+850	40+400	Plain	Agriculture	0.550
35	40+400	40+700	Plain	Built up	0.300
36	40+700	41+650	Plain	Agriculture	0.950
37	41+650	41+700	Plain	Water body	0.050
38	41+700	43+400	Plain	Agriculture	1.700
39	43+400	43+450	Plain	Built up	0.050
40	43+450	43+600	Plain	Agriculture	0.150
41	43+600	43+700	Plain	Water body	0.100
42	43+700	46+200	Plain	Agriculture	2.500
43	46+200	46+220	Plain	Water body	0.020
44	46+220	48+100	Plain	Built up	1.880
45	48+100	49+400	Plain	Agriculture	1.300
46	49+400	49+500	Plain	Water body	0.100
47	49+500	51+700	Plain	Agriculture	2.200
48	51+700	51+720	Plain	Water body	0.020
49	51+720	58+000	Plain	Agriculture	6.280
50	58+000	58+580	Plain	Built up	0.580

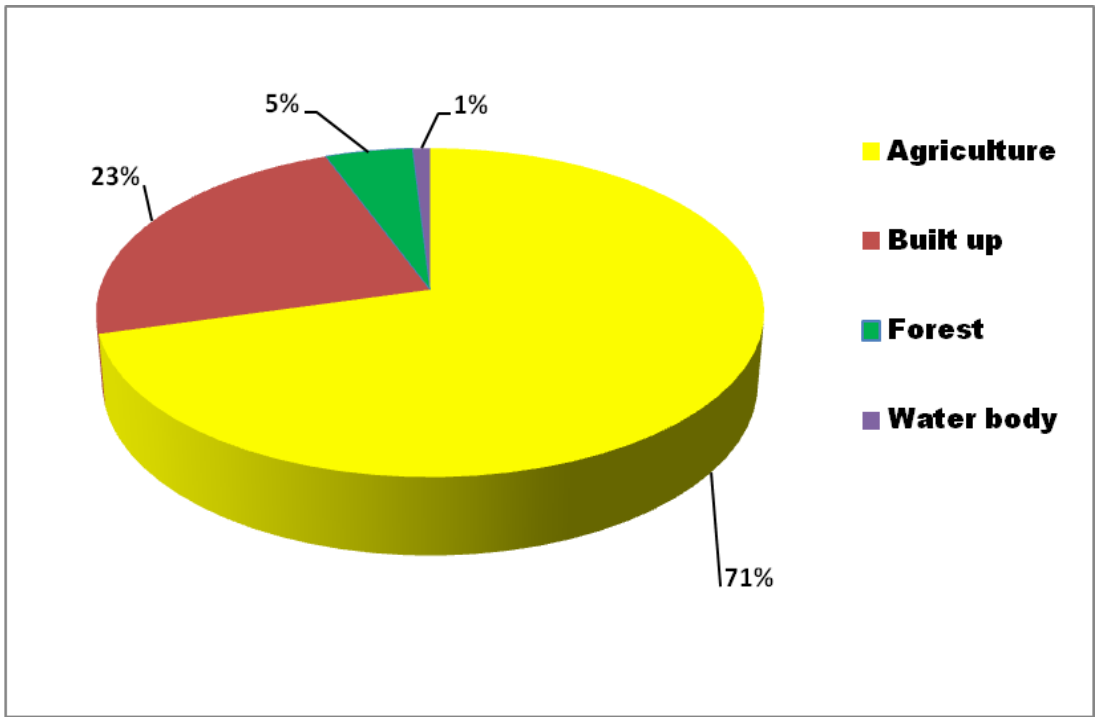


Figure 5.6: Landuse Pattern along the Project Section.

5.1.7 Surface Water Bodies

There are two major rivers namely Kathina river and Gomti River cross the alignment at Km 12.755 and Km 24.900. Apart from these rivers a number of streams and irrigation canals the alignment at different locations. These irrigation canals form major source of surface water utilized for irrigation purpose. Apart from the streams and canals, the area along the project section is dotted with number of ponds. Some ponds are located close to the road. The detailed list of water bodies along the project corridor is presented in **Table 5.7**. Photographic clips of some of the water bodies along the project road are shown in **Figure 5.7.**

Table 5-7: Water Bodies along the Project Road

S. No.	Water bodies	Chainage (Km)	Distance from CL (m)	Width of River/Stream/ Canal (m)	LHS/RHS
1	Stream	1+400	-	8.8	Crosses
2	Pond	5+750	11.00	-	RHS
3	Pond	6+200	28.00	-	RHS
4	Irrigation Canal	7+160	-	19.2	Crosses
5	Pond	8+000	53	-	LHS
6	Pond	9+000	12.00	-	LHS
7	Kathina River	12+755	-	50	Crosses
8	Stream	18+8870	-	6.7	Crosses
9	Gomti River	24+900	-	116	Crosses
10	Pond	27+900	6.500	-	LHS
11	Pond	29+500	7.200	-	RHS
12	Pond	31+200	6.500	-	RHS
13	Irrigation Canal	34+000	-	8.1	Crosses

S. No.	Water bodies	Chainage (Km)	Distance from CL (m)	Width of River/Stream/ Canal (m)	LHS/RHS
14	Stream	35+238	-	8.4	Crosses
15	Stream	39+835	-	8.7	Crosses
16	Pond	40+600	10.00	-	LHS
17	Irrigation Canal	41+650	-	8.7	Crosses
18	Pond	42+800	13.00	-	RHS
19	Stream	43+670	-	41	Crosses
20	Pond	43+600	9.00	-	LHS
21	Pond	47+200	8.50	-	LHS
22	Irrigation Canal	46+200	-	37	Crosses
23	Stream	49+400	-	20	Crosses
24	Irrigation Canal	51+700	-	12.5	Crosses
25	Pond	53+965	7.0	-	LHS

Gomti River at Km 24+900

Pond at Km 42+800 (LHS)

Figure 5.7: Photographs of Water Bodies along the Project Road

Primary data generation on surface water quality was carried out in the month of November, 2014 in order to assess the surface water quality within the project area. The water samples from the following water sources were collected for assessing the physico-chemical characteristic of water are given in **Table 5.8.** The analysis result of various quality parameters has been presented in **Table 5.9**

Table 5-8: Locations of Surface Water Sampling

S. No.	Sample Code	Sources	Location (Name)	Chainage (Km)
1.	SW-1	Gomti River	-	24+900
2.	SW-2	Pond	Machecha	42+800

Table 5-9: Characteristics of Surface Water in the Project Area

S. No.	Parameters	Unit	Concentration	
			Gomti River (SW-1)	Pond at Machecha (SW-2)
1	Temperature	° C	25	22
2	pH at 26^{0}C		7.90	7.12
3	Turbidity	NTU	3.7	74
4	Electrical	µs/cm	343.0	308

S. No.	Parameters	Unit	Concentration	
			Gomti River (SW-1)	Pond at Machecha (SW-2)
	Conductivity at 25° C			
5	Colour	Hazen	<1.0	4
6	Total Suspended Solids (as TSS)	mg/l	6.4	165
7	Total Dissolved Solids (as TDS)	mg/l	211.00	168
8	Odour		Unobjectionable	Unobjectionable
9	Dissolved Oxygen	mg/l	6.2	6.6
10	Biochemical Oxygen Demand (for 3 days at 27^0 C)	mg/l	<2.0	29.4
11	Chemical Oxygen Demand	mg/l	<4.0	95.23
12	Total Kjeldahl Nitrogen	mg/l	<0.3	3.24
13	Total Hardness (as CaCO3)	mg/l	168.56	141.12
14	Sodium (as Na)	mg/l	18	6
15	Potassium	mg/l	4	12
16	Calcium (as Ca)	mg/l	34.5	31.36
17	Magnesium	mg/l	19.76	15.05
18	Ammonia	mg/l	<0.1	1.18
19	Chloride (as Cl)	mg/l	7.6	7.6
20	Sulfate (as SO4)	mg/l	6.76	6.28
21	Phosphate	mg/l	0.25	<0.15
22	Nitrate (as NO3)	mg/l	1.37	0.94
23	Fluoride (as F)	mg/l	0.41	0.46
24	Surfactants	mg/l	<0.02	<0.02
25	Dissolved Iron	mg/l	<0.05	<0.05
26	Copper (as Cu)	mg/l	<0.02	<0.02
27	Zinc (as Zn)	mg/l	<0.02	<0.02
28	Manganese (as Mn)	mg/l	0.13	0.23
29	Arsenic (as As)	mg/l	<0.01	<0.01
30	Lead (as Pb)	mg/l	<0.005	<0.005
31	Mercury (as Hg)	mg/l	<0.001	<0.001
32	Boron (as B)	mg/l	<0.5	<0.5
33	Chromium (as Cr)	mg/l	<0.01	<0.01
34	Phenols	mg/l	<0.001	<0.001
35	Cadmium (as Cd)	mg/l	<0.001	<0.001
36	Total coliform	MPN/100ml	8	2
37	Faecal Coliform	/100ml	Present	Absent

Source: Primary Data collected from site

The analysis result reflects that all the surface water bodies from which the water samples were taken, meet the quality criteria for Class C (Drinking water source after conventional treatment and disinfection) and Class D (Propagation of Wildlife and Fisheries) of surface water. The pH is varying from 7.12 to 7.90, Dissolve Oxygen is varying from 6.2 mg/l to 6.6 mg/l and Biological

Oxygen Demand (BOD) ranged from <2 mg/l to 29.41 mg/l. All the other measured parameters were observed well within the prescribed limit of water quality standards.

5.1.8 Ground Water Quality

The generation of baseline data on groundwater quality within the project area was carried in the month of November 2014. The ground water samples were collected from 3 locations along the project corridor to assess the quality of ground water around project area. The location of sampling is given in **Table 5.10**. The result of physico-chemical analysis of ground water is given in **Table 5.11.**

Table 5-10: Locations of Ground Water Sampling

S. No.	Sample Code	Chainage (Km)	Location	Sources
1.	GW-1	1+000	Gola (LHS)	Hand Pump
2.	GW-2	30+300	Mohammadi (LHS)	Hand Pump
3.	GW-3	58+400	Shahjahanpur (LHS)	Hand Pump

Table 5-11: Physico-Chemical Characteristics of Ground Water Samples

Sl. No.	Parameters	Unit	Concentration			Water Quality Standard as per BIS (IS: 10500:1991)	
			GW-1	GW-2	GW-3	Desirable Limit	Max. Permissible Limits in the absence of alternate source
1	Temperature	° C	28	28	27		
2	pH at 25^0C		7.61	7.19	7.31	6.5 to 8.5	No relaxation
3	Turbidity	NTU	<1.0	<1.0	<1.0	5	10
4	Electrical Conductivity at 25° C	µs/cm	729	1081	563		
5	Colour	Hazen	<1.0	<1.0	<1.0	5	25
6	Total Suspended Solids (as TSS)	mg/l	<2.5	<2.5	<2.5		
7	Total Dissolved Solids (as TDS)	mg/l	415	618	320	500	2000
8	Odour		Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
9	Dissolved Oxygen	mg/l	6.8	6.6	6.1		
10	Biochemical Oxygen Demand (for 3 days at 27^0 C)	mg/l	2.7	<2.0	<2.0		
11	Chemical Oxygen Demand	mg/l	11.9	<4.0	<4.0		
12	Total Kjeldahl Nitrogen	mg/l	<0.3	<0.3	<0.3		
13	Total Hardness (as $CaCO_3$)	mg/l	388.08	450.8	250.8	300	600
14	Sodium (as Na)	mg/l	22	68	22		
15	Potassium	mg/l	9.0	9.6	1		
16	Calcium (as Ca)	mg/l	90.94	90.94	45.47	75	200
17	Magnesium	mg/l	38.57	53.62	32.93		
18	Ammonia	mg/l	<0.1	<0.1	<0.1		

Sl. No.	Parameters	Unit	Concentration			Water Quality Standard as per BIS (IS: 10500:1991)	
			GW-1	GW-2	GW-3	Desirable Limit	Max. Permissible Limits in the absence of alternate source
19	Chloride (as Cl)	mg/l	24.69	106.36	13.29	250	1000
20	Sulfate (as SO_4)	mg/l	42.6	15.4	6.8	200	400
21	Phosphate	mg/l	<0.15	<0.15	<0.15		
22	Nitrate (as NO_3)	mg/l	15.76	0.14	17	45	100
23	Fluoride (as F)	mg/l	0.38	0.63	0.56	1.0	1.5
24	Surfactants	mg/l	<0.02	<0.02	<0.02		
25	Dissolved Iron	mg/l	0.10	<0.05	<0.05	0.3	1.0
26	Copper (as Cu)	mg/l	<0.02	<0.02	<0.02	0.05	1.5
27	Zinc (as Zn)	mg/l	<0.02	0.45	0.16	5.0	15.0
28	Manganese (as Mn)	mg/l	<0.02	0.07	0.03	0.10	0.3
29	Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	0.05	No relaxation
30	Lead (as Pb)	mg/l	0.08	<0.005	<0.005	0.05	No relaxation
31	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	0.001	No relaxation
32	Boron (as B)	mg/l	<0.5	<0.5	<0.5	1.0	5.0
33	Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	0.05	No relaxation
34	Phenols	mg/l	<0.001	<0.001	<0.001	0.001	0.002
35	Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	0.01	No relaxation
36	Total coliform	MPN/100ml	63	<2	<2		
37	Faecal Coliform	/100ml	Present	Absent	Absent		

Source: Primary Data collected from site

The test results of the ground water samples along the project road at all the locations reflect that the pH was within permissible limit. The same varied between 7.19 to 7.61. The Total dissolve solid varied from 320.00 mg/l to 618.00 mg/l at different locations along the project road. The water sample collected from Mohammadi showed TDS as high as 618.00 mg/l which is higher that the desirable level but within the maximum permissible level as per IS: 10500. The Total hardness (as $CaCO_3$) ranged from 250.8 mg/l to 450.8 mg/l at different locations along the project road. The Fluoride (as F) is below the permissible limit in all the samples taken along the project road.

5.1.9 Ambient Air Quality

To study the baseline ambient air quality scenario within the project corridor with respect to PM_{10}, $PM_{2.5}$, SO_2, Nox, CO and HC, post-monsoon air sampling was carried out in the month of November, 2104. The samples of air were collected from three locations covering representative locations with respect to landuse and location of sensitive receptors along the project. The air sampling locations with respect to the proposed project road has been presented in **Table 5.12.** The air quality analysis report is given **Table 5.13**.

Table 5-12: Proposed Air Quality Sample Location

S. No.	Monitoring Station Code	Location		Landuse
		Place	Chainage (Km)	
1.	AQ-1	Kanja Gola	2+200	Residential & Commercial area
2.	AQ-2	Mohammadi	28+900	Commercial and Mixed activities
3.	AQ-3	Shahjahanpur	57+900	Industrial, Commercial and Mixed Activities

Table 5-13: Ambient Air Quality at Different Locations along Project Corridor

S. No.	Location	Chainage (Km)	Concentration Level	Concentration					
				PM_{10} (µg /m^3)	$PM_{2.5}$ (µg /m^3)	SO_2 (µg /m^3)	NOx (µg /m^3)	CO (mg /m^3)	HC (ppm)
1.	Kanja Gola	2+200	Maximum	122	69	6.7	27.8	0.85	0.784
			Minimum	96	52	5.4	25.0	0.51	0.575
			Mean	**109**	**62**	**6.7**	**27.7**	**0.8**	**0.777**
2.	Mohammadi	28+900	Maximum	112	58	5.2	25.3	0.65	0.758
			Minimum	88	48	4.5	22.2	0.47	0.568
			Mean	**99**	**52**	**4.9**	**23.9**	**0.56**	**0.653**
3	Shajahanpur	57+900	Maximum	189	94	6.3	26.1	1.050	0.882
			Minimum	169	86	5.1	23.7	0.65	0.575
			Mean	**177**	**91**	**5.9**	**24.7**	**0.88**	**701.81**
Standard				***100.0***	***60.0***	***80.0***	***80.0***	***2.0***	**-**

Source: *Primary Data collected at site*

The mean concentration of PM_{10} in ambient air was found in the range of 109 µg/m^3 at Kanja Gola, 99.00 µg/m^3 at Mohamadi and 177.0 µg/m^3 at Shahjahanpur. The mean concentration of $PM_{2.5}$ in the ambient air was found in the range of 62 µg/m^3 at Kanja Gola, 52 µg/m^3 at Mohamadi and 91 µg/m^3 at Shahjahanpur. The Kanja Gola showed slightly higher concentrations of PM10 and PM2.5 than the National Ambient Air Quality Standards i.e. 100 µg/m^3 for PM10 and 60 for PM2.5. The Kanjagola is a congested area with commercial activities (market area). There

is major junction near the monitoring location. Congested traffic movement and activities in the market area result into generation of dust.

The concentration of PM_{10} and $PM_{2.5}$ in the air at Shahjahanpur at Km 57.900 exceeded the National Ambient Air Quality Standard significantly. At shahjahanpur presently construction of ROB is in progress which has caused damage to the road surface, moreover the movement of construction vehicles and materials result into generation of fugitive dust around the construction area. A number of brick kilns are operational around the project stretch at this location which also add to the dust concentration in the area. These may be attributed to the significant rise in fine dust around the area.

The concentration of other air quality parameters studies was observed well within standard limit at all the locations.

Ambient Noise Level

Noise level monitoring was carried out in the month of November, 2014 at different sensitive locations along the project road to understand the present scenario of noise pollution along the project section locations covering different land use including sensitive sites, residential and commercial areas. The locations for Noise monitoring are given in **Table 5.14**. The Daytime and Nighttime noise level is presented in **Table 5.15**.

Table 5-14: Noise Monitoring Locations

S. No.	Location Code	Location	Chainage (Km)	Distance from Highway Edge (m)	Direction from Highway	Landuse
1.	NQ-1	Kanja Gola	2+200	8.0	RHS	Residential/Commercial
2.	NQ-2	Mohammadi	28+900	15.10	RHS	Sensitive location
3.	NQ-3	Gokan	40+500	13.7	RHS	Sensitive location
4.	NQ-4	Shajanhanpur	58+000	8.0	RHS	Mixed Activities

Table 5-15: Noise Level along Project Alignment

Station Code	Place	Equivalent Noise Level (Leq dB(A))			
		Mean Daytime	Mean Nighttime	Max.	Min.
NQ-1	Kanja Gola	60.6	50.3	64.9	43.5
NQ-2	Mohammadi	58.9	45.3	63.4	41.1
NQ-3	Gokan	53.8	45.4	59.7	40.9
NQ-4	Shajanhanpur	72.1	59.2	77.5	51.6
Permissible Limits as per CPCB in Leq dB(A) Day Time & Night Time			**Zone**	**Day Time**	**Night Time**
			Industrial Zone	75.0	65.0
			Commercial/ Mixed Activities Zone	65.0	55.0
			Residential/ Rural Zone	55.0	45.0
			Silence Zone	50.0	40.0

Source: *Primary Data collected at site*

The ambient noise level was monitored along project corridor at four locations to assess the noise pollution levels. The average daytime equivalent noise level was recorded in the range of 53.8

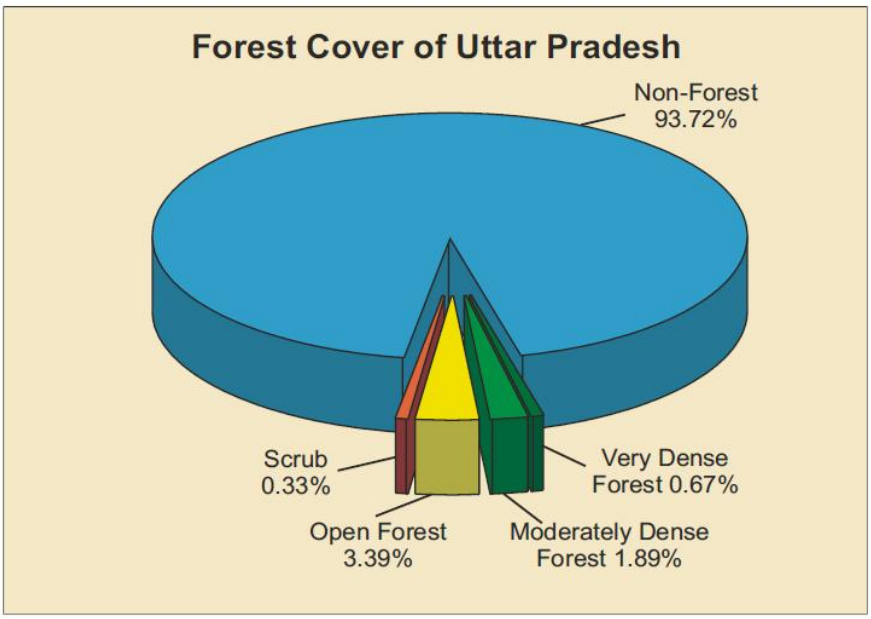
Leq dB(A) to 72.1 Leq dB(A) whereas the same varied from 45.3 Leq dB(A) to 59.2 Leq dB(A) during night time. The noise levels were observed within permissible level for commercial and mixed area at all the locations except at Shahjahanpur. At Shahjahanpur daytime equivalent noise was recorded to 72.1 Leq dB(A), which is higher than permissible limit for Commercial and mixed rea (65 Leq dB(A)) but within permissible level for industrial area . The higher noise level at Shahjahanpur may be attributed to due to congested built-up area located along the project road on both the side and congested traffic movement, congestion created around construction of ROB at Shahjahanpur and frequent horn blows. The nighttime equivalent noise levels were within the permissible level at all the location with their respective to land use zone.

5.2 Ecological Resources

The project stretch does not pass through any significant natural vegetation community. The major land use pattern is agriculture followed by builtup area.

5.2.1 Forest Cover

The project road of Gola to Shahjahanpur section of SH-93 is located in the state of Uttar Pradesh. As per Indian State of Forest Report 2013, the total forest cover in Uttar Pradesh is 14,349 sq.km, which is 5.96% of state geographic area. Out of total forest cover in the state, very dense forest is spread in 1,623 sq.km, moderately dense forest cover about 4,550 sq. km and open forest cover about 8,176 sq.km. The forest cover map of Uttar Pradesh is shown in **Figure 5.8.**



Source: India State Forest Report 2013

Figure 5.8: Forest Cover in the state of Uttar Pradesh

The forest cover in the concerned project districts as per India State Forest Report 2013 is given in **Table 5.16**. The report reflects that forest cover in Lakhimpur Kheri and Shahjahanpur districts are 17.07 percent and 2.69 percent of total geographical area of the district, respectively. The district of Lakhimpur Kheri has more percentage of land under forest coverage than the state's percentage of forest coverage, whereas the district of Shahjahanpur has lower

percentage of area under forest than that of state's ratio forest cover.

Table 5-16: District-wise Forest Coverage along Project Road

State/ District	District / State Geographical area (sq.km)	Very Dense Forest (sq.km)	Moderately Dense Forest (sq.km)	Open Forest (sq.km)	Total (sq.km)	Percent of Forest from District Geographical area
Lakhimpur Kheri	7860	409	475	427	1311	17.07
Shahjahanpur	4575	23	63	37	123	2.69
Uttar Pradesh	**240928**	**1623**	**4550**	**8176**	**14349**	**5.96**

Source: India State Forest Report 2013, Forest Survey of India, MoEFCC

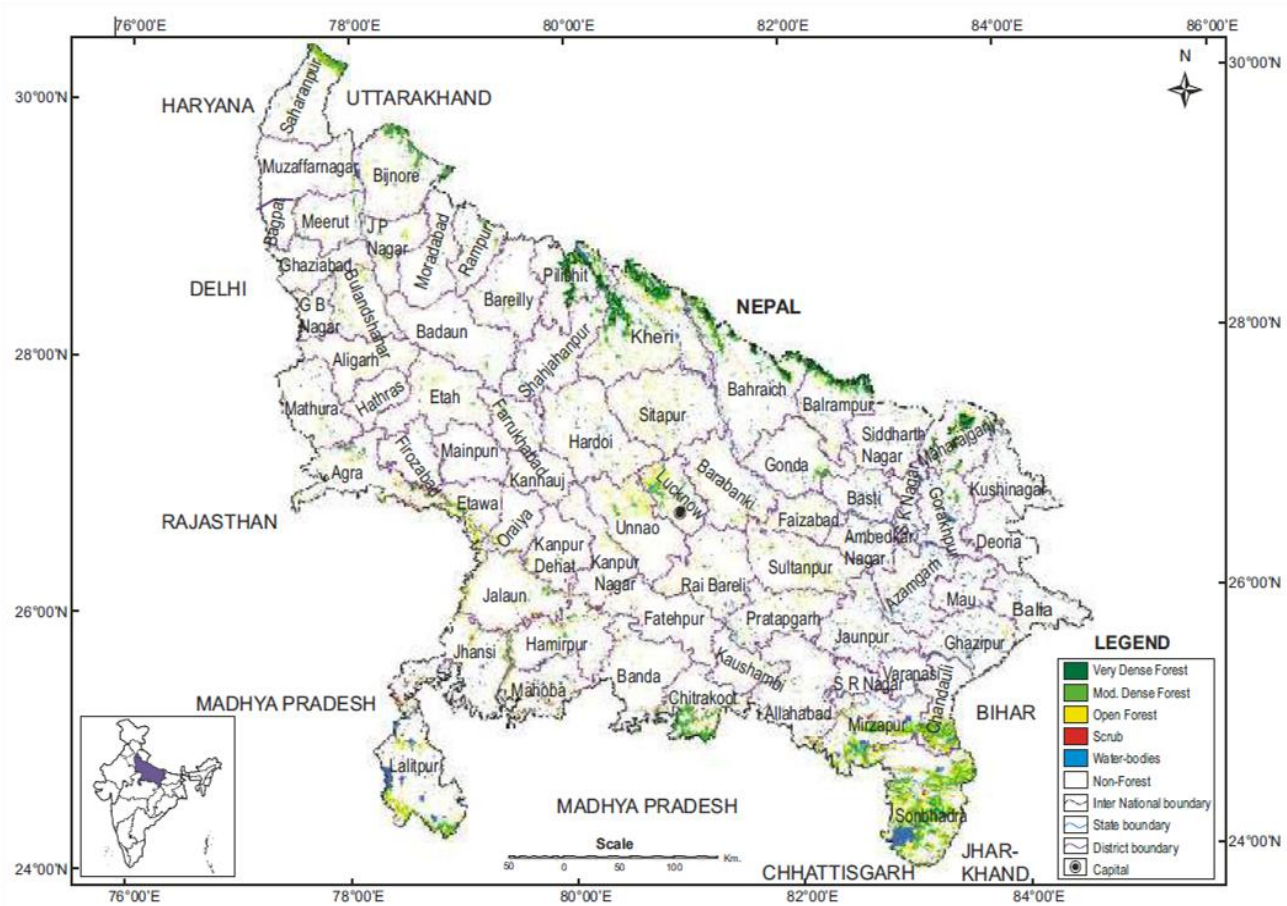


Figure 5.9: Forest Cover Map of Uttar Pradesh

5.2.2 Reserve Forest

Pockets of reserved forest is located along the project section at two locations covering a total length of about 2.900 Km. The Kathina River forms the boundary of the reserved forest. In these pockets of reserve forest area plantation of teak, sal and sheesham trees has been done by the local forest department for commercial utilisation. **Table 5.17** depicts location of reserved forest pockets along the project road. The photographs of the reserved forest pockets are shown in **Figure 5.10.**

Table 5-17: Details of stretches of Reserved Forest along the ROW of Project road

S. No	Chainage (Km)		Length (Km)
	From	To	
1.	12+000	13+400	1.400
2.	14+000	15+500	1.500
	Total length		2.900


Figure 5.10: Reserved Forest Pockets along the Project Road

5.2.3 Wildlife Sanctuary/ National Park/ Tiger Reserve or Eco-sensitive Zone

Uttar Pradesh has one National Park and 23 Wildlife Sanctuary. The Project section does not pass through wildlife sanctuary, national park or notified ecologically sensitive areas or any other significant area of ecological interest, neither these features are located within 10 Km radius on either side of the project road. The only National Park in the state i.e. Dudhwa National Park is located in Lakhimpur Kheri district, which is approximately 50 km away from the Project road.

5.2.4 Threatened or Endangered Species

No threatened or endangered flora or fauna exists along the project corridor

5.2.5 Wetlands of Ecological Importance

The Wetland atlas prepared by the Ministry of Environment and Forests reflects that there is no significant wetland exists in both the districts district. The site survey also confirms the absence of such feature along the project corridor.

5.2.6 Protected Forest

In the state of Uttar Pradesh linear plantation along National Highways, State Highways and Canals within right of way has been declared as Protected Forests by the State's Department of Forest and accordingly the land within the ROW was transferred to the Forest Department after Notification. For the project stretch of SH-93, the roadside plantation within the existing RoW on either side has been declared as Protected Forest. Hence the felling of tree within RoW will attract the provision of Forest (Conservation) Act. The notification of the same is enclosed as **Annexure 5.2**.

5.2.7 Roadside Trees

Plantation of trees along the project section has been recorded within the RoW. The predominant tree species along roads are Eucalyptus, Siris, Neem, Sheesham, Mango, etc Apart from these Peepal, Banyan, Palm, Babool etc are also located along the roadside. Mostly single row of linear plantation is observed along either side of the road except few locations where plantation in two rows has been observed. Majority of the trees are located with 10 m from centre line on both the side. Altogether a total number of 5289 trees of varying girth is recorded along the project stretch within 30 m of road corridor. The kilometer-wise distribution of trees along the project stretch is presented in the **Table 5.18** and the species wise and girth wise details of trees likely to be affected due to the project is provided in **Annexure 5.3.**

Table 5-18: Kilometer wise distribution of trees along the Project Road

S. No.	Chainage (Km)		LHS	RHS	Total
	From	To			
1	0+000	1+000	23	9	32
2	1+000	2+000	57	35	92
3	2+000	3+000	94	17	111
4	3+000	4+000	47	6	53
5	4+000	5+000	64	63	127
6	5+000	6+000	47	49	96
7	6+000	7+000	46	76	122
8	7+000	8+000	65	76	141
9	8+000	9+000	30	40	70
10	9+000	10+000	43	37	80
11	10+000	11+000	63	74	137
12	11+000	12+000	58	84	142
13	12+000	13+000	26	68	94
14	13+000	14+000	27	44	71
15	14+000	15+000	43	95	138
16	15+000	16+000	20	30	50
17	16+000	17+000	12	40	52
18	17+000	18+000	33	146	179
19	18+000	19+000	28	77	105
20	19+000	20+000	40	66	106
21	20+000	21+000	31	82	113
22	21+000	22+000	40	78	118
23	22+000	23+000	18	38	56
24	23+000	24+000	39	56	95
25	24+000	25+000	43	21	64
26	25+000	26+000	6	52	58
27	26+000	27+000	3	43	46
28	27+000	28+000	20	42	62
29	28+000	29+000	50	71	121
30	29+000	30+000	15	62	77
31	30+000	31+000	31	44	75
32	31+000	32+000	42	44	86
33	32+000	33+000	67	66	133
34	33+000	34+000	47	37	84

S. No.	Chainage (Km)		LHS	RHS	Total
	From	To			
35	34+000	35+000	83	59	142
36	35+000	36+000	94	45	139
37	36+000	37+000	51	45	96
38	37+000	38+000	32	23	55
39	38+000	39+000	23	13	36
40	39+000	40+000	22	20	42
41	40+000	41+000	8	5	13
42	41+000	42+000	8	10	18
43	42+000	43+000	50	14	64
44	43+000	44+000	25	42	67
45	44+000	45+000	43	26	69
46	45+000	46+000	65	39	104
47	46+000	47+000	23	57	80
48	47+000	48+000	32	37	69
49	48+000	49+000	22	31	53
50	49+000	50+000	31	27	58
51	50+000	51+000	70	17	87
52	51+000	52+000	134	31	165
53	52+000	53+000	62	47	109
54	53+000	54+000	32	23	55
55	54+000	55+000	117	70	187
56	55+000	56+000	57	54	111
57	56+000	57+000	62	24	86
58	57+000	58+000	58	38	96
59	58+000	58+700	33	39	72
Total			**2555**	**2704**	**5289**

Species-wise affected trees along the project alignment within 20 m corridor is presented in the following **Table 5.19.**

Table 5-19: Species-wise Distribution of Trees along the Project Road

S. No.	Species	***Scientific Name***	Total Number
1	Ashok	*Polyalthia longifolia*	21
2	Amla	*Phyllanthus emblica*	6
3	Babool	*Acasia arabica*	68
4	Bakain	*Melia azadirach*	19
5	Banyan	*Ficus benghalensis*	18
6	Bel	*Aegle marmelos*	1
7	Ber	*Ziziphus jujuba*	15
8	Eucalyptus	*Eucalyptus hybrid*	686
9	Gular	*Ficus glomerata*	8
10	Gulmohar	*Delonix regia*	61
11	Jamun	*Eugenia jambolana*	60
12	Jungle Jalebi	*Pithecellobium dulce*	44
13	Kadamb	*Anthocephalus cadamba*	16
14	Kanchan	*Bauhinia sps.*	10
15	Kaner	*Thevetia peruviana*	5

S. No.	Species	*Scientific Name*	Total Number
16	Karanj	*Pongamia pinnata*	279
17	Khajoor	*Phoenix dactylifera*	2
18	Mahogany	*Swietenia mahagoni*	261
19	Mahua	*Madhuca indica*	1
20	Mango	*Mangifera indica*	469
21	Neem	*Azadirachta indica*	443
22	Pakar	*Ficus infectoria*	302
23	Palm	*Palmyra Palm*	40
24	Peepal	*Ficus religiosa*	64
25	Poplar	*Populus sps.*	26
26	Sheesham	***Dalbergia sissoo***	1499
27	Siris	*Albizia lebbeck*	545
28	Teak	*Tectona grandis*	280
29	Others		40
		Total	**5289**

5.2.8 Green Tunnel

There is no green tunnel situated along the project corridor.

5.2.9 Fauna

Domesticated animals constitute the faunal density in the area surrounding the project road. These are dogs, cows, ox, buffaloes, goat, etc. Common birds like crow, parrot, pigeon, common ducks, bagula, etc. are seen here. No endangered flora and fauna species are spotted within the proposed project corridor. Sometime wild animals like Neel gai, Fox and jackals, etc are observed in the project vicinity. There is no natural habitat of these animals along the highway section.

5.3 Social Environment

5.3.1 Demographic Profile

The demographic features of the project district as per 2011 Census are provided in **Table 5.20.** The population density is far lower in the district with respect to the State's population density. The sex ratio reflects the socio-economic and demographic characteristics of the population. It is an important indicator of migration and gender equity (in a developing country context) since it helps to point out the employment opportunity in the districts. There are 912 females for every thousand males in Uttar Pradesh State, while the sex ratios of the project concern districts are 861 females for every 1000 males, which is lower than the state's ratio.

Table 5-20: District wise Demographic Profile of the Project Area

District / State	Total Rural Urban	Total No of House Hold	Population			Sex Ratio	Population Density (no. per sq Km)
			Total	Male	Female		
Lakhimpur Kheri	Total	527501	3006538	1606403	1400135	871	382
	Rural	425057	2412446	1293714	1118732	864	
	Urban	102444	594092	312689	281403	900	

District / State	Total Rural Urban	Total No of House Hold	Population			Sex Ratio	Population Density (no. per sq Km)
			Total	Male	Female		
Shahjahanpur	Total	745077	4021243	2123187	1898056	894	858
	Rural	661245	3560208	1880679	1679529	893	
	Urban	83832	461035	242508	218527	901	
Uttar Pradesh	**Total**	**33448035**	**199812341**	**104480510**	**95331831**	**912**	**829**
	Rural	**25685942**	**155317278**	**80992995**	**74324283**	**918**	
	Urban	**7762093**	**44495063**	**23487515**	**21007548**	**894**	

Source: Census of India, 2011 Census

5.3.2 Schedule Castes and Schedule Tribes

Table 5.21 depicts the population details of Scheduled Castes (SC) Scheduled Tribes (ST) in the concerned districts.

Table 5-21: SC and ST Population of Concern District in Project Area

District/ State	Total Rural Urban	Population					
		SC			ST		
		Total	Male	Female	Total	Male	Female
Lakhimpur Kheri	Total	532673	285280	247393	508	259	249
	Rural	479352	257180	222172	251	122	129
	Urban	53321	28100	25221	257	137	120
Shahjahanpur	Total	1061782	559240	502542	53375	26984	26391
	Rural	1019387	536713	482674	52446	26460	25986
	Urban	42395	22527	19868	929	524	405
Uttar Pradesh	**Total**	**41357608**	**21676975**	**19680633**	**1134273**	**581083**	**553190**
	Rural	**35685227**	**18663920**	**17021307**	**1031076**	**526315**	**504761**
	Urban	**5672381**	**3013055**	**2659326**	**103197**	**54768**	**48429**

Source: Census of India, 2011 Census

5.3.3 Literacy Rate

Literacy rate is a significant indicator of any district or state's economic as well as social development status. The higher literacy rate indicates higher awareness and vice versa.

The Literacy rate of the state according to the 2011 Census is 57.25%. The literacy rates for Lakhimpur Keri and Shahjahanpur are 49.58 5 and 50.58 % respectively.

Table 5.22 below provides the area wise male and female literacy rates of the state of Uttar Pradesh, and the project districts.

Table 5-22: Literacy Rate

District / State	Total Rural Urban	Population			% age
		Total	Male	Female	
Lakhimpur Kheri	Total	1490930	915142	575788	49.58
	Rural	1156822	725363	431459	47.95
	Urban	334108	189779	144329	56.24

District / State	Total Rural Urban	Population			% age
		Total	Male	Female	
Shahjahanpur	Total	2034044	1237157	796887	50.58
	Rural	1746934	1076152	670782	49.06
	Urban	287110	161005	126105	62.27
Uttar Pradesh	**Total**	**114397555**	**68234964**	**46162591**	**57.25**
	Rural	**85284680**	**51793688**	**33490992**	**54.91**
	Urban	**29112875**	**16441276**	**12671599**	**65.43**

Source: Census of India, 2011 Census

5.3.4 Employment Pattern

The work participation rate for total workers is defined as the percentage of total workers to total population. In a similar way it is defined for main and the marginal workers. **Table 5.23** & **Table 5.24** illustrate the work participation in the project districts of the state of Uttar Pradesh as a whole for the marginal workers and the main workers respectively. The relative importance of the main spheres of economic activity may be gauged from the pattern of distribution of main workers in cultivation, agricultural labour, household industry and other economic activities.

Table 5-23: Work Participation for the Marginal Workers

District / State	Total Rural Urban	Population		
		Total	Male	Female
Lakhimpur Kheri	Total	192711	142593	50118
	Rural	158778	115924	42854
	Urban	33933	26669	7264
Shahjahanpur	Total	306469	202986	103483
	Rural	276078	180374	95704
	Urban	30391	22612	7779
Uttar Pradesh	**Total**	**21179223**	**12426463**	**8752760**
	Rural	**18412163**	**10540532**	**7871631**
	Urban	**2767060**	**1885931**	**881129**

Source: Census of India, 2011 Census

Table 5-24: Work Participation for the Main Workers

District / State	Total Rural Urban	Population		
		Total	Male	Female
Lakhimpur Kheri	Total	699503	640720	58783
	Rural	560332	515060	45272
	Urban	139171	125660	13511
Shahjahanpur	Total	958249	855497	102752
	Rural	849900	758812	91088
	Urban	108349	96685	11664
Uttar Pradesh	**Total**	**44635492**	**37420299**	**7215193**
	Rural	**33538817**	**27812347**	**5726470**
	Urban	**11096675**	**9607952**	**1488723**

Source: Census of India, 2011 Census

5.4 Economic Development

5.4.1 Agriculture Pattern

Agriculture remains the main occupation of the people of the project concerned district and about 80% of the population depends on agriculture for its livelihood. The distribution of area of land irrigated by different sources of irrigation is Canals and bore wells. The details area, production and productivity of major crops cultivated in Lakhimpur Kheri and Shahjahanpur districts are given in **Table 5.25** and **Table 5.26** respectively.

Table 5-25: Area, Production and Productivity of Major Crops Cultivated in the Lakhimpur Kheri District

S. No.	Crop	Area (ha.)	Production (Qtl.)	Productivity (Qtl./ha.)
1.	Rice	180163	429358	23.83
2.	Wheat	230270	580397	28.55
3.	Maize	9148	8622	8.24
4.	Urd	3454	1090	4.38
5.	Lentil	23478	18125	7.72
6.	Pea	742	726	9.79
7.	Pigeon Pea	1709	1138	6.66
8.	Seasame	4081	257	1.40
9.	Mustard	30266	20255	6.69
10.	Ground Nut	5200	3110	5.98
11.	Sugar Cane	219325	10975023	500.40
12.	Potato	1297	19829	152.80

Source: updes.up.nic.in/district profile/

Table 5-26: Area, Production and Productivity of Major Crops Cultivated in the Shahjahanpur District

S. No.	Crop	Area (ha.)	Production (Qtl.)	Productivity (Qtl./ha.)
1.	Rice	204915	459829000	22.44
2.	Maize	297	5610000	18.87
3.	Jowar	1553	1592000	10.25
4.	Bajra	4666	5291000	10.25
5.	Pulses (Kharif)	8483	5455000	-
6.	Seasame	4765	548000	1.15
7.	Ground Nut	6101	6278000	10.29
8.	Soyabean	56	55000	9.76
9.	Wheat	247112	864892000	35.00
10.	Barley	574	1169000	20.36
11.	Gram	543	483000	8.89
12.	Pea	1600	1872000	11.70
13.	Lentil	5412	3969000	7.33
14.	Linseed	289	119000	4.13
15.	Mustard	7677	7351000	9.58
16.	Toria	12000	9608000	8.00

Source: updes.up.nic.in/district profile/

5.4.2 Educational Institutes / Hospitals

The educational institutions and hospital/health centers constitute the sensitive environmental receptors. The list of such features along the ROW along the project roads is presented in **Table 5.27**. Photographic view of few educational institutions located along the Project Road is shown in **Figure 5.11**

Table 5-27: List of Environmental Sensitive Receptors along ROW of Project Road

S. No.	Institution / Hospitals	Chainage (Km)	Distance from CL	LHS/RHS
1	School	0+200	8+500	LHS
2	Sardar Patel Smarak Inter College	5+400	10+500	LHS
3	Mamri School	6+100	15+000	RHS
4	School	9+100	23+500	RHS
5	Mayagrani Bal Vidyamandir	11+550	11+800	LHS
6	School	20+400	15+500	RHS
7	A G Convent School	20+500	20+000	RHS
8	ITI	26+650	15+500	RHS
9	Doon Public School	27+050	18+000	LHS
10	New Gurukool School (Gate)	31+400	12+400	LHS
11	R P Inter College	34+920	14+000	LHS
12	P B Memorial School	40+200	15+500	RHS

ITI at Km 26+650 (RHS)

P B Memorial School at Km 40+200 (RHS)

Figure 5.11: Institutions along the project road

5.4.3 Industries

The Industrial Scenario of Lakhimpur Kheri and Shajahanpur districts are given in **Table 5.28** and **Table 5.29** respectively.

Table 5-28: Industrial Scenario of Lakhimpur Kheri district

S. No	Head	Unit	Particular
1	Registered Industrial Unit	No.	495
2	Total Industrial Unit	No.	2500
3	Registered Medium and Large Unit	No.	15
4	Estimated avg. no. of daily worker employed in small	No.	1363

S. No	Head	Unit	Particular
	scale industries		
5	Employment in large and medium industries	No.	8924
6	Nos. of industrial Area	No.	3

Source: Ministry of MSME, GoI

Table 5-29: Industrial Scenario of Shahjahanpur District

S. No	Head	Unit	Particular
1	Registered Industrial Unit	No.	45529
2	Total Industrial Unit	No.	2873
3	Registered Medium and Large Unit	No.	9
4	Estimated avg. no. of daily worker employed in small scale industries	No.	27418
5	Employment in large and medium industries	No.	4318
6	Nos. of industrial Area	No.	3

Source: Ministry of MSME, GoI

There are some industrial establishment observed along the project road, details of which are presented in **Table 5.30**. The inventory survey reflects that the major industrial establishments along the project stretch are brick kiln and rice mill.

Table 5-30: Industrial Units along the Project Road

S. No	Industrial Unit	Chainage (Km)	RHS/LHS
1	Shee Shyam Udyog Factory (Rice mill)	1+200	LHS
2	Rice Mill	1+600	LHS
3	Rice Mill	1+700	RHS
4	Brick Kiln	8+500	RHS
5	Brick Kiln	3+100	RHS
6	Brick Kiln	25+400	LHS
7	Rice mill	27+700	LHS
8	Brick Kiln	30+400	RHS
9	Brick Kiln	40+400	LHS
10	Brick Kiln	44+500	LHS
11	Brick Kiln	56+500	RHS
12	Brick Kiln	56+800	LHS
13	Brick Kiln	57+200	RHS

5.4.4 Cultural Properties

A number of religious structures are located in the vicinity of project area. Few of these structures are situated close to the existing road edge which may require to be shifted. The lists of such features are presented in **Table 5.31.**

Table 5-31: List of Religious Cultural Features along the Project Roads

S. No.	Religious / Cultural Resources	Chainage (Km)	Distance from CL	LHS/RHS
1	Mosque	0+300	8.8	RHS
2	Temple	2+500	10.0	RHS
3	Temple	2+800	7.5	LHS
4	Temple	4+200	7.1	LHS
5	Temple	8+700	12.0	RHS

S. No.	Religious / Cultural Resources	Chainage (Km)	Distance from CL	LHS/RHS
6	Temple	9+300	9.0	LHS
7	Temple	11+700	6.5	RHS
8	Shiva Temple	12+400	4.0	RHS
9	Temple	12+700	6.0	RHS
10	Temple	17+400	5.5	RHS
11	Sri Ram Lakhan Janaki Mandir	19+200	17.0	LHS
12	Mosque	19+300	30.0	RHS
13	Gurudwara	23+200	25.0	LHS
14	Temple	30+700	13.5	LHS
15	Mosque	30+750	21.0	RHS
16	Temple	30+800	11.0	RHS
17	Mosque	31+800	18.0	LHS
18	Temple	36+500	4.0	LHS
19	Mosque	40+800	30.0	RHS
20	Temple	45+300	4.5	RHS
21	Temple	48+100	4.5	RHS
22	Temple	48+600	23.0	RHS

5.4.5 Historical Monument/Archeological Site

No Archeological site or historical monument recorded along the project corridor. A strip plan indicating different environmental features along the project corridor is given in **Annexure 5.4**.

6 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

In this chapter, potential environmental impacts, both bio-physical and socio-economic, are assessed in terms of the direct and indirect nature of the impact, extent, duration and significance. The level of assessment of each potential impact was based on the important environmental issues identified in baseline environmental studies and the proposed improvement and activities of the project.

The impacts of major infrastructure projects can be divided into two principal categories. First direct impacts which result from physical presence of the facilities and the way they are designed, built and operated. Second, indirect impacts, which stem from the construction and economic activities surrounding construction and the induced development resulting from improved access. These impacts occur in two main phases- Construction and operation. Direct environmental impacts are those that are directly caused by road construction or operation. During construction these impacts primarily occur within the road formation area or immediately adjacent to it, and at ancillary sites such as quarries and workforce camp. Direct construction impacts can include the loss of agricultural land damage to ecological features such as land resources and water bodies, damage to manmade structures and resettlement. During road operation direct impacts may include a reduction in air and water quality.

Relatively small potential for negative impacts is generally envisaged for road widening and upgrading project. Most of these negative environmental effects can be 'design out' at an early stage through proper engineering designs, which will emphasize the contractors to follow environmentally friendly construction methodology.

The construction activities will mainly be restricted to the proposed ROW along the entire stretch except for the temporary camp sites, quarry and borrow areas which are the activities associated with the construction and are usually located beyond the right of way. All the proposed construction activities will follow the current Indian standards for highway engineering design. The potential environmental impacts are studied as direct, indirect or cumulative effects on various environmental components.

The improvement of road have positive influence by virtue of better connectivity and accessibility, low vehicle operating cost, quick access to marketing centers, educational and medical facilities, improvement of way side amenities, enhancement of safety for the road users as well as the population living in the vicinity of the highway, etc. and thus provide tremendous opportunities of socio-economic development of the region. Besides these, the negative environmental impacts due to the road development works can be correlated to the loss of land and properties, deterioration of environmental quality (air, water, soil and noise) and ecological degradation during various constructional works as well as during operational phase due to increase in traffic volume, change in land use pattern, landscape deterioration, etc.

The road improvement project may influence various environmental components at different stages of the project viz: Pre-constructional phase Constructional phase and Operational phase. The impacts may be direct or indirect and may be beneficial or adverse with respect to the environment. The major works associated with the construction phase mainly are site clearance, Earth work in embankment, excavation, pavement and cross drainage works, dumping of spoils

and waste materials and other construction activities and associated works like mobilization of constructional equipments, setting up of workforce camps, quarrying, transportation and storage of materials, etc. These activities have potential impacts on physical, biological as well as social environment. The impacts may be of short terms and temporary or long terms and permanent. The likely impacts on various environmental components have been described as follows:

6.1 Impacts During Design/ Pre-constructional Phase

Sufficient Right of way is available in the entire section of the project road to accommodate the proposed widening of the existing highway section to standard two lane with paved shoulder and the project work would mostly be limited within ROW. Little adverse impacts on environmental components are anticipated due to the project.

6.1.1 Impact on People due to Affect of Properties

The project activities will be confined to the available right of way (ROW). As per baseline survey on social features, it has been revealed that there are number of non-titleholders in the form of squatters and encroachers will be affected within the ROW. However, at junctions and 4-laning sections, a number of titleholders will be affected, which will be established after detailed survey under Resettlement and Rehabilitation Report.

Mitigation Measures:

- A separate R&R policy has been framed after identification of different categories of affected persons to address the issues pertaining to the Project Affected People and their rehabilitation & resettlement .
- The acquisition of private properties will be carried out in accordance with the RAP and entitlement framework for the project.
- Early identification of affected persons for compensation and advance planning of Resettlement and Rehabilitation Action Plan to Compensate the Losses.
- All the affected people will be compensated for the loss as per R & R Policy of the project before commencement of Construction works
- PIU-UPPWD has to ascertain that any additional environmental impacts resulting from acquisition of properties are addressed and integrated into the EMP and other relevant documents.

6.1.2 Impacts on Other Assets

In addition to the above features, 107 hand pumps are likely to be affected due to the proposed widening in both the project sections.

Mitigation Measures: All the affected hand pumps will be relocated at suitable locations before commencement of construction activities.

6.1.3 Religious, Common and Govt. Property Affected

The baseline study reflects that there are total 22 nos. of religious structures and 107 numbers of hand pumps located along the project corridor within 20 m corridor. Out 22 nos. religious structures, 18 nos. are saved, 4 nos. are partially affected.

6.1.4 Impact on Utilities

Several types of utilities serving local and regional needs are falling under COI will need to be relocated from their present position due to the proposed widening alignment. These services are mainly electric poles, transformers, bore wells and water supply pipelines which may be required to be relocated at some locations. The analysis of impact on public utilities reflects that a total number of 95 electric poles, 107 numbers of hand pumps, 11 numbers of telephone poles and 32 numbers of transformers will be affected and will need to be relocated due to the project. Apart from these resources, water supply pipelines are located close to the pavement at Mohammadi (RHS) from Km 28.850 to Km 31.500 and therefore are required shifting to accommodated the widening of the road. Such type of impacts due to the widening of highways is inevitable. These will cause disruption in services and inconvenience to the local residents.

Mitigation Measures: All the utilities will be restored in advance prior to the start of construction works. The required mitigation measures would be to instruct in advance the relevant owners of these utilities to shift those before construction starts to avoid disruption of local services. The PIU-UPPWD will liaise with and assist the line department for early and quick shifting of these utilities in minimum time to avoid such impact on community.

6.1.5 Impact on Roadside Trees

The present project will have varying levels of impact on the roadside plantations throughout the project stretch. This impact is viewed critical due to the duration required for its reversal and sometimes it is irreversible. The roadside trees not only provide a healthy aesthetics to the road users but also provide shade and protect the users from harmful effects of contaminants by absorbing them through vegetation canopy. The cutting of trees along the rod will result into reduced buffering of air pollutants, hotter, drier microclimate along the project road.

The tree inventory showed that 5289 trees of varying girth located within the ROW may be affected due to the proposed widening. The baseline studies showed that there is no any endangered or rare tree species located within the project area. The predominant tree species are Babool, Sheesham, Neem, Eucalyptus, etc.

Effort will be made to minimize the tree felling by restricting tree felling within the formation width only.

Mitigation Measures

- Permission of Roadside cutting will be obtained from the line department, i.e. Forest Department.
- All efforts will be made to preserve trees by restricting tree cutting within the formation width. Special attention will be given for protecting giant trees, and locally important trees (having cultural importance)
- Compensatory plantation will be carried out along the space available within the proposed ROW in the ratio of at least 2 times as much the trees are proposed to cut as per Forest (Conservation) Act
- A general guideline for tree plantation will be followed as per IRC: SP: 21:2009 and as per Tree Plantation Strategy given in **Annexure-9.1**

6.1.6 Legal implications due to Roadside trees declared as Protected Forest

The tress plantation within ROW on both side of project road section of SH-93 from Gola to Shahjahanpur is declared as protected forest. Due to protected nature of roadside tree plantation, tree felling within 10 m corridor on either of the road from existing centerline, will attract the provision of Forest (Conservation) Act and hence forest clearance would be required for diversion of forest area for non forest purpose, i.e. widening of road. The proposed widening will require diversion of about 47.200 Ha of protected forest lands.

6.1.7 Impacts on Reserve Forest:

It is proposed to construct a new bridge on left side of the existing bridge across Kathina River at Km 12+900. The pocket of Reserve forest is located on bothside of the existing road along the ROW just after the existing bridge. Due to proposed new bridge oneside approach road will pass through the reserve forest for about 140 m length, thereby requiring additional land from the forest area. Thus a small area of about 0.098 ha will require to be diverted from the reserved forest area for construction of approach road to the new bridge. This will also require felling of about 100 trees. These trees are mainly teak trees planted by the Forest department in this forest pocket.

Mitigation Measures

- Diversion of forest land from reserved forest pocket will attract the provision of Forest (Conservation) Act and hence forest clearance would be required for acquisition of reserve forest land.
- All the conditions stipulated in the forest clearance will be complied with during construction.
- No construction Plants, construction camp or borrow area will be located in the project stretch long the Reserved Forest. A minimum distance of 1.000 Km from the reserved forest patch will be maintained for siting these features.
- The contractor will take all precautionary measures in the forest stretch to avoid any incidence of forest fire.

6.2 Impacts during Construction Phase

Most of the adverse environmental impacts are related to construction works which are inevitable but are manageable through certain environmental friendly practices. The negative environmental effects can be taken care of at an early stage through proper engineering designs and through the contract during construction practices.

The standard road construction works involve are site clearance, excavation, filling of earth materials and sub grade materials, laying of bituminous mixtures, handling of hazardous materials like bitumen, diesel, etc, dumping of unusable debris materials, transportation of materials from production site to construction site, and other constructional activities and associated works like mobilization of constructional equipments, setting up of different construction plants, setting up of workforce camps, quarrying, material storage etc. These activities have certain impacts of various magnitudes on different components of environment. The anticipated impacts due to all these activities have been described below:

6.2.1 Impact on Land Resources

Clearing and grubbing and excavation of the land within the extent of formation width of the proposed alignment as well as the proposed bypasses are the primary activity to prepare the bed for road construction. The excavation activity will lead into generation of excavated materials which would mainly soil mixed with pebbles in the project area. The suitable materials will be re-used as fill materials, aggregates. The unsuitable excavated material will need to be disposed off due to non-suitability for use in road fill materials. The disposal of debris materials in haphazard manner will not only hamper the aesthetic look of the area but at the same time they are potential contaminant for the surrounding land.

Some land would be needed to establish site offices and construction camps, worker/labour camps. These will require temporary land acquisition for a short period. Substantial amount of land would also be required for extraction of borrow materials.

For fulfilling the requirement of soil and aggregates certain land acquisition will be required followed by excavation of that land area. Such type of activity can lead into disfiguration of topography of the area. Water stagnation in the borrow pit provides ideal breeding sites for mosquitoes and thereby can spread malaria and dengue if borrow pit is not properly managed. Pits near settlements can pose health risk.

As per estimation of quantity of materials for the construction of project road, 4,43,180 Cum of soil, 554500 Cum of coarse and fine aggregates and 16100 cum of sand would be required. In addition to these quantities, 12600 tonnes of cement, 10100 tonnes of bitumen and 1474.100 tonnes of steel would be required for construction of roads including bridges and culverts. The aggregate will be sourced from different quarry areas whereas the earth will be collected from different borrow areas and reusable earth materials generated due to road cutting and drain excavation. It has been estimated that due to roadway cutting and drain & toe wall excavation about 5,80,394 Cum of earth work materials will be generated, out of which 201500 cum cut materials will be used for sub-grade and embankment. About 24180 Cum fly ash will be utilized for embankment construction thereby reducing the soil requirement to 4,19,000 Cum. Rest quantity of cut materials (378894 cum) which is not suitable for construction will require to be disposed off. About 2,17,500 cum of earth will be required to be taken from borrow areas to meet the balance requirement of earth. This clearly reflects that the reuse of excavated materials generated from roadway cutting and drain excavation will reduce the disposable quantity, which shall have lesser impacts associated with disposal of the entire cutting materials. However appropriate measures will be required for disposal of unusable materials.

Mitigation Measures

- No Borrow area and quarry will be operated without written agreement of the land owner.
- The Contractor will obtain environmental clearance for the borrow area and quarry as per MoEFCC circular on environmental clearance for minor minerals and the conditions stipulated under the environmental clearance will be binding on the contractor. The Contractor will submit the copy of clearance letter to the Engineer and PIU before commencement of material extraction.
- All the borrow area will be operated in accordance with IRC specification and MoEFCC guidelines.

- The earth material generated due to excavation will be used to optimum quantity to reduce impact on land resources.
- The Construction camps will be located preferably on barren land and sufficiently away from settlements and water bodies.
- The Construction camp will be provided with necessary sanitation arrangements and basic facilities.
- After dismantling of Camp the natural condition of the land will be restored.
- No scare will be left unattended after excavation activity.
- The Borrow area will be located preferably on barren land or unirrigated land.
- The Borrow pits will not be dug within 800 m of town or village settlement, within ROW, within 1 km from any forest area.
- After excavation is over, the borrow area will be rehabilitated suitably
- Proper reclamation of pits will be done
- Cut face of the pit will be merged with the slope of the adjoining terrain
- Bottom of the pits will be graded towards natural outfalls to prevent water accumulation
- The reclaimed area will be seeded to provide grass coverage.
- Quarrying of metal will be done only at licensed quarry and the area will be suitable rehabilitated after quarrying is over.
- The borrow areas and stone quarry site should be operated and managed as per guidelines provided in **Annexure 9.3** & **Annexure 9.4**, respectively.

6.2.2 Impact on Soil

The site clearance process includes excavation and vegetation clearance which ultimately induces vegetation loss as well as loss of top soil. Since vegetation clearance shall be confined to the minimum area required for widening activities beyond the ROW, the area affected would be very less. The activities associated with the site preparation and excavation plus movement of vehicles and equipments can disturb the surrounding lands. At the borrow area, temporary camp site or stockyards, workshops, and other ancillary sites there is chance of loss to soil fertility due to various activities.

In order to minimize the impact on soil fertility the top soil will be preserved separately and the top soil will be reused to site restoration work.

6.2.2.1 Contamination of Soil

Contamination of soil during construction stage is primarily due to construction and allied activities. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. Pollution of soil can also occur in hot-mix plants from leakage or spillage of asphalt or bitumen. Refuse and solid waste from labour camps can also contaminate the soil. Contamination of soil during construction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping being done near water body locations. However, by following mitigation measures such as maintenance of vehicles and machines and fuel refilling is carried out in a confined area can avoid contamination of soil to a great extend. The provision for oil interception chamber is suggested in EMP for treating the waste water generated from vehicle washing,

refilling and maintenance areas. Fuel storage and refilling sites should be kept away from cross drainage structures and important water bodies. All spoils shall be disposed off as desired and the site shall be fully cleaned before handing over. These measures are expected to minimise the impact on soil contamination.

6.2.2.2 Compaction of Soil

Compaction of soil may be anticipated due to the movement of construction vehicles and heavy machines. Thus regulation of movement of heavy equipments and vehicles shall be essential to prevent this.

Mitigation Measure

- The excavation activities and vegetation clearance will strictly be limited to formation width only.
- All the usable excavated materials will be re-used as fill materials and aggregates.
- The movement of construction vehicles and equipments will be restricted to only designated route.
- Designated storage site for fill materials and adequate stockpiling to prevent erosion and runoff related problem.

6.2.3 Impact on Water Resources

The proposed widening will result into slight increase of surface run-off. The geological studies of the project area show water table 8-10 m below the ground level. As the depth of the ground water table is very high no adverse impact is anticipated on ground water. Laying of pavement within the formation width may lead to reduction in the ground water recharge capacity. But as the area involved in the road construction is very less, the chances of this influence will be non-significant.

6.2.3.1 Water Requirement for Construction

The water demands for the construction work may pose severe stress on the public water supply if the water for construction and allied activities are taken from the same source as the project area is a water stressed area and water supply sources are limited.

The main source of water for construction and other related activities will be a mixture of surface water source and ground water source. groundwater may be used by installing bore wells at different locations such at camp sites and plant sites. Separate water supply arrangement for construction and allied works will be made in from ground water/surface water source away from public water supply source so that there is no interfere with the normal public water supply. The water for the construction will be taken after taking prior permission from Competent Authority and comply with all the requirements of State Ground Water Authority/ Irrigation Department. The Contractor will take all the measures in order to minimize wastage of water during the construction.

The baseline study indicate that the area along the project falls under safe to subcritical zones in terms of ground water availability, usage and water balance and recharging capacity. The estimated water requirement is for the entire project length and the abstraction of water will not be confined to a single location but will be extended at different locations, therefore pressure on a single aquifer will not be significant.

The Source of water for construction shall be identified by the Contractor depending upon the location of construction sites, construction camp and plant site locations in consultation with line department and UPPWD and will obtain all necessary statutory permits for usage of water before start of abstraction of water.

Mitigation Measures

- Longitudinal drains of sufficient capacity will be provided on both sides of the road to accommodate increased run-off.
- In urban stretches, the lined drains will be provided with cut in between to facilitate ground water recharging. The cut will be made of granular coarse material, which will increase the infiltration rate.
- Rainwater Harvesting pits will be provided in consultation with Ground Water Boards covering the entire project stretch The recharge pit can only be provided at those locations where the water table is greater than 5 m deep . The schematic plan of rainwater harvesting is presented in **Annexure 9.5**. The Contractor will have to collect the information about the water table and then construct the rainwater harvesting pits which will be approved by the Engineer and PIU-UPPWD. The Contractor will submit completion after construction of rainwater harvesting pits along with their details duly certifies by the Engineer and PIU-UPPWD
- The Contractor will arrange separate water supply arrangement for construction work and will not interfere with the normal public water supply.

6.2.4 Impact on Water Quality

No permanent impact is anticipated on water quality due to the project. Construction activity may temporarily deteriorate surface water quality near the alignment through increase in turbidity as well as in oil and grease. These impacts can be handled through following proposed mitigation measures:

- All water and liquid wastes arising from construction activities will be properly disposed off and will not be discharged into any water body without adequate treatment.
- Littering or unauthorized discharge will not be permitted.
- Permission of the engineer and the concern regulatory authorities will be obtained for disposal of the waste as the designated disposal point.
- The stream course and drain will be kept free from dumping of solid wastes and earth materials.
- The construction materials and debris will be stored away from water bodies or water ways and only on the designated sites along the construction zones.

6.2.5 Impact on Ambient Air Quality

The air quality parameter is the most common environmental feature, which is being affected by any road improvement projects at different stages i.e. during constructional as well as operational phase. The major indicators of Ambient Air Quality relevant to the road project are suspended particulate matters (SPM), Particulate matters of size less than 10 µ (PM_{10}), particulate matters of size less than 2.5 µ ($PM_{2.5}$), Sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO) in the atmosphere. Significant amount of dust is likely to be generated due to site clearance and excavation activities, exhaust of mobile and stationary construction equipment, stone crushing plant, batching plant, HMP, demolition, embankment and grading activities, transportation of

earth materials and dumping of spoils, which have potential deterioration of air quality during the process. This can increase the localized concentration of fugitive during construction phase. During asphalt preparation, operation of hot mixing plants needs burning of fuels that result into release of significant amount of gaseous pollutants into the atmosphere like oxides of sulfur, hydrocarbons and particulate matters. These are likely to deteriorate the air quality in general and also cause occupational exposure in particular. These impacts are, however, temporary one that will remain only upto the period of clearance and excavation processes. Besides this, air quality deterioration is also expected at deposits and borrows sites, materials treatment areas, quarries, access roads and the site where facilities provided for project workers due to dust generation and gaseous pollutant emission. Additional vehicular emission is expected during the mobilization of construction equipments, transportation of materials, etc. due to the increased vehicular number at the project sites but that will be minor in extent as there will not be significant increase in vehicle numbers.

The improper sanitation at work camps and waste disposal usually lead to odour problem. Foul odour may also cause during laying of pavement. The abovementioned problems related to the deterioration of air quality, however, will temporal in nature till the construction period only. Further, the activities will not be confined to any one place rather, it will progressively move along the ROW, so prolonged deterioration in air quality will not occur at any one site. The minor volume of dust generated will cause a short-term localized problem through settlements.

Mitigation Measures

Generation of Dust

- Water will be sprayed during construction phase, in earth handling sites, asphalt mixing sites and other excavation areas for suppressing fugitive dust.
- Water sprinkling and transporting construction materials with tarpaulin coverage during the construction stage.
- During the sub-grade construction, sprinkling of water will be carried out on regular basis during the entire construction period especially in the winter and summer seasons.
- In case fly ash is used, dust emission during its loading and unloading, storage at open place and handling for road construction shall be suppressed by regular water sprinkling.
- Dust emission from stock piles of excavated material will be controlled either by covering the stockpiled materials or water spraying over it.
- Special attention will be given when working near educational institutions and health centers and settlement areas.
- As soon as construction is over all the surplus earth will be utilized properly all loose earth will be removed from the site.

Mitigation measures for Plants & Equipments:

- The Stone crusher plant, hotmix plant and Wet Mix Plant will be located sufficiently away from settlement towards downwind direction and will conform to the siting and operation requirements under Environmental (Protection) Rules, 1986.
- Proper management of all Plant sites having stone crusher unit, Hotmix plants, Batchmix plant, stockyards.
- All the vehicles used during the construction stage to have valid PUC certificate

- Provision of effective air pollution control systems in stone crushers, Hotmix Plant, Batchmix plants such as dust containment cum suppression system for the equipment, Construction of wind breaking walls along periphery of plant sites, construction of the metalled roads within the premises, regular cleaning and wetting of the ground within the premises, etc.

Gaseous Pollution

- All the Construction vehicles and machineries will be regularly maintained to conform to the emission standards stipulated under Environment (Protection) Rules, 1986.
- Asphalt mixing /Stone Crusher plans should be located at list 1000 m away from any habitation or sensitive environmental site and at least from national highway and 250 m from State Highway away towards downwind direction.
- All the DG sets will conform to the emission standards as stipulated under Environment (Protection) Rules, 1986.
- The workers working at asphalt mixing and subsequent application of asphalt mix on road surface will be provided with heat resistant shoes and masks.

Handling and Transportation of Fly ash:

- The fly ash handling and transportation of the same shall be done as per section 4.6 of IRC: SP: 58-2001. Fly ash being a very fine material gets air borne easily and cause dust nuisance. Dust at a construction site may be a safety hazard. It may also lead to environmental pollution, public resentment and damage to internal combustion engine of the construction equipment besides being a health hazards to workers. To avoid this, fly ash from hoppers or silos must be conditioned with water at power plant to prevent dusting enroute. Fly ash is typically delivered to the site in covered dump truck to minimize loss of moisture and dusting. On the other hand, pond ash generally contains enough moisture to prevent dusting, and may even contain excess moisture to create road spillage during transport. In such cases, periodic inspection and lifting of ash from relatively dry areas of the pond would be needed.
- The fly ash may require on site temporary stockpiling if the rate at which the ash is supplied to the project site is more than the contractor's demand for an efficient rate of placement. Such cases should be avoided to the extent possible and in case stockpiling at site is inevitable, adequate precautions should be taken to prevent dusting by spraying water on stockpiles at regular intervals. Otherwise, the surface of fly ash stockpile may be covered with tarpaulins or a thin layer of soil or other granular material not subject to dusting. Traffic movement may be restricted to those areas which are kept moist to prevent tyres of passing vehicles dispersing ash into the air.

6.2.6 Impacts on Ambient Noise Level

Operation of heavy machineries; movement of heavy vehicles, stone crushing aggregate mixing activities generates high noise increasing the ambient noise level in the surrounding. The behaviour of truck drivers also plays roles in increasing the noise level by the injudicious frequent use of blow horns. Especially in the settlement area this can pose a problem.

Workers working near the noise generating equipments and plants are likely to be exposed to

high noise level. The acceptable limits (for 8 hour duration) of the equivalent noise level exposure during one shift is 90 dB(A). Hence, noise generated due to various activities in the construction camps may affect health of the workers if they are continuously exposed to high noise level. For reasons of occupational safety, exposure to impulses or impact noise should not exceed 140 dB(A) (peak acoustic pressure). Exposure to 10,000 impulses of 120 dB(A) are permissible in one day. The noise likely to be generated during excavation, loading and transportation of material will be in the range of 90 to 105 dB (A) and this will occur only when all the equipment operate together and simultaneously. This is however, is a remote possibility. The workers in general are likely to be exposed to an equivalent noise level of 80 to 90 dB (A) in an 8-hour shift, for which all statutory precautions should be taken into consideration. However, careful planning of machinery selection, operations and scheduling of operations can reduce these levels. A typical Noise generation due to different activities has been given in the **Table 6.1**.

Table 6-1: Typical Noise Levels of Principal Construction Equipment during Major Construction Activity (Noise Level in dB(A) at 50 Feet)

CLEARING	
Bulldozer	80
Front end loader	72 - 84
Dump truck	83 - 94
Jack hammer	81 - 98
Crane with ball	75 - 87
EXCAVATION AND EARTH MOVING	
Bulldozer	80
Backhoe	72 - 93
Front end loader	72 - 84
Dump truck	83 - 94
Jack hammer	81 - 98
Scraper	80 - 93
STRUCTURE CONSTRUCTION	
Crane	75 - 77
Welding generator	71 - 82
Concrete mixer	74 - 88
Concrete pump	81 - 84
Concrete vibrator	76
Air compressor	74 - 87
Pneumatic tools	81 - 98
Bulldozer	80
Cement and dump trucks	83 - 94
Front end loader	72 - 84
Dump truck	83 - 94
Paver	86 - 88
GRAND AND COMPACTING	
Grader	80 -93
Roller	73 - 75
5.1.1.1 PAVING	

Paver	86 - 88
Truck	83 - 94
Tamper	74 - 77
LANDSCAPING AND CLEAN UP	
Bulldozer	80
Backhoe	72 - 93
Truck	83 - 94
Front end Loader	72 - 84
Dump Truck	83 - 94
Paver	86 - 88

Source: CPCB, Govt. of India

It is evident from the above table that the operation of construction machinery e.g. hot-mixer, bulldozer, loader, backhoes, concrete mixer, etc will lead to rise in noise level to the range between 80-95 dB (A). Vehicles carrying construction materials will also act as the noise sources. The magnitude of impact from noise will depend upon types of equipment to be used, construction methods and also on work scheduling. However, the noise pollution generated due to different construction activities is a temporary affair. Each type of activity can generate different type and levels of noise that continue for a short period during the operations of those activities.

Implementing proper mitigation measures can reduce a lot of problem associated with noise pollution due to construction activities.

Mitigation Measures:

- All noise generating equipments will be installed sufficiently away from settlement areas.
- The main stationary noise producing sources such as generator sets shall be provided with noise shields around them. The noise shields can either be a brick masonry structure or any other physical barrier which is effective in adequate attenuation of noise levels. A three meter high enclosure made up of brick and mud with internal plastering of a non-reflecting surface will be very effective in these regards
- The plants and equipment used for construction will strictly conform to CPCB noise standards.
- Vehicles and equipments used will be fitted with silencer and maintained accordingly.
- Noise to be monitored as per monitoring plan and if the noise level at any time found to be higher than immediate measure to reduce noise in that area will be ensured.
- Noise standards of industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts.
- All the workers working very close to the noise generating machinery shall be provided earplugs to avoid any ill impacts on their health.
- An awareness programme will be organized for drivers and equipment operators to make them aware of the consequences of noise and to act properly at site

6.2.7 Impact on Ecological Resources

The baseline study within the project area did not show any endangered or significant flora or fauna within the corridor of impact therefore, any potential direct impact on biological environmental characteristics such as, loss of rare or endangered species, habitat fragmentation and wild life migrations is not envisaged. The temporary impact may be in the visual appearance of the trees and shrubs as construction activity may lead to deposition of dust cover over the leaves and foliage. This is limited to construction period and gets washed away with the first monsoon shower.

6.2.8 Impact on Social Environment

6.2.8.1 Impairment of access to the properties

During construction of road, cross water and side drain temporary blockage of access or interference with the access to the properties located along the right of way may occur, causing inconvenience to the road users and enhances the accident risk if not managed properly. Such impact can be avoided through proper planning of works and good engineering practices. Safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road shall be ensured by providing temporary access. Adequate signage and barricades shall be raised at the expected bottlenecks for safe movement of people. The Contractor shall provide early information to the affected people. On completion of the works, all-temporary obstructions to access shall be cleared away, all rubbish and piles of debris that obstruct access should be cleared.

6.2.8.2 Aesthetics

Disturbance of landscape aesthetics due to excavation of borrow pits, extensive quarrying, disposal site of spoils, is expected during the constructional phase. However, it is only temporary one and it can be restored with proper management plans within a short period such as roadside plantation, etc. During operational phase this will be enhanced with the activities associated with the maintenance of landscape such as plantation programme, by providing road side amenities, parks etc.

Mitigation Measures:

- The site will be cleaned immediately after the construction activity is over.
- The debris materials will be disposed off only at identified area for disposal and proper leveling will be done after disposing the materials and shall be covered with top soil and some plantation will be done at the disposal site
- The borrow area will be rehabilitated as per site condition. It can either be developed as ponds, backfilled and leveled matching with the surrounding terrain.

6.2.8.3 Public Health and Safety

Health and safety are of major concern during the construction as well as operational phases. The impact on health and safety can be envisaged for both workers at site and road users as well as inhabitants of nearby areas.

Emission of gaseous pollutants and dusts are major result of various processes like material treatment, operation of hot mix plant, stone crushing, and asphalt preparation. This emission

effect is only for short term till the construction work is over but the effect may be significant from the point of view that the workers are directly exposed to these emissions. Apart from this, safety risks to road workers, primarily in the areas of storage and handling of dangerous materials, and in operation of heavy machinery close to traffic, slopes, power line and water courses, are also involved during the construction works.

The dust and gaseous pollutant generation within the congested area during the construction works will adversely affect the health of people residing in the close proximity of the road. Excavation of borrow pits on both the sides of roads within and outside the existing ROW can create unhealthy aesthetics and also enhance the risk of malaria. These areas provide ideal breeding zones for flies and insects. Stagnancy of water in borrow pits located nearby settlements during rains may enhance the possibility of spreading of diseases. The vehicles and equipment operation increase the chances of collision with vehicles, pedestrians and livestock. The poor sanitation and poorly manages dispose off the waste may cause increase in communicable diseases.

Mitigation Measures

- The project will comply with the requirements of the EHS Guidelines of the World Bank Group, 2007[1]. The relevant ones are general guidelines available on the internet.
- The plants and equipments will be installed sufficiently away from the settlement.
- All the construction equipments and vehicles will conform with the emission standards stipulated by the CPCB.
- Safe working techniques will be followed up and all the workers will be trained
- All the workers will be provided with proper personal safety equipments at construction as well as plant site
- Proper caution signage, barricading, delineators etc. will be installed at Construction zone and temporary diversions
- Proper traffic management will be ensured at the Construction zone as per IRC.
- An Emergency Response system in case of any incidence will be developed and implemented
- Periodical health check facility will be provided at camp sites.

6.2.9 Other Environmental Concerns of Construction Phase:

Various other environmental impacts during construction stage include:

6.2.9.1 Diversion of Traffic

Short term impact associated with the project will be traffic diversion and management during construction phase. Construction activities will cause hindrance to the existing traffic flow. There is possibility of accident hazards during construction phase of the widening project. There will be requirement for diversion of existing traffic at various construction sites during construction phase. It needs to be mentioned that though there are no direct impacts on the natural environment due to disruption/diversion of such services, but diversion can also lead to adverse impacts if not planned properly. Rapid restoration of diverted services can help in minimizing the

[1] *Reference: (i) http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES and (ii) http://www.ifc.org/wps/wcm/connect/7e4c7f80488554d5b45cf66a6515bb18/Final%2B-%2BToll%2BRoads.pdf?MOD=AJPERES&id=1323162564158]*

severity of impacts arising out due to diversions of existing services.

Mitigation Measures

- Proper preventive measures will be taken during the construction activities at the construction sites
- Reduce speed through construction zones.
- Construction of bridges/culverts will be carried out prior to construction of new carriageway at the first stage.
- Strengthening/raising of existing two lanes will be done only after the completion of the first stage.
- Proper warning signs will be displayed at construction sites.

6.2.9.2 Equipment Servicing and Fuelling

On large road projects, thousands of liters of diesel and many other petroleum products are transported and used throughout the work site every day. Construction equipment generates large amount of waste oil, and its proper handling is critical, since improper storage and leakage can result in the contamination of land and water bodies. Even the spillage can affect surface water bodies by the road sector project.

Mitigation Measures

- The vehicle and equipment service centers will be established away from any water body or agricultural land.
- Proper bunding with appropriate Containment will be provided at the equipment and vehicle servicing centers. The spent wash from the service center will be put in separate soak pits and sand pits
- All the fuel and chemical storage will be sited on an impervious base within an embankment and secured by fencing. The storage area will be located away from water course or wetland.

6.2.9.3 Construction Camps

Workers' Camp

Construction workers are a very neglected group in the country. Unless the workers are provided proper amenities to live at the construction site the environmental issues of road construction cannot be properly met. Apart from labour camps, separate construction Camps also established where various plants and equipments as well as offices and residential units for technical and non technical staff are located and often labour camps are also provided in the same premises. Location of the Construction camp also has certain impacts on surrounding environment if not properly managed. It is preferred to engage local labour depending upon the aviability in the area, however generally migrated labours are also engaged for different construction activities. It is estimated that around 200 labours will be required for different activities of construction during peak construction period. For migrated labour, camps with appropriate number of dwelling units is required to be provided by the contractor till the construction period.

At labour and construction camps lot of wastes are generated. These wastes are refuge from the plants, and equipments, waste water and other domestic waste. These wastes are solid as well as liquid waste mainly refuse water and kitchen waste. The disposal of such waste material to the

surrounding land can potentially damage the land and would generate health risk to not only surrounding area but within the premises itself. Improper drainages system within the premises also creates insanitation condition thereby enhancing health risk.

Mitigation Measures

- Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 as well as the guidelines of IFC and EBRD[2] will be followed for construction and maintenance of labour camp throughout the construction period.
- The Construction/labour camps will be established only on area approved by Supervision Consultant.
- The worker's/labour camp will be located away from water bodies, schools and residential areas. The camp will be constructed with proper accommodation facilities.
- The workers camp will be provided with drinking water supply system so that local water sources are not disturbed.
- The camp should be provided with fuel for cooking like kerosene and /or LPG to avoid any cutting of trees for fuel wood.
- All camps will be provided with proper sanitation facilities, separate toilets and bathrooms for female and male workers, septic tanks with soak pits of sufficient size, dust bins etc.
- Waste water from domestic uses and solid wastes will be disposed of without violating environmental norms. The measures will be site specific.
- The labour camps will be provided with crèche, first aid facilities, etc as required under Factory Act.
- After completion of construction, the contractor will dismantle the camp and restore it to the original condition of the area before handing over the site to the land owner.

6.2.9.4 Disruption of Services

Local services, including water supply lines, irrigation line, drainage, ditches, streets are commonly cut during road earthworks. These activities are required by the local people for crop production, drinking water supply and access, and have the potential to damage road work too. These services are often either inadequately reconnected or not reins ted at all.

Mitigation Measures

- The Contractor will arrange their own source to cater for their water requirement for construction and other activities and will not interfere with the local water supply system
- All irrigation canals, water supply lines and stand pipes, drainage and streets will be maintained during construction or if necessary, temporary services shall be arranged of the owner/ user's permission for temporary cessation will be gained.
- All the Services will be progressively reinstalled as soon as road excavation has been completed.

2
http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/learning+and+adapting/knowledge+products/publications/publications_gpn_workersaccommodation

6.3 Impacts during Operational Phase

During operation stage, the main sources of environmental impacts are the increased traffic volume and speeds and better access to forest lands. The increase in traffic volume and speed may enhance the safety risk especially in the rural area. The better access to the forest area can stimulate the human interference in these areas. No sudden change in the traffic volume is expected due to this road as the road is already existing one and opened for public traffic. The project also provides the opportunities of the restoration of vegetation around the vicinity of the worksite and roads by implementing the compensatory plantation programme, which will not only enhance the aesthetic view but can also help in reclamation of soil. During operational phase this will be enhanced with the activities associated with the maintenance of landscape such as plantation programme, by providing roadside amenities, parks etc.

During the operational phase when the plantation works will be adequately implemented will enhance the aesthetic as well as hygienic environment thereby reducing the chances of diseases due to vehicular emission. Widening will ensure smooth plying of the vehicles and also will help in reducing the congested zone and thus will reduce the emission rate of vehicles. Various impacts during operation phase are discussed below:

6.3.1 Impacts on Water Quality and Resources

During the operation phase, the possibility of degradation of water quality is very remote. The impact on the surface water quality during operation can be expected due to accidental spillage. However the probability of such accidents are minimal since enhancement of road safety measures such as improvement of curves and widening of the roads and other pedestrian facilities are taken care of in the design stage.

6.3.2 Impact on Air Quality

The baseline study revealed that the people residing along the road face problem due to high dust along the project section. The dry condition and exposed area, earthen shoulders along the highway sections is the main reason behind the high concentration dust. Improvement in road surface condition such as roughness, pot, patch, congestion, etc., improvement of curves and junctions, provisions of organized parkings will likely to reduce the dust problem in the vicinity of road. Moreover, the project will ensure smooth traffic flow and reduce idling time of engines thus will reduce the emission rate of vehicles thereby reducing the magnitude of air quality degradation. Further, roadside avenue plantation with pollution abating tree species will also help in reducing the ambient pollution levels.

6.3.3 Impact on Noise Quality

Noise level is a matter of concern. Interrupted movement of heavy and light vehicles at high speeds and movement in upward direction increase ambient noise levels along the roadway. Noise produced by vehicles using the road can be attributed to the engine, vibration, friction between tyres and the road, and horns. Increased levels of noise depend upon volume of traffic, road condition, vehicle condition, vehicle speed, congestion of traffic and the distance of the receptor (home, store etc.) from the source. The friction caused due to contact between tires and pavement increases the traffic noise. The proposed work includes smoothening of pavement, reduction of curves at several places that will reduce the overall noise level.

6.3.4 Human Use Values

Both land use and aesthetics are in fact, likely to improve due to afforestation and proper landscaping. Proper engineering design like raising of embankment, provision of sufficient number of culverts will ensure the reduction of the chances frequent road damages due to water logging during rains. The provision of parking space, way side amenities, rest area, toilets and drinking water will also help in smooth and comfortable flow of traffic and better acceptability of the project by the community.

6.3.5 Impact on Climate Change due to Project

Fuel Consumption in MT per 1000 Veh-Km has been calculated using HDM-4 model. It has been calculated for 20 years (period 2015 to 2034) considering "with" and "without" project. The calculated fuel consumption "without" and "with" project is 12,32,419 MT per 1000 veh-km and 13,29,038 MT per 1000 veh-km respectively for 20 years. Fuel consumption has been calculated for different type of vehicles such as motorcycle, 3-wheeler, passenger car, minibus, big Bus, light commercial vehicle (LCV), truck-rigid 2-axle, truck-rigid 3 axle, multi axel vehicle (MAV) and horse & semi-trailer-3 & 4 axles along the project road. There will be slight increase in fuel consumption. This is due to the fact that the existing road is already two lane and the road surface is in good condition. Presently the average speed of vehicles is between 60-80 km per hour. The proposed design is for 100 km speed. It has been assumed that the vehicles will have uniform speed of 100 Km per hour in open areas and 80 Km per hour in built up section. As a result of the higher speeds there will be increase in fuel consumption. So, the rise in fuel consumption may be attributed to rise in average speed of vehicles. The details of change in total fuel consumption including petrol and diesel "with" and "without project" scenario is depicted in following Table 6.2.

Table 6-2: Fuel Savings [MT Fuel Consumption per 1000 veh-km] due to project

Project Length (Km)	MT Fuel Consumption per 1000 veh-km (Base/Without Project)	MT Fuel Consumption per 1000 veh-km (With Project)	Fuel Savings [MT Fuel Consumption per 1000 veh-km]
48.94	12,32,419	13,29,038	-96,619

Estimation of fuel saving with respect to diesel & petrol is shown in following Table 6.3:

Table 6-3: Fuel Saving in "With" and "Without Project" Scenario

Fuel Type	Without Project	With Project	Fuel Saving
Assuming 60 % Diesel (Quantity in MT)	7,39,451	7,97,423	-57,971
Assuming 40 % Petrol (Quantity in MT)	4,92,968	5,31,615	-38,648
Density of Petrol	0.77 Kg/lt		
Density of Diesel	0.832 kg/l		
Petrol Quantity (lt)	64,02,17,652	69,04,09,242	-5,01,91,590
Diesel Quantity (lt)	88,87,63,688	95,84,40,714	-6,96,77,026

The Carbon Dioxide (CO_2) emissions have been calculated using "mobile combustion GHG emission calculation tool, version 2.3" and the summary of Carbon Dioxide (CO_2) emissions is given in **Table 6.4**.

Table 6-4: Green House Gas Emission in "With" and "Without" Project Scenario

Greenhouse gas	Fossil Fuel Emissions	
	Without Project (metric tonnes)	**With Project** (metric tonnes)
Total (metric tonnes CO2)	38,32,906	41,71,929

The analysis of result with the above details, it may inferred that that there will marginal increase in fuel consumption and thereby increase in Carbon Dioxide (CO2) emissions in "with" project scenario as compared to "without" project i.e 8.85 % of CO2 increase. The marginal increase in fuel consumption and CO2 is because the existing road is already having 2 lane configuration and in good condition. The proposal is to maintain the two lane configuration with additional paved shoulders on either side.

Integration of climatic change and change in hydrology in cross drain design:

The hydrological regime of the project stretch has been studies and integrated in designing of bridges to counter inevitable climate change. The drainage pattern and hydrology of the area has been assessed and analysed considering the rainfall pattern in the area. The hydrological study for region has been carried out considering 50 years data of rainfall, temperatures and flood status.

For the calculation of discharge of the stream by Area-Velocity method, topographical survey including levelling surveys have been carried out across and along the watercourses to determine the cross-section and the longitudinal section of stream. A number of cross-sections have been taken at regular intervals on both upstream and downstream side of the structure, including one at the proposed location of the structure in accordance with IRC specifications. The peak discharge and the High Flood Level (HFL) have been calculated. The detailed hydrological calculations have been carried out for all new/reconstruction Bridges.

Based on the study, no impact on hydrology and discharge is envisaged due to proposed project. No additional major or minor bridge is proposed in the project. The project road has 13 existing bridges, out of which 12 are of minor bridges and 1 is major bridge. 5 minor bridges will be retained with repairs, 3 minor bridge will be retained with widening and 4 to be replaced. 1 major bridge will be replaced. The design discharge has been taken with 50 years prediction of discharge. The design discharge and HFL has been estimated as below and has been integrated in design of cross drain structures:

Table 6-5: The design discharge and afflux HFL at Bridge locations

S. No.	Chainage (Km)	Design Discharge (Cumec)	Affluxed High Flood Level (HFL) in m
1	0+200	7.721	154.889
2	12+900	205.554	149.029
3	24+500	1328.618	148.095
4	33+800	5.208	151.260
5	49+700	45.861	154.913

It is proposed to raise the vertical profile of the road in the overtopping sections at one location between Km 12+200 to Km 12+590 for a length of 390 m due to HFL. Additional 11 numbers of balancing culverts have been proposed at different locations to allow passage of water during any flood which will have positive impacts on drainage.

7 ANALYSIS OF ALTERNATIVES

7.1 Introduction

The project road section of SH-93 starts from Gola Market at Km 1+281 and ends at Shahjahanpur at Km 58+580, covering a distance of 58.100 km. The road section falls in Lakhimpur Kheri and Shahjahanpur districts of Uttar Pradesh. The project stretch passes through major settlement areas namely Gola, Mamri, Maheshpur, Mohammadi, Mohamadpur, and Shahjahanpur.The analysis of alternatives has been carried out 'with project' and 'without project' scenarios in terms of potential environmental impacts.

The present alignment has been followed for widening and mainly concentric widening has been proposed except for few locations where eccentric widening is proposed for the purpose of widening of bridge, curve correction or widening of culverts. The alignment is to follow the existing highway section. Therefore the analysis of alternative has been carried out 'with project' and 'without project' scenarios for the only one possible alternative i.e. to follow the existing alignment only**.**

7.2 "With" and "Without" Project Scenario

The proposed development of project road of SH-93 from Km 1.281 to Km 58.580 in the State of Uttar Pradesh is not only development of surrounding area but will also provide smooth movement of traffic and linking with other roads of the country. Keeping in view, the site conditions and the scope of development of the area, the 'With' and 'Without' project scenarios has been compared for the lone existing alignment and is represented in **Table 7.1**.

Table 7-1: 'With' and 'Without' Project Scenario

With Project		Without Project	
Positive Impacts	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**
❖ The improvement of road surface and bottlenecks will improve, thus reduce the traffic congestion and reduction in wastage of fuel. ❖ Flourish in trade and commerce ❖ Providing better level of service in terms of improved riding quality and smooth traffic flow. ❖ Reduction in accident rate ❖ Access to new employment opportunities ❖ Employment of local workers for the execution of project ❖ Better access to health care and other social services ❖ Improved quality of life of the local people ❖ Better way side amenities and other facilities like bus bays/shelters ❖ Increase of aesthetics and	❖ Increase of traffic will lead to slight increase in air and noise pollution. ❖ Removal of trees and vegetation due to widening and upgradation ❖ Short term Increase in dust pollution and noise pollution during construction period. ❖ Public Safety and Inconvenience due to construction activities till construction period. ❖ Inconvenience due to interference with public utilities during shifting	❖ No acquisition properties and hence no displacement of families. ❖ No felling of existing trees and vegetation	❖ Travel time and fuel consumption level will be more due to bottlenecks ❖ Increase in dust pollution and vehicular emission ❖ The accident rate will increase ❖ Road Safety is presently most important concern of the people living along the highway which has not been addressed properly. ❖ Further deterioration of project road.

With Project		Without Project	
Positive Impacts	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**
environmental condition due to Avenue Plantation along the project road ❖ Provision of systematic utility duct will enhance the road aesthetics as well as reduction in frequent damage of road due to repairing/ up gradation of utilities. ❖ Increase in groundwater recharge due to proposed rain water harvesting structures.			

The existing road is having single lane, intermediate lane and two lane carriageway thus posing restriction in smooth plying of traffic as well as increases the risk of accidents. Ad-hoc parking of commercial vehicles often obstructs the free flow of traffic. Major obstructions to free flow of traffic are numerous intersections, narrow settlement areas, sharp curves, non motorised traffic and a variety of road users. In case of "Do Nothing" alternative, the regional development as well as any other developmental activities will be adversely affected due to inadequate service level of the highway. The maintenance of economic stability and growth of the area will be impeded not only in the close proximity of the project area but will have its impacts, far and wide. The quality of life of local people will also be affected as the issues are directly related to the communication systems available to them.

The proposed project road will have standard two lane carriageway of 7.0 m with 1.5 m paved shoulders on eitherside throughout the project length. Apart from this there is provision of 18 nos. of bus bays on both sides, 1 no. of truck lay byes, facilities for pedestrian movement, traffic signboards which will not only enhance the service level but at the same time will enhance the safety to the highway users and road side communities to a great extent.

Material Requirement

As per estimation of quantity of materials for the construction of project road, 443180 Cum of soil, 554500 Cum of coarse and fine aggregates and 16100 cum of sand would be required. There are two alternative for availability of construction materials, one the entire quantity of materials can be taken from different borrow areas and second reuse of excavated materials for construction to optimum level and rest to extract from the borrow area.,. About 24180 Cum fly ash will be utilized for embankment construction thereby reducing the soil requirement to 4,19,000 Cum. It has been estimated that the 5,80,394 Cum of earth work materials will be generated due to roadway cutting and drain excavation about 580850 m^3 earth work materials will be generated. It is proposed to reuse about 201500 cum cut materials for sub-grade and embankment. The balance quantity of about 2,17,500 cum of earth will be taken from borrow areas. Rest quantity of cut materials (378894 cum) which is not suitable for construction will require to be disposed off. Reuse of excavated materials will not only reduce the impact on land due to borrowing of earth and at the same of the excavated time the disposable quantity will also be reduced.

It is also proposed to use 24180 cum of fly ash in embankment. This will further reduce the requirement of earth for construction to 219000 cum thereby reducing the impact on land.

Widening Options

In general concentric widening has been proposed in order to avoid land acquisition and to minimize impacts on roadside trees and settlement. 5 nos. of realignment are proposed in the project of total length of 2.277 Km. However at few locations one side widening is proposed for alignment improvement, saving built-up area and trees, and widening of CD structures. Altogether 52.058 Kms will include concentric widening, left widening in 0.77 Kms length and right side widening in 2.995 Km length.

Table 7-2: Widening options

Chainage (Km)		Length (Km)	Widening
To	From		
1+280	6+840	5.559	Concentric
6+840	7+330	0.490	Right
7+330	10+950	3.620	Concentric
10+950	11+100	0.150	Left
11+100	12+250	1.150	Concentric
12+250	12+300	0.050	Left
12+300	12+550	0.250	Concentric
12+550	12+590	0.040	Right
12+590	12+900	0.310	Realignment due to construction of bridge
12+900	12+995	0.095	Concentric
12+995	13+045	0.050	Curve Improvement
13+045	13+480	0.435	Concentric
13+480	13+560	0.080	Left
13+560	13+600	0.040	Concentric
13+600	13+650	0.050	Right
13+650	23+590	9.940	Concentric
23+590	24+880	1.290	Right
24+880	25+810	0.930	Realignment due to reconstruction of major brige and geometric improvement
25+810	33+520	7.710	Concentric
33+520	33+800	0.280	Left
33+800	40+050	6.250	Concentric
40+050	40+200	0.150	Right
40+200	43+530	3.330	Concentric
43+530	43+870	0.340	Realignment due to reconstruction of bridge
43+870	44+000	0.130	Left
44+000	46+800	2.800	Concentric
46+800	47+132	0.332	Realignment due to reconstruction of bridge
47+132	48+650	1.518	Concentric
48+650	49+540	0.890	Right
49+540	52+250	2.710	Concentric
52+250	52+565	0.315	Realignment due to reconstruction of bridge
52+565	52+600	0.035	Right
52+600	54+120	1.520	Concentric
54+120	54+200	0.080	Left
54+200	58+150	3.950	Concentric
58+150	58+200	0.050	Right
58+200	58+580	0.380	Concentric

To avoid/minimize the impact on adjacent land and properties toe line walls of varying height have been proposed at 4 locations on LHS covering a length of 0.595 Kms and 6 locations on RHS for a total length of 1.070 Kms. The location of toe wall has been given in **Table 2.7** of Chapter 2.

Drainage conditions

It has been observed that the road section at 1 location gets submerged during flood and thereby the road gets damaged frequently. To improve drainage condition in this stretch, the proposed vertical profile of the road has been raised between Km 12.200 to Km 12.590 for a length of 390 m. There are 73 culverts exists in the project road. All the 73 culverts will be retained with repairs. Additional 11 numbers of balancing culverts have also been proposed in the project in order to allow passage of water during any flood in order to improve drainage conditions of the area.

Emission of Greenhouse Gas (CO_2)

A comparative analysis of CO_2 emission has been carried out in both "With" and "Without Project" scenario. The analysis reflects that there is slight increase in fuel consumption and thereby marginal increase in CO_2 emission under "with Project" scenario compared to "Without Project" scenario.

With the above comparison it can be concluded that "With" project scenario, positive/beneficial impacts will greatly enhance social & economic development of the region and improve the environment, when compared to the "Without" project scenario, which may further deteriorate the existing environment and quality of life. Hence the "With" project scenario with some reversible impacts is an acceptable option rather than "Without" project scenario. The implementation of the project therefore will definitely be advantageous to improve the environmental quality of the sub-region besides to achieve an all round development of the economy and progress of the region.

There is little increase in the pollution levels during construction. Dust and particulate matter during construction will affect the air quality on a short-term basis but will be temporary in nature. The safety of road users as well as surrounding population will enhance to great extent due to the project with provisions of traffic lights, bus shelters, etc which are inadequate in the present scenario.

8 PUBLIC CONSULTATION

8.1 Focus Group Discussion (FGD)

Public participation and community consultation has been taken up as an integral part of social and environmental assessment process of the project. Public participation has been viewed as a continuous two way process, involving promotion of public understanding of the process and mechanism through which developmental problems and needs are investigated and solved. Focus Group Discussion (FGD) was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decision was made. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted. This participatory process helped in reducing the public resistance to change and enabled the participation of the local people in this development process.

8.1.1 Need and Usefulness of Focus Group Discussion (FGD)

Focus Group Discussion (FGD) is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plan.

8.1.2 Objectives

The objectives of Focus Group Discussion for this project are:

- Awareness of the project to local people, impacts and their suitable mitigation measures;
- Identify alternative design and mitigation measures;
- To improve environmental and social conditions;
- Establish transparent procedures for carrying out proposed projects;
- Create accountability and sense of local ownership during project implementation.

8.1.3 Level of Discussion

The discussion process established for the project has employed a range of formal consultative tools including in depth interviews with key informants and on-site Focus Group Discussion and meetings. The enactment of participation and consultation with villagers en-route has been done at various locations along the project corridor.

8.1.3.1 Local/Village level discussion

These discussions were held along the corridor of impact of the project road to inform people about the purpose and preliminary design of the project. These discussions were carried out to identify:

- Specific social and environmental issues
- Extent of likely impact due to the project
- Expectation and reservations of people towards project; and
- Resettlement and rehabilitation options.

Village/local level Focus Group Discussions were held at selected locations to understand the implication of the project impacts on various groups, especially those with distinct degree of vulnerability. The venues of the meetings were the villages/settlement along the project corridor. At these meetings, the people were invited covering project affected persons, prominent village persons, village panchayat members, teachers, health workers, etc.

Local level consultations meetings were carried out in 3 villages namely at Pipariya Dhani, Mohammadi and Mohammadpur Tajpur along the project road. **Table 8.1** presents the location wise output of the issues discussed, suggestions made by the participants.

The general issues discussed in all locations are given below:

- Perception on the existing project road and usage of the road
- Benefits and problems faced if any with the existing road
- Perception on the proposed 2 lane with paved shoulder improvements and alignment options
- Widening options and impact on local properties and business
- Type of environmental enhancement
- Identification of environmental issues

Table 8-1: Outputs of Local Level Consultations

S. No.	Name of the Village	Date of Consultation	Participants	Suggestions/Observations	Remarks
1	**Pipariya Dhani village**	04.11.2014	Affected villagers, the local residents, roadside residents and probable impacted families and the feasibility study team members.	1. People expressed their happiness that the road is going to be widened. 2. It will lead to development of the village. 3. The water in the area have high iron content. 4. Expansion of road should be to a limited possible extent. 6. Neelgai, Fox, Jackal is commonly seen is observed sometimes. Many times Neelgai causes great damage to their crop. 6. Acquisition of properties should be made after doing justice to the loss.	The widening will be carried out mostly within existing ROW. The affected persons will be compensated for the loss as per R&R policy adopted for UPCRNDP.
2	**Mohammadi**	06.11.2014	Affected villages, the local residents, roadside residents and probable impacted families and	1. The participants are glad to hear that Project road after 2 laning with paved shoulder, there social & economic income will increase & accidents can be minimized due to high speed of vehicles. It will lead to development of the area.	

S. No.	Name of the Village	Date of Consultation	Participants	Suggestions/Observations	Remarks
			the feasibility study team members.	2. Accidents can be minimized 3. Houses and business will be affected. 4. They insisted that the design should be made properly so that there will be minimum loss of property and The losses should be properly estimated for compensation. 5. Safety aspects should be addressed properly 6. They also suggested that all mitigation measures to be adopted to reduce the impact on the road side business. 7. Neelgai is commonly observed in that area and it causes great harm for cultivations.	The widening will be carried out mostly within existing ROW. The affected persons will be compensated for the loss as per R&R policy adopted for UPCRNDP. Traffic calming measures have been proposed in major built-up areas. The provision includes providing Table tops with pedestrian markings at start (from both end) of traffic calming zone and then subsequently at 250m within the traffic calming/ built-up zone. These measures will reduce the speed of vehicles enhancing safety of pedestrians in built-up areas. Elsewhere along the road, at all potential safety hazard locations like school etc, table tops with pedestrian markings have been proposed. The necessary road signs and road studs to improve night time visibility have also been proposed at these locations.
3	**Mohammadpur Tajpur village**	05.11.2014	Affected villages, the local residents, roadside residents and probable impacted families and the feasibility study team members.	1. The villagers are mostly engaged in agriculture and commercial activities. 2. The villagers opined that Project road after 2 laning with paved shoulder the rate of accidents increased and people are facing lot of hardships to cross the road. 3.There is scope for increase in accidents due to high speed of vehicles	The widening will be carried out mostly within existing ROW. The affected persons will be compensated for the loss as per R&R policy adopted for UPCRNDP. Traffic calming

S. No.	Name of the Village	Date of Consultation	Participants	Suggestions/Observations	Remarks
					measures have been proposed in major built-up areas. The provision includes providing Table tops with pedestrian markings at start (from both end) of traffic calming zone and then subsequently at 250m within the traffic calming/ built-up zone. These measures will reduce the speed of vehicles enhancing safety of pedestrians in built-up areas. Elsewhere along the road, at all potential safety hazard locations like school etc, table tops with pedestrian markings have been proposed. The necessary road signs and road studs to improve night time visibility have also been proposed at these locations.
				4. The villagers complained that the noise pollution due to movement of traffic is very irritating, so requested for plantation of more nos. of tree in that area in both the sides of the roads. 5. Neelgai, Fox, & Jackal are seen. Neelgai are in large number & is causing great loss to the agriculture.	Compensatory plantation will be carried out on both the side of the road in the ratio of 1:2, which will acts as vegetative noise barrier in the area. Additional tree plantation has been proposed along the primary school at Pipariya and Bagchan village.

The attendance sheets and photographs of Public Consultations at different locations are provided in **Annexure 8.1** and **Annexure 8.2** respectively.

9 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The present chapter details the Environmental Management Plan for the project section of State Highway-93 starting from Km 1.280 at Gola Market to Km 58.580 at Shahjahanpur. The Environmental Management Plan is based on the Environmental Impact Assessment study carried out for the project.

The Environmental Management Plan (EMP) consists of the set of mitigation, monitoring and institutional measures to be taken during the design, construction and operation stages of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The plan also includes the actions needed for the implementation of these measures.

The major components of the Environmental Management Plan are

- Mitigation of potentially adverse impacts
- Monitoring during project implementation and operation
- Institutional Capacity Building and Training
- Implementation Schedule and Environmental Cost Estimates
- Integration of EMP with Project planning, design, construction and operation.

9.1 Objectives of the EMP

Road strengthening and widening projects generally produce adverse impacts of lower magnitude, which can be prevented or mitigated through proper engineering design and by following environmental friendly construction practices. Environmental management plan is developed for ensuring the most efficient and cost effective way to mitigate the points of environmental concern in the construction contract provisions.

The main aim of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced. The management practices are developed for all the stages of project, i.e., Pre-construction/Design, Construction and Operational stages. The objectives of the EMP at various stages of the project planning and implementation can be summarized as follows:

Design Stage

- To have minimum impact on road side trees,
- To keep land acquisition and building demolition at a minimum
- To provide maximum safety to the highway users and road side communities
- To develop a design that incorporates environmental safeguards and
- To provide mitigation measures to all expected environmental degradation

Construction Stage

- To prevent and reduce the negative environmental impacts of the project by implementable mitigation measures, to be carried out by the Contractor.

- To ensure that the provisions of the EMP are strictly followed and implemented by strengthening implementation arrangements.

Operation Stage

- To prevent deterioration of environment components of air, water, soil, noise etc.
- To improve the safety of the highway users and road side communities

9.2 Critical Environmental Issues

The critical environmental components along the project corridor were identified on the basis of the assessment of the potential impacts. These issues need to be addressed carefully in the Environmental Management Plan. The most critical issues identified at various locations along the project corridor are described in the following **Table 9.1.**

Table 9-1: Critical Environmental Issues to be Addressed

Sl. No.	Critical Environmental Issues	Location
1	Resettlement and Rehabilitation Issue	For squatters/Encroachers within ROW throughout the project stretch in built-up sections
2	Removal of trees	Throughout the project stretch.
3.	Diversion of Protected Forest area	Throughout the project stretch as roadside trees declared as Protected Forest.
4.	Reserve Forest	Pocket of Reserve Forest located on both side between Km 12.000 to Km 13.400 and between Km 14.000 to Km 15.500
5.	Pond	7 ponds located close to the road
6.	Impact of religious features	4 No. of religious structure located in 20 meter road corridor within existing ROW. All structure have been saved
7.	Ambient Air Quality	Throughout the corridor
8.	Traffic Safety	More pronounced in major settlements

9.3 Environmental Management Action Plan

This section describes the Environmental Management Action Plan during different stages of project. The Environmental mitigation measures have been incorporated at all the stages of the project right from Designing phase to Construction and Operational Phase. All care has been taken to provide mitigation measures for all expected environmental degradation at different stages. The Environmental Management action plan has been formulated for the present project for mitigation/management/avoidance of potential adverse impacts and the enhancement of the various environmental components along with its location, timeframe of implementation, and overseeing/supervising responsibilities. The safeguard measures identified for different phases are tabulated in **Table 9.2**.

Table 9-2: Environnemental Management Plan

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
A. PRE-CONSTRUCTION STAGE					
PC.1.1 Loss of Properties	• There are number of non-titleholders in the form of squatters and encroachers will be affected within the ROW. However, at junctions and 4-laning sections, a number of titleholders will be affected, which will be established after detailed survey. Acquisition of private properties will be carried out in accordance with the RAP and entitlement framework for the project. • Early identification of entitlement for Compensation and Advance planning of Resettlement and Rehabilitation Action Plan to Compensate the Losses. • All the affected people will be compensated as per R & R Policy of the Project before commencement of Construction works • PIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents.	Habitation area	Pre-Construction Stage	PIU-UPPWD, NGOs	PMC/PIU-UPPWD
PC.1.2 Roadside Trees Cutting	• A total number of 5289 trees will be affected for which statutory permission for diversion of protected forest and tree felling will be obtained prior to cutting of trees. • All efforts will be made to preserve trees by restricting tree cutting within the formation width. • The tree plantation will be carried out the ratio of 1:2 within the proposed ROW along the project highway as compensatory plantation by following Guidelines for Landscaping and Tree Plantation (**IRC: SP:21-2009)**. • A general compensatory plantation scheme is presented in **ANNEXURE 9.1**	Through the Project Stretch	Pre-Construction Stage	Contractor & PMC/PIU-UPPWD	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC.1.3 Reserve Forest	• Diversion of about 0.098 ha of reserve forest land will be required for diversion for construction of approach road to new proposed bridge at Km 12.900 across Kathina River. • Diversion of forest land from reserved forest pocket will attract the provision of Forest (Conservation) Act and hence forest clearance would be required for acquisition of reserve forest land. • All the conditions stipulated in the forest clearance will be complied with during construction. • No construction Plants, construction camp or borrow area will be located in the project stretch long the Reserved Forest. A minimum distance of 1.000 Km from the reserved forest patch will be maintained for siting these features. • The contractor will take all precautionary measures in the forest stretch to avoid any incidence of forest fire.	Proposed new Bridge acr4ossat Kathina River at Km 12.900	Preconstruction Stage	PIU-UPPWD/PMC	PIU-UPPWD/ PMC
PC.1.3 Relocation of Community Utilities and Common Property Resources	• All community utilities and properties i.e., water supply lines at 1 villages, 95 electric poles, 32 transformers, 11 telephone poles and 107 hand pumps will be relocated before start of construction. • The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community. • Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.	Throughout Corridor wherever these features are located	Pre-Construction Stage	PIU-UPPWD, NGOs and R&R unit	PMC/PIU-UPPWD, Line Department
PC.1.4 Relocation of Religious/Cultural Properties	• Alignment selected to minimize loss of cultural property. Public consultation carried out for obtaining opinion for shifting of religious structures	Throughout Corridor wherever these features are located	Pre-Construction Stage	PIU-UPPWD, NGOs and R&R unit	PIU-UPPWD, PMC

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC-1.5 Arrangements for pedestrian safety in design	• Traffic calming measures have been proposed in major built-up areas. The provision includes providing Table tops with pedestrian markings at start (from both end) of traffic calming zone and then subsequently at 250m within the traffic calming/ built-up zone. These measures will reduce the speed of vehicles enhancing safety of pedestrians in built-up areas. Elsewhere along the road, at all potential safety hazard locations like school etc, table tops with pedestrian markings have been proposed. The necessary road signs and road studs to improve night time visibility have also been proposed at these locations.	Built-up areas	Design Stage	DPR Consultant	PIU-UPPWD
PC-1.6 Arrangements for temporary land for Establishing Camps/Plants/ Temporary diversions, etc.	• The Contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for workers camp, construction sites/hot mix plants/traffic detours etc. • The Contractor will submit the legal agreement/ written Consent letter from the owner of the land for using fir specific purpose along with its rehabilitation plan as agreed by the owner. • The Contractor will ensure that the site is properly restored to the satisfaction of the land owner prior to handling over to the owner and shall submit satisfactory certificate from the Land Owner.	At temporary camp site, temporary diversion and plant sites	Pre-Construction Stage and Post utilization of the land	Contractor	PMC/PIU-UPPWD
PC. 1.7 Establishment of Construction/ Workers Camp	• The locations of construction camp to be identified by the Contractor. • Construction camps will not be proposed within 1 Km from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. • Location for stockyards for construction materials will be identified at least 1000m from water sources / and 10 Km from Wildlife Sanctuary boundary. • The Contractor will submit the legal agreement/ written Consent letter from the owner of the land for using fir specific purpose along with its rehabilitation plan as agreed by the owner. • The Camp site will be provided with all the necessary facilities as per norms.	At temporary camp site, temporary diversion and plant sites	Pre-Contruction Stage and Post utilization of the land	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC 1.8 Establishment of Stone crushers, hot-mix plants, WMM Plant, Concrete Batching plants etc.	• Stone crushers, Hot mix plants, WMM Plants and Concrete Batching plants will be sited sufficiently away from settlements, agricultural operations and any commercial establishments. Such plants will be located at least 1000m away from the boundary of the nearest village/settlement and forests towards downwind direction. • The Contractor will conform to the siting and operation requirements of stone crusher unit, Hotmix plants, Batchmix plant, WMM Plants as per Environmental (Protection) Rules, 1986. • The Contractor shall submit a detailed layout plan for all such sites and approval of the Environmental Expert of PMC shall be necessary prior to their establishment. • All plants will be fitted with adequate dust suppression and emission control equipments and facilities. • Specifications of crushers and hot mix plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be obtained from the State Pollution Control Board. • The Contractor shall not operate the plants till the required legal clearance are obtained and submitted. • A general guideline given in **ANNEXURE-9.2** will be followed for establishing the plants sites, operation and pollution control measures to be adopted at site.	Plant Site	Pre-Construction Stage	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC.1.9 Borrow Area	• Finalizing borrow areas for borrowing earth and all logistic arrangements are well as compliance to environmental requirements, as applicable, will be the sole responsibility of the Contractor. • The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between the land owner and the Contractor and a copy is submitted to the PMC/PIU-UPPWD. • All the borrow areas will be approved by the Engineer based on both material and environmental considerations. • The Contractor will obtain environmental clearance for the borrow area as per MoEF circular and the conditions stipulated under the environmental clearance will be binding on the contractor. The Contractor will submit the copy of clearance letter to the Engineer and PIU before commencement of material extraction. • All the borrow area will be operated in accordance with IRC specification and MoEF guidelines. • No earth will be borrowed from within the RoW. • Non-productive, barren lands, raised lands, river beds, waste lands are recommended for borrowing earth. • The unpaved surfaces used for the haulage of borrow materials will be maintained properly • To avoid any embankment slippages, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer. • Each borrow area should be rehabilitated within one month after completion of extraction of materials to the satisfactions of the land owner and the Engineer. • A general guideline for Borrow area operation and rehabilitation given in **ANNEXURE 9.3** will be followed.	Identified Borrow area	Pre-Construction and Construction Stage	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC.1.10 Quarry Area	• The quarry material will be obtained from licensed sites only, which operate with proper environmental clearances, including clearances under the Air Act. • If the Contractor wants to open a new Quarry, then he has to obtain necessary environmental clearance from MoEFCC and lease license from Directorate of Geology and Mines. • All the quarries will be approved by the Engineer based on both material and environmental considerations. • The quarry operations will be undertaken within the rules and regulations in force. All safety and environmental concerns will be addresses adequately during quarry operations and transportation of materials as per prevailing rules. • Only controlled blasting shall be carried out, if necessary for extraction of stone materials in strict compliance with the statutory norms and specification • The restoration of Quarry will be done as per the conditions of the owner before handing over the site back to the owner.	Quarry sites recommended	During construction	Contractor	PMC/ PIU-UPPWD
PC-1.11 Contractor's Environmental and Safety Officer	The Contractor has to appoint one Environmental and Safety Officer having requisite qualification and has sufficient experience in implementation of Environmental safeguards in road projects.	-	During construction	Contractor	PMC/ PIU, UPPWD
PC-1.12 Disaster Management and Emergency Response Plan	• The Contractor will develop and maintain emergency response system in order to address any accidents or other emergency situation or disaster at site such as fall of workers from height, collapse of pier, flood, earthquake, accident, etc. • The Contractor will follow a general guidelines on Disaster Management and Emergency Response Plan as given in **Appendix-9.1**.	All the bridge construction zones	Pre-Construction stage	Contractor	PMC/PIU-UPPWD
B. CONSTRUCTION STAGE					
C.1. Impact on Land and Soil					

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.1.1. Soil Erosion	• High embankments will be provided with chutes and drains to minimize soil erosion • Stone pitching and retaining walls will be made at high embankments in critical areas • Turfing of low embankments and plantation of grasses and shrubs will be done in slope stabilisation • In borrow pits, the depth of the pit will be regulated that the sides of the excavation will have a slope not steeper than 1: 2, from the edge of the final section of bank. • Soil erosion checking measures as the formation of sediment basins, slope drains, etc, will be carried out.	At all embankment locations, bridge locations and borrow pits	During construction	Contractor	PMC/PIU-UPPWD
C.1.2. Loss of topsoil	• Agricultural areas will be avoided for borrowing of materials, unless requested by the land owner. • The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles of height not exceeding 2m. • The stored topsoil will be spread back to maintain the soil physico-chemical and biological activity. The preserved top soil will be used for restoration of sites, in landscaping and avenue plantation	Throughout project corridor	During construction	Contractor	PMC/PIU-UPPWD
C.1.3. Compaction of soil	• Construction vehicles, machinery and equipment will move, or be stationed in the designated area, to avoid compaction of soil. • If operating from temporarily hired land, it will be ensured that the topsoil for agriculture remains preserved & not destroyed by storage, material handling or any other construction related activities.	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD
C.1.4. Contamination of land from fuel and lubricants	• Impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform will be appropriately provided at construction camp, servicing area and liquid fuel and lubes at storage areas.	Construction Camp, Vehicle and Equipment Servicing Centre and Construction site	During Construction	Contractor	PMC/PIU-UPPWD
C.1.5. Contamination of land from construction wastes and spoils	• All spoils will be disposed off as desired and the site will be fully cleaned before handing over. The non-usable bitumen spoils will be disposed off in a deep trench providing clay lining at the bottom and filled with soil at the top (for at least 0.5m)	All construction sites, borrow pits camps Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C. 2. Impact on Water Resources					
C.2.1. Drainage and run-off	• The Contractor will always clear all the cross drainage structures and natural drainage before onset of monsoon in order to keep all drainage unblocked Earth, stones, wastes and spoils will be properly disposed off, to avoid blockage of any drainage channel. • All necessary precautions will be taken to construct temporary or permanent devices to prevent inundation or ponding.	At locations of CD structures	During construction	Contractor	PMC/PIU-UPPWD
C.2.2 Rainwater Harvesting & Removal of Oil & Grease from Runoff water	• The Contractor will construct Rain water harvesting pits at an average distance of 500 m which will be connected with longitudinal drains • The pits should be at least 5 m above the highest ground water table. • The Contractor shall submit a detailed layout plan for all such sites in consultation with Central Ground Water Board and approval of the PMC shall be necessary prior to their establishment. • The schematic diagram of Rain water harvesting pit is presented as **Annexure 9.5**. • The Contractor will provide oil receptors connected with longitudinal drains in a manner that can regulate the runoff water as well as extract the oil and grease from the runoff water before entering the rainwater harvesting pits or nearby water bodies or agriculture fields. A typical schematic plan may be followed for construction oil receptors at strategic locations as per **Annexure 9.6**	Throughout the stretch	Construction Stage	Contractor in consultation with Ground Water Board	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.2.3. Contamination of water from construction and allied activities	• All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity. • The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into canals, water bodies or the irrigation system and avoid construction works close to canals or water bodies during monsoon. • All wastes arising from the project will be disposed off, as per SPCB norms, so as not to block the flow of water. • No construction materials/ spoils will be stored along the water bodies and adequate provision will be made for preventing spillage of materials into these water bodies. • Wastes must be collected, stored and taken to approve disposal site. • Water quality to be monitored periodically as per Environmental Monitoring Plan.	Throughout Project Corridor where the Water Bodies located	During construction and after	Contractor	PMC/PIU-UPPWD
C.2.4. Contamination of water from fuel and lubricants	• The Contractor will ensure that all construction vehicle parking location, fuels/lubricants storage sites, vehicles, machinery and equipment maintenance sites are located at least 100m away from any water body. The Contractor will also ensure that spillage of fuels and lubricants do not contaminate the ground. • The slopes of embankment leading to water bodies will be modified and re chanelised so that contaminants do not enter the water body. • Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. • The Contractor will arrange for collection, strong and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to PMC/PIU-UPPWD) and approved by the Environmental Expert. All spills and collected petroleum products will be disposed off in accordance with statutory guidelines.	Throughout Project Corridor and at all locations of water bodies	During construction	Contractor	PMC/PIU-UPPWD
C.2.5. Sanitation and waste disposal in construction camps	• Garbage tanks and sanitation facilities will be provided at camps. • The construction camps will be located away from water sources. • Efforts will be made to provide good sanitary conditions at camp to avoid epidemics. • The workplace will have proper medical approval by local medical, health or municipal authorities.	At Construction camp locations, wherever located along the Project corridor	During construction	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.2.6. Use of water for construction	• The Contractor will use ground water/surface water as a source of water for the construction after taking prior permission from Competent Authority. • The Contractor will provide a list of locations and type of sources from where water for construction will be used. • To avoid disruption/disturbance to other water users, the Contractor will extract water from fixed locations. The Contractor will not be allowed to pump water from any irrigation canal and surface water bodies used by the community. • The Contractor is required to comply with the requirements of the State Ground Water Department and seek its approval for doing so and submit copies of the permission to Environmental Expert of PMC/PIU-UPPWD. • Wastage of water during the construction will be minimized.	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD
C.2.7 Community water Source	• Damage to any community water source such as wells, tube-wells, water supply pipelines etc., due to construction activities in a particular area, will be replaced immediately by the Contractor at their own cost.	Throughout the Stretch	During construction	Contractor	PMC/PIU-UPPWD
C.3. Impact on Air Environment					
C.3.1. Emission from construction vehicles and machinery	• All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the SPCB norms. • The asphalt plants, crushers and the batching plants will be sited at least 1000 m in the downwind direction from the nearest human settlement (Boundary of town/village). • Vehicles transporting earth materials will be covered • Mixing equipment will be well sealed and equipped as per PCB norms.	Throughout Project Corridor at construction sites, hot mix plant, concrete batching plant	During construction and after	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.3.2 Emission from Construction Vehicles, Equipment and Machineries	• Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of UPPCB. • The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'. • Periodical monitoring of fine Particulate Matters (PM_{10} and $PM_{2.5}$) will be carrier out as per Environmental Monitoring Plan. • Workers at mixing sites will be provided with good quality personal protective equipments (PPE) reduce the chances of ill effect of dust.	Throughout Project Corridor at construction sites, hot mix plant, concrete batching plant and the equipments and vehicles at sites	During construction	Contractor	PMC/PIU-UPPWD
C.3.3 Dust Pollution	• The Contractor will take every precaution to control dust nuisance at all the construction zones and allied sites where works are under progress. • Every equipments and machinery will be fitted with dust suppression devices such as water sprinklers, dust bags, cyclone etc. As appropriate. • The Contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation. • At all the construction zones and unpaved lead roads, earthen temporary diversions and plant premises periodical water sprinkling will be carried out to suppress dust. • Transportation of loose earth, sand will be done in covered vehicles. • All equipments and machineries will be maintained properly. • Periodical monitoring of fine Particulate Matters (PM_{10} and $PM_{2.5}$) will be carried out as per Environmental Monitoring Plan. • Workers at mixing sites will wear masks to reduce the chances of exposure to fugitive dusts.	Throughout the Construction zones, plant sites, borrow area/quarry sites, camp site	During construction	Contractor Contractor through Approved Monitoring Agency	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.3.4 Fly ash Handling and utilization	• The handling and transportation of fly ash will be done as per section 4.6 of IRC: SP: 58-2001. • Fly ash from hoppers or silos must be conditioned with water at power plant to prevent dusting enroute. • Fly ash will be transported to the site in covered dump truck to minimize loss of moisture and dust generation. • The quantity of fly ash will be transported based on utilization as per work plan to avoid stockpiling of excees quantity. However if stockpiling is required then Adequate precautions will be taken to prevent dust generation by spraying water on stockpiles at regular intervals. • The stockpile of flyash will be covered with tarpaulins or a thin layer of soil or other granular material to avoid dust generation.	Construction zones and stockyards	During Construction	Contractor	PMC/PIU-UPPWD
C.4. Impact on Noise Pollution					
C.4.1. Noise from vehicles, asphalt plants and equipments	The Contractor will conform with the following measures: • All plants and equipments used in construction shall strictly conform to the MoEFCC/CPCB/UPPCB noise standards. • All vehicles and equipment used in construction will be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery will be done for exhaust silences and will be checked and if found defective will be replaced. • All the construction sites within 150m of the nearest habitation, noisy construction work such as crushing, concrete mixing will be stopped during the night time between 10.00 pm to 6.00 am. • No noisy construction activities will be permitted around educational institutions/health centers (silence zones) up to a distance of 100 m from the sensitive receptors. • Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to PMC/PIU-UPPWD. • Environmental Expert will be required to inspect regularly to ensure the compliance of EMP.	Throughout Project Corridor and at all construction sites, hot mix plant concrete batching plants	During the construction, till the closure of such sites	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.5. Impact on Flora					
C.5.1. Loss or damage to vegetation	• Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other that those identified for cutting is minimum. • Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert. • The Contractor, under any circumstances will not cut or damage trees. • Trees identified under the project will be cut only after receiving clearance from the Forest Department and after the receipt of written permission from PIU. • Vegetation only with girth of over 30 cm measured at a height of 1.0 m above the ground will be considered as trees and shall be compensated.	Throughout Project Corridor	Just after completion of construction activities	Contractor	PMC/PIU-UPPWD
C.5.2. Compaction of vegetation	• Construction vehicles, machinery and equipment will move or be stationed in the designated area only (RoW or CoI, as applicable), to prevent compaction of vegetation outside the RoW. • While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil and damage to naturally occurring herbs and grasses will be avoided.	Throughout Project Corridor	Just before commencement of construction	Contractor	PMC/PIU-UPPWD
C.6. Impact on Fauna					
C.6.1. Loss, damage or disruption to fauna	• Construction workers will be directed not to disrupt or damage the fauna. • State rules for hunting (wild life protection) will be adhered and rules for Bird catching (wild life protection) will be adhered • Construction vehicles will run along specified access to avoid accidents to cattle.	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.7. Safety And Accident Risks					
C.7.1. Accident risks from construction activities	• The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms of safety during construction • To ensure safe construction in the temporary accesses during construction, lighting devices and safety sign boards will be installed. • Traffic rules and regulations will be strictly adhered to. • At blasting sites, the blasting time, signal and guarding will be regulated. Prior to blasting the site will be thoroughly inspected. Blasting will not be carried out during rush hours • Safety of workers undertaking various operations during construction will be ensured by providing helmets, masks, safety goggles, etc • The electrical equipment will be checked regularly • At every camp site, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), para medical staff and an attending doctor will be provided. • Road safety education will be imparted to drivers running construction vehicles. In case of negligent driving, suitable action will be taken. • Adequate signage, barriers and persons with flags during construction to control the traffic will be provided. • Communications through newspaper/announcements/radio/TV about the time frame of the project and the activities causing disruptions on road access and the temporary arrangement made to give relief to the public will be undertaken.	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.7.2 Occupational Health & Safety of Workers	• The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007[3] and the statutory norms of safety during construction. • The Contractor will provide adequate good quality Personal Protective Equipments (PPE) to all the workers working at construction zones and Plant sites and will ensure that these PPEs are used by workers at all time during works. • Adequate drainage, sanitation and waste disposal will be provided at workplaces. • Proper drainage will be maintained around sites to avoid water logging leading to various diseases • Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc. • A health care system will be maintained at construction camp for routine checkup of workers and avoidance of spread of any communicable disease • Readily available First Aid kit bearing all necessary first aid items will be proved at all the work sites and should be regularly maintained. • The Contractor will organize awareness program on HIV aids and sexually transmitted diseases (STDs) for workers on periodic basis.	Workers Camp Site and Construction Zones	During construction	Contractor	PMC/PIU-UPPWD
C.7.3 Accessibility	• The Contractor will all time provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property access as connecting the project road. The Contractor will also ensure that the existing accesses are not blocked without providing adequate provisions and to the prior satisfaction of Engineer. • The Contractor will take care that the cross roads are constructed in such a sequence so that traffic movement on any given area does not get affected.	At all Construction Zones Along settlement stretches and at major intersections	During construction	Contractor	PMC/PIU-UPPWD

[3] *Reference: http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES and http://www.ifc.org/wps/wcm/connect/7e4c7f80488554d5b45cf66a6515bb18/Final%2B-%2BToll%2BRoads.pdf?MOD=AJPERES&id=1323162564158]*

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.7.4 Planning for Traffic diversion	• Detailed Traffic Control Plans will be prepared and submitted to the Engineer and PMC/PIU-UPPWD for approval, five days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation hazardous materials and arrangement of flagmen. • The Contractor will provide specific measures for safety of pedestrians and workers at night as a part of traffic control plans. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. The Contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from PMC/PIU-UPPWD.	All the Construction Zones	During Construction	Contractor	PMC/PIU-UPPWD
C.8. Impact Cultural Properties					
C.8.1. Damage or loss of cultural properties	• Relocation of adversely impacted cultural properties • If any valuable or invaluable articles such as fabrics, coins, artefacts, structures, or other archaeological relics are discovered, the excavation will be stopped and Archaeology Department, UP will be intimated. • Construction camps blasting sites and all allied construction activities will be located at least 500 m away from the cultural property	Throughout Project Corridor at all locations of Cultural Properties	Before construction starts During construction	Contractor and Archaeology Department UP.	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.9 Camp Site Management					
C.9.1 Labour Camp facility	• Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 as well as the guidelines of IFC and EBRD[4] will be followed for construction and maintenance of labour camp throughout the construction period. • The location, layout and basic facility provision of each labour camp will be submitted to The Engineer and PIU prior to their construction. • The construction will commence only upon the written approval of the Engineer. • The contractor will maintain necessary living accommodation and ancillary facilities in Functional and hygienic manner and as approved by the Engineer. • Periodical medical check-up will be ensured for all the workers.	Camp Site	Construction Stage	Contractor	PMC/PIU-UPPWD
C.9.2 Potable Water	• The Contractor will provide potable water facilities within the precincts of every workplace in an accessible place. • The Contractor will also guarantee the following: • Supply of sufficient quantity of potable water (as per IS) in every workplace/labour camp at suitable and easily accessible places and regular maintenance of such facilities. • If any water storage tank is provided, the bottom of the tank will be kept at least 1mt. above from the surrounding ground level. • If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well will be disinfected before water is used for drinking. • All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. • A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month.	Camp site and work zones	Construction Stage	Contractor	PMC/PIU-UPPWD

4 http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/learning+and+adapting/knowledge+products/publications/publications_gpn_workersaccommodation

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.9.3 Sanitation and Sewage system	• The Contractor will ensure that- The sewage system for the camp will be designed, built and operated in such a fashion that it should not pollute the ground water or nearby surface water. • Separate toilets/bathrooms, will be arranged for men and women • Adequate water supply is to be provided in all toilets and urinals • All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition • Night soil (human excreta) is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15cm, layer of waste or refuse and then covered with a layer of earth for a fortnight.	Camp Site	Construction Stage	Contractor	PMC/PIU-UPPWD
C.9.4 Waste disposal	• The Contractor will provide segregated garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of PMC/PIU-UPPWD. • Unless otherwise arranged by local municipal authority, arrangements for disposal of night soils (human excreta) suitably approved by the local municipal authority or as directed by the Engineer, will be arranged by the Contractor.	Camp site	Construction Stage	Contractor	PMC/PIU-UPPWD
C.10 Monitoring of Pollution					
C.10.1 Monitoring of Air, Water & Noise Quality Pollution Monitoring	• The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in environmental monitoring plan will be the responsibility of Contractor. • PIU will appoint MOEFCC/UPPCB approved pollution monitoring agency for this purpose.	As per Environmental Monitoring Plan (Construction Zones and Plant/Camp Sites)	During Construction	Contractor through approved laboratory	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.11 Site Restoration and Rehabilitation					
C.11.1 Clean-up Operations, Restoration and Rehabilitation	• Contractor will prepare site restoration plans, which will be approved by the Engineer. • The cleanup and restoration operations are to be implemented by the Contractor prior to demobilization. • The contractor will clear all the debris material at site, temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by the Engineer (PMC). • All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by the PMC in a layer of thickness of 75 mm-150 mm. • All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant • sites, crushers, batching plant sites and any other area used/affected by the project will be • left clean and tidy, at the contractor's expense, to the entire satisfaction of the Engineer (PMC).	Construction zones, Camp and other allied sites	After Completion of Construction and before demobilization of Construction Team	Contractor	PMC/PIU-UPPWD
C. OPERATION STAGE					
O-1: Monitoring of Operation Performance	• The PIU-UPPWD will monitor the operational performance of the various mitigation/enhancement measures carried out as a part of the project. • The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated utilities, hand pumps and other relocated structures if any; status of rehabilitation of borrow areas; and noise barriers, which are proposed at different locations.	Throughout the project Stretch	Operation stage/	Contractor	PMC/PIU-UPPWD
O-2: Maintenance of Drainage	• PIU-UPPWD will ensure that all drains (side drains, cross drains etc.) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding. • PIU-UPPWD will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.	Throughout the project Stretch	Operation stage/	Contractor	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
O-3: Pollution Monitoring	• The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in environmental monitoring plan will be the responsibility of Contractor. • PIU-UPPWD will appoint MOEFCC/UPPCB approved pollution monitoring agency/Laboratory for this purpose.	As per Environmental Monitoring Plan	Operation stage/	Contractor through approved laboratory	PMC/PIU-UPPWD
O-4: Contamination of Surface Water due to Traffic Movement & Accidents	• Contingency Plans will be developed for cleanup of oil spills, fuel and toxic chemicals.	Throughout the project stretch	Operation stage/	Contractor/ PIU-UPPWD	PIU-UPPWD
O.5: Noise Pollution	• Noise pollution will be monitored as per monitoring plan at different zones. • Noise attenuating Tree Species to be planted along the road • Noise control programs are to be enforced strictly. Monitoring the effectiveness of the pollution attenuation barriers, if there is any, will be taken up.	Specially inhabitant location	Operation stage	Contractor through approved laboratory	PIU-UPPWD
O.6: Accident Hazard and Safety	• Provision of elaborate system of sign boards and road markings along the whole stretch • Provision of suitable lighting arrangement at required locations • Development of Emergency Response and Contingency Plan for accidents • Regular highway patrolling	Thought the project stretch	Operation Stage	Contractor, PMC/PIU-UPPWD	PMC/PIU-UPPWD

9.4 Environmental Enhancement

Enhancement measures for community properties located adjacent to the road has been proposed at Bagchan Village at Km 9+300, Mohammadi at Km 28+000 and at Pipariya Village at Km 50+200 The details of enhancement measures is presented in **Annexure 9.11**.

9.5 Environmental Monitoring Programme

Environmental monitoring provides an essential tool to make necessary recommendations and adopt suitable control strategies so that menace of rising environmental degradation could be minimized and a relief be extended to the people including labours in case of any damage caused under occupational health hazards. The monitoring is necessary for the following reasons:

- To see what impacts have occurred;
- To evaluate the performance of mitigation measures proposed in the EMP;
- To ensure that the conditions of approval are adhered to;
- To suggest improvements in management plan, if required;
- To see that benefits expected from the EA are achieved as the project proceeds; and
- To satisfy the legal and community obligations.

9.5.1 Performance Indicators (PIS)

The physical, biological and social components, which are significant in affecting the environment at critical locations, have been suggested as Performance Indicators. The following specific environmental parameters can be qualitatively measured and compared over a period of time and therefore selected as Performance Indicators for monitoring due to their regulatory importance and the availability of standardized procedures and relevant expertise.

- Soil contamination & Erosion indices
- Air quality
- Water quality
- Noise levels around sensitive locations
- Re-plantation success /survival rate
- Restoration of borrow pits
- Construction camp management
- Sedimentation in the ponds adjacent to road
- Debris Clarence and disposal

9.5.2 Selection of Indicators for Monitoring

The environmental parameters that may be qualitatively and quantitatively measured and compared over a period of time, due to their importance and the availability of standardized procedures and expertise have been selected as Performance Indicators (PIs).

- Ambient Air Quality
- Noise levels
- Water Quality
- Soil Quality
- Flora
- Debris Clarence and disposal

9.5.3 Monitoring of Performance Indicators

Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters which are recommended for monitoring of widening and strengthening of state highway are PM_{10} (Particulate Matter having less than 10 micron size) or $PM_{2.5}$ (Particulate Matter having less than 2.5 micron size), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOx) and Carbon Monoxide (CO) and Hydrocarbon (HC). These parameters are to be monitored at selected locations such as plant and machinery sites, crusher sites, excavation works, etc. starting from the commencement of construction activity. Data should be generated once in a season at the selected monitoring locations in accordance with National Ambient Air Quality (NAAQ) Standards 2009 (**ANNEXURE-9.7)**.

Ambient Noise Monitoring

The measurement for monitoring the noise levels to be carried out at sensitive locations and at construction sites along the project road in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) (**ANNEXURE 9.8)**. Sound pressure level would be monitored on twenty-four hourly basis. Noise shall be recorded at "A" weighted frequency using digitized noise monitoring instrument.

Water Quality

Water quality of local water resources that is used by local community shall be monitored. The physical and chemical parameters recommended for analysis of water quality relevant to road project are pH, total solids, total suspended solids, total dissolved solids, COD, BOD, DO, Oil and Grease, Chloride, Iron, etc. The monitoring of the water quality will be carried out at all locations identified along the project road during construction and operation phase. Monitoring parameters will be as per IS-10500 (**ANNEXURE-9.9**) for ground water quality and for surface water quality as per CPCB Guidelines for used based surface water classification (**ANNEXURE-9.10**).

Soil Quality

The soil quality of the surround fields close to the construction site and plant site will be monitored to understand the impact of soil quality. The physic-chemical parameters recommended for analysis are physical Parameter: Texture, Grain Size, Gravel, Sand, Silt and Clay and Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen and Absorption Ratio.

Tree Survival Rate

Roadside plantation of trees and their management will be an important environmental activity for the management group. These activities will include selection of plant, development of nurseries, protection of plant, interaction with roadside communities for plantation management and their maintenance, etc.

The widening and up gradation of the project requires felling of roadside trees. This lost will be compensated by compensatory afforestation. The compensatory afforestation will be done as per Forest (Conservation) Act and policy of Uttar Pradesh Forest Department.

To ensure the proper maintenance and monitoring of the compensatory afforestation, a regular maintenance and monitoring of the survival rate of the planted trees is being proposed up to a period of 3 years from the operation of the project. This will be monitored by implementing agency with the help of Forest Department.

Debris clearance and disposal

The contractor has to clear the debris material from the completed sections on regular basis and the debris are required to be disposed off at approved disposal sites. To ensure regular clearance and disposal of debris the monitoring will be required for the same. Visual monitoring of the site will be carried out on periodical basis especially in the section which is completed.

9.6 Environmental Monitoring Action Plan

The monitoring action plan covering various performance indicators, frequency and institutional arrangements of the project in the construction and operation stages is given in **Table 9.3**.

9.7 Environmental Reporting System

Monitoring and evaluation are important activities in implementation of all projects. Monitoring involves periodic checking to ascertain whether activities are going according to the plans. It provides the necessary feedback for project management to keep the programme on schedule.

The reporting system will operate linearly with the Contractor, who will report to Project Management Consultant (PMC), who will in turn report to the Project Implementation Unit (PIU). All reporting by the Contractor and PMC shall be on monthly/quarterly/annual basis. The PIU shall be responsible for preparing targets for each of identified EMP activities.

The compliance monitoring and the progress reports on environmental components may be clubbed together and submitted to the PIU regularly during the implementation period. The operation stage monitoring reports may be annual or biannual. The operation stage monitoring reports will have to be prepared as specified in the said project Environmental Completion Report.

9.8 Environmental Monitoring Cost

A separate budgetary provision has been made for implementation of Environmental Monitoring Plan. The environmental monitoring cost is estimated on the basis of the length and existing environmental scenario of the project road. A budget allocation has been made against environmental monitoring during construction and operation stages of **Rupees 7.68 lakhs** and **Rupees 1.74 lakhs** respectively. The details are provided in **Table 9.3.**

Table 9-3: Environmental Monitoring Plan

Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	**Standards**	**Locations**	**Frequency**	**Duration**	**Action Plan in case criteria exceeds**	**Implementation**	**Supervision**
Air	**Construction**	PM_{10} µg/m^3, $PM_{2.5}$ µg/m^3, SO_2, NOx, CO	National Ambient Air Quality Standard (CPCB, 18th Nov, 2009)	Plant site, HMP and Stone Crusher (1 location)	Once in 3 month for 2 years excluding monsoon period)	Continuous 24 hours	Check and modify control device like bag filter/cyclones of hot mix plant	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
		PM_{10} µg/m^3, $PM_{2.5}$ µg/m^3, SO_2, NOx, CO		Along the project road at 2 locations in consultation with PMC.	Once in a season excluding the monsoon for 2 Years	Continuous 24 hours	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
	Operation	PM_{10} µg/m^3, $PM_{2.5}$ µg/m^3, SO_2, NOx, CO		Along the project road at 2 locations in consultation with PMC	In the interval of 4 months excluding the monsoon for 1 Year	Continuous 24 hours	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Surface Water Quality	**Construction**	pH, Temperature, DO, BOD, COD, Oil & Grease, Total Suspended Solid, turbidity, Total Hardness, Chlorine, Iron, Total Coliform	Surface Water Quality Standard	At identified locations (3 locations)	Once in a season excluding monsoon for 2 Years	Grab Sampling	Check and modify Oil interceptors, silt fencing devices	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD

Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	**Standards**	**Locations**	**Frequency**	**Duration**	**Action Plan in case criteria exceeds**	**Implementation**	**Supervision**
	Operation	pH, Temperature, DO, BOD, COD, Oil & Grease, Total Suspended Solid, turbidity, Total Hardness, Chlorine, Iron, Total Coliform		At identified locations (2 locations)	In the interval of 4 months excluding the monsoon for 1 Year	Grab Sampling	Check and modify petrol interceptors, silt fencing devices	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Ground Water Quality	**Construction**	pH, Temperature, TSS, Total hardness, Suspended Solid, Chlorine, Iron, Sulphate, Nitrate	Ground Water Quality Standard as per IS: 10500, 1991	Construction site (2 locations)	Once in 3 months for 2 Years	Grab Sampling	Check and modify petrol interceptors, silt fencing devices	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Noise Level	**Construction**	Leq dB (A) (Day and Night) Average and Peak values	Ambient Noise Standard (CPCB, 2000)	At equipment yards and locations as identified along the project road by PMC (3 locations)	In the interval of 3 months for 2 Years	24 hourly recording of Leq	Check and modify equipment and devices used to protect noise level	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD

Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	**Standards**	**Locations**	**Frequency**	**Duration**	**Action Plan in case criteria exceeds**	**Implementation**	**Supervision**
	Operation	Leq dB (A) (Day and Night) Average and Peak values		Locations as identified by PMC (3 locations)	In the interval of 4 months for 1 Year	24 hourly recording of Leq	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Soil	**Construction**	Physical Parameter: Texture, Grain Size, Gravel, Sand, Silt, Clay; Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen, Absorption Ratio		Near Construction sites along the road as identified by the PMC (3 locations)	In the interval of 3 months for 2 Years	-	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
	Operation	Physical Parameter: Texture, Grain Size, Gravel, Sand, Silt, Clay; Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen, Absorption Ratio		Along the road (2 locations)	In the interval of 4 months for 1 Year	1 Year	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD

Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	**Standards**	**Locations**	**Frequency**	**Duration**	**Action Plan in case criteria exceeds**	**Implementation**	**Supervision**
Tree Plantation/Greenbelt Development	**Construction**	Tree Survival rate	90% Tree Survival Rate	Throughout the Project in substantially completed section	Once in a month	1 Year	Replacement of dead tree with healthy saplings of same species, repairing of tree guards, fencing etc.	Contractor	PMC, PIU UP PWD
	Operation	Tree Survival rate	80% Tree Survival Rate	Throughout the Project stretch	Once in three months	1 Year	Replacement of dead tree with healthy saplings of same species	Contractor	PMC, PIU UP PWD
Water Bodies	**Construction**	Turbidity in Storm water Silt load in ponds/Rivers	As specified by the engineer Water quality standards	At the drains, Ponds, Water reservoir and River along the project road	Pre-monsoon and post monsoon seasons for 3 years	3 years	Inspection and modification of silt fencing/ any leakage of drains to these surface water bodies	Contractor	PMC, PIU UP PWD
	Operation	Turbidity in Storm water Silt load in ponds	As specified by the engineer/ Water quality standards	At major water bodies (Pond, within the Proposed ROW and those located at immediate vicinity of the Proposed ROW.	5 Year before onset of monsoon	5 Years	Check and repair catch drains, storm water drains and silt trap	Contractor	PMC till defect liability period, PIU UP PWD

Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	**Standards**	**Locations**	**Frequency**	**Duration**	**Action Plan in case criteria exceeds**	**Implementation**	**Supervision**
Debris Clarence and disposal	**Construction**	Debris removal from different construction site	Visual observation	Along the project road	Once in quarter	3 years	Shall be checked in completed section	Contractor	PMC, PIU UP PWD

9.9 Institutional Arrangement for Implementation of EMP

The Government of Uttar Pradesh has setup Project Implementation Unit for UPCRNDP to streamline decision-making and provide more autonomy for project execution and delivery. The PMU is headed by Chief Engineer, Work Bank (Roads) supported by Superintending Engineer (Project) and Project Director, UPCRNDP at Head Office. The Superintending Engineer (Projects) is responsible to assist Chief Engineer in ensuring that overall expenditure under each of the agreed component does not exceed the total cost specified in the project document, to assist Chief Engineer in monthly plan review and monitoring meeting wherein physical and financial review will be done at the level of Chief Engineer and for budget provision/Allotment/CCL/ Assurance/Rules/Draft Para/Audit Para/PAC Para.

The Project Director will have overall responsibility for implementation of projects.

For implementation of EMP/ RP, an Environmental and Social Development Cell (ESDC) has been set up in PMU. The cell is headed by an Executive Engineer. He is overall responsible for EMP Implementation, coordinating and laisoning with government organization as well as the World Bank with respect to different forest and environmental issues. He will also responsible for progress monitoring of Environmental safeguards during project execution and submission of quarterly/ annual report on EMP compliance to the funding Agency.

There are three World Bank Circles located at Moradabad, Kanpur and Lucknow which are heads by respective Superintending Engineers. There is provision of two Executive Engineers in each World Bank Circle whose responsibility is to oversee the project progress at site in their respective area. It is proposed to have one Environmental Nodal Officer at Office of each Executive Engineer who will look into the compliance with the safeguards, laisoning with local authorities in connection with different permits and licenses, redressing the public complaints on environmental issues, etc.

The PMU will appoint Project Management Consultant as Engineer in-charge who will supervise the Contractors activities, compliances and monitor the overall progress of work. There is provision of Environmental Specialist in PMC who will be responsible for providing technical guidance to the Contractor for implementation of the EMP and preparation of checklists/formats/reports, etc. for implementing each of the activities as per the EMP. He will conduct regular monitoring of the implementation of the EMP by the Contractor and will Prepare monthly or quarterly and annual monitoring reports on EMP implementation and compliance with environmental clauses of Contract Agreement. He shall be responsible for record keeping, providing instructions to the field representatives for corrective actions, ensuring compliance of various statutory and legislative requirements.

The Contractor will have one Environmental & Safety Officer, who will be directly responsible for implementation of environmental safeguards at different locations of construction. He will ensuring compliance of the instructions given by the PMC. He will maintain close interaction with PMC and his Field Representative and seek instructions and guidance from PMC's Environmental Expert on any issue related to implementation of environment and safety measures. He shall be responsible for record keeping, and reporting to the PMC through PM on actions taken. He will also give inhouse training to the workers on environment and safety. Maintaining the record of day to day monitoring of environmental and safety issues at site

The Roles and responsibility of implementation and Supervision Agencies at different levels have been defined in **Table 9.4**. The proposed Institutional structure for EMP implementation is presented in **Figure 9.1**.

Table 9-4: Roles and Responsibility of Implementing Agency/Organisations

PMU-UPCRNDP	PIU, Site Office	PMC	Contractor
• Obtain statutory clearances. • overall project coordination and management through PIU supported by SC • Interaction and Reporting to World Bank • Effective implementation of EMP and Monitoring of EMP • Compilation of Data relating to implementation of Environment Management Plan. • Advising and suggesting corrective measures to adhere to time schedule for implementation of EMP. • Carry out verification Exercise for implementation of EMP with respect to modification (if required) for enhancement measures.	• Joint verification to be carried out by PMU, PMC, Contractor Env. Officer. • Overall Supervision of implementation of EMP • Environmental monitoring through approved Laboratory. • Consent for opening of Borrow areas, Quarry areas, and Labour camps and supervising its monitoring. • Keeping records of all consents obtained by contractor. • Compilation of Data relating to implementation of EMP. • Filling of Summary Sheets and reporting to PMU. • Approval of plans prepared by contractor	• Assist and advise the PMU/PIU in matters relating to environment and social matters. • Part of Joint Verification Exercise to be carried out by PMU, PIU and Contractor for review of EMP for modification in enhancement measures (if required) • Supervise implementation of EMP by contractor • Develop Good Practices construction guidelines to assist contractor in implementation of EMP • Conduct Consultations programs with the stakeholders on regular basis to get first hand information on the inconvenience caused to contractor‟ s activities such as noise, debris disposal etc. • Maintain Environmental reporting system	• Joint Verification Exercise including, PMU/PIU PMC for review of EMP • Interaction with ESDC, PIU and PMC • Contractor‟ s Environment & Safety officer will be primarily responsible for implementation EMP • Filling of Reporting Format and submitting to PMC • Monitoring through approved agency. • Preparation of various plans for effective implementation of EMP as detailed out in EMP and submitting it for approval to PMC • Identification of Sites for Labour camps, Hot mix Plant, Batch Mix Plant, debris disposal etc • Day to day monitoring of implementation of Environmental Safeguards

The role and responsibilities of Environmental personnel at different levels will be as follows:

Position	Roles & Responsibilities
PMU's Environmental and Social Nodal Officer (ESD Cell)	• Finalize the EIA and EMP for individual sub-project with inputs from PMC • Confirm integration of EMP provision related to works in the contract documents • Provide guidance on environmental issues to PIUs Environmental and Social officers as requested • Coordinate with regulatory agencies like Forest Departments, and at request of PMC and/or Contractor, UPPCB • Prepare regular reports on progress on EMP implementation across the project with inputs from the PMC's environmental specialist • Document experiences of developing and implementing environmental mitigation measures an convert it into training material for internal and external capacity building • Facilitate interaction between environmental teams of different sub-projects to allow cross-fertilization of ideas, successes and learnings

Position	Roles & Responsibilities
Environmental and Social Nodal Officer at PIU (Division Office)	• Coordinate with PMC's environmental specialist to monitor and report on progress on EMP implementation as part of works contracts • Participate in and facilitate consultations with stakeholders • Participate in project meetings and report on the issues related to environmental management to provide for any mid-course corrections that may be required based on situation on the ground • Coordinate on the training and capacity building initiatives
Environmental Specialist, PMC	• Lead the development of the sub-project specific EIA and EMP for the entire project • Review contract documents to ensure that EMP provisions related to works are included in the contract documents • Assist the Environmental Specialist in the PMU to follow-up with state government departments • Oversee and report to the PMU on implementation of EMP provisions included in the works contract for each sub-project • Act as a resource person in trainings based on experience on implementing this project and previous relevant work
Contractors' Environmental and Safety Officer	• Lead the implementation of EMP measures included in the Contract • Report on progress and shortcomings of the measures implemented to Environmental Specialist of PMC

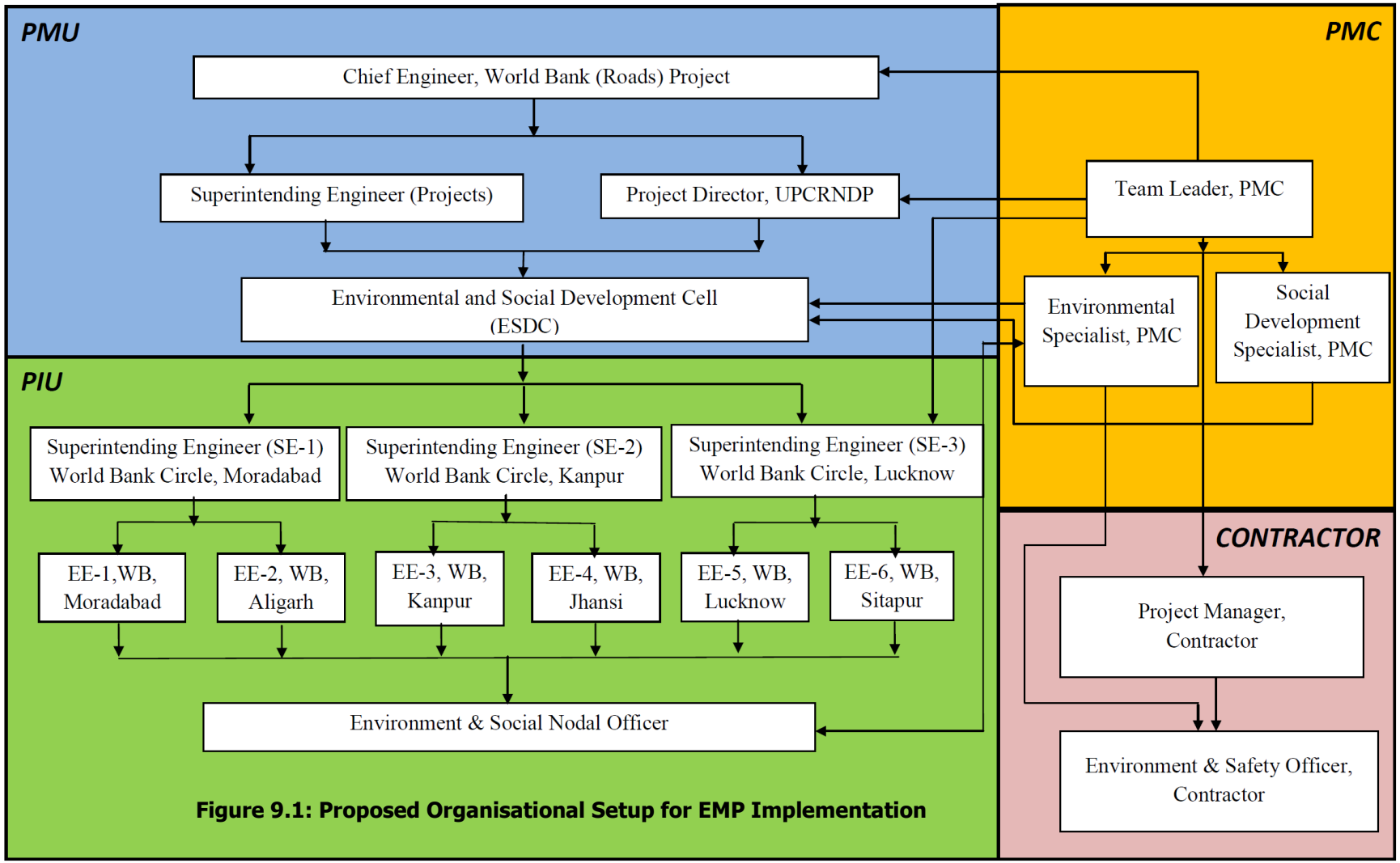


Figure 9.1: Proposed Organisational Setup for EMP Implementation

9.10 Environmental Training

To enhance the capacity of officials for effective implementation of proposed mitigation measures and monitoring the resultant effect, as well as create awareness amongst workers and supervision staff trainings and awareness programmes have been planned and is given in **Table 9.5**. The institutions/agencies like regional office of MoEFCC, SPCB/CPCB, Indian Institute of Technologies can be consulted for such trainings. Independent subject‟s experts/consultants can also be the resource persons to impart trainings. These experts/agencies shall be appointed based on specific need for the training. A budgetary provision of Rs. 4.0 Lakh has been made for imparting Environmental Training.

Table 9-5: Details of Proposed Training Program on Environmental Issues

Module	Title	Objectives	Time of Training	Duration (Day)	Level	Participants
1	Concept of Environmental and Social Management Framework	• Brief up Bank's safeguard policies and requirements • Brief up latest on environmental legislations • Implementation, Supervision and Monitoring Mechanism • Provision made in Contract Documents	Before awarding contracts	1	State	PIU (SE and Executive Engg.) PMU, UP PWD
2	Orientation Workshop on ESMF Implementation	• ESMF requirements • Implementation, Supervision and Monitoring Mechanism • Roles and Responsibilities of Contractors and UP, PWD Engineer • Identification of social issues • Addressing social impacts • Preparing mitigation plans	Pre-construction stage (when contractors are substantially mobilized)	1	State	PIU (Executive Engg. /AEE/AE, PMU, Contractors and Third Party Monitoring Agency
3	Focused Training on Specific Issue/s	• Analyzing problems, referring stipulations in Contract and GEMP and agreed to feasible solution within specified timeframe • Issues relating to wage parity, child labor, etc.	During construction, as and when needed.	0.5	District	PIU, Contractors and Third Party Monitoring Agency
4	Training on HIV AIDS issues	To increase the level of awareness about prevention and control of HIV/AIDS among the different communities' particularly tribal communities in scheduled	During construction	1 day	District	PIU, NGO Contractors

Module	Title	Objectives	Time of Training	Duration (Day)	Level	Participants
		areas abutting project road; Social and Psychological support to AIDS Infected				
5	Road Safety	To raise road safety consciousness among the road users; train drivers and medical aid to the victims of road accidents particularly for special target groups like drivers of heavy vehicles/goods vehicles, etc.	During and pre-construction	0.5	District	PIU, NGO and contractor
6	EMP Implementation during construction stage	To understand the requirement of EMP and its implementation during construction stage of the project road. Good and bad practice of EMP during construction stage of the project	During Construction stage	0.5		Contractor and their staffs.

9.11 Grievance Redressal Mechanism

An integrated system will be established with Grievance Redressal Cells (GRCs), with necessary officers, officials and systems, at the state as well as sub project levels. Grievances if any, may be submitted through various mediums, including in person, in written form to a noted address, through a toll free phone line or through direct calls to concerned officials, and online. PWD will appoint a person to receive such calls and online messages. The person incharge based on nature of complaint, will forward the same to the concerned official. A ticket or a unique number will be generated for all such call and messages. The complainant will follow up based that unique number. All calls and messages will be responded within two weeks. In response is not received within 15 days, the complaint will be escalated to next evel.

All local contact information and options for complaint submission will be available on site on local information boards. Moreover, they will be in addition to the PIO officers to be appointed under the RTI Act. A half yearly report on Grievance Redressal by the project will be prepared. The project will abide by the RTI Act of 2005; it will commit itself for proactive disclosure and sharing of information with the key stakeholders, including the communities/beneficiaries. The project will have a communication strategy focusing on efficient and effective usage of print and electronic media, bill boards, posters, wall writing, and adoption of any other method suiting local context, logistics, human and financial resources.

As part of IGRM, a Grievance Redress Cell (GRC) will be set up at the district level. The staffing of GRC will include Environment and Social Nodal Officer of PMU; E&S Officer of PIU; and two representatives from community / beneficiary / affected persons. The head of the cell will be a person of repute but not continuing in the government service. The GRC will have its own bye laws. The functions of the GRC will include: (i) to redress grievances of community / beneficiaries / project affected persons (PAPs) in all respects; (ii) rehabilitation and resettlement assistance and related activities; (iii) GRC will only deal/hear the issues related to R&R and environmental grievance; (iv) GRC will give its decision/verdict within 15 days after hearing the aggrieved

person; (v) final verdict of the GRC will be given by the Chairman/Head of GRC in consultation with other members of the GRC and will be binding to all other members.

9.12 Environmental Budgeting

A budgetary Provision of Rupees **8.73 Crores** has been made for the various environmental mitigation measures and monitoring. The detailed break-up of the budgetary provision is given in **Table 9.6**. Some of the provisions of budget for environmental protection measures are the part of engineering cost and Resettlement and Rehabilitation Cost and hence they have not been included here. The cost of diversion of Protected forest area has been calculated based on standard calculation practices of the Forest Department by using current rate of NPV of the forest area, tree felling cost within the proposed forest area, compensatory afforestation cost, protection measures and maintenance cost of tree plantation. This figure is only tentative and may vary after the final demand note received by the Forest Department and as decided by the Forest Task Force during Forest Clearance. The cost as per the Forest Department will be deposited to the concern Forest Department before commencement of any construction works in the forest stretch.

Table 9-6: Proposed EMP cost for Project section "Gola-Shahjahanpur section of SH-93 from Km 0+000 to Km 59+000 in Lakhimpur Kheri and Shahjahnpur districts of Uttar Pradesh"

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
A.	**Pre-Construction Stage**					
A.1	Forest Clearance	Diversion of forest land for non forest activites (Project road widening)-(a) Total NPV cost/hect (The final cost will be provided by the forest department after joint verification, which is required to be deposited by UP, PWD)	Hect	47.2	9,60,000	4,53,12,000
A.2	Tree cutting along the project road	Clearing of Roadside plantation (from Km 1.281 to Km 59.000)-Tree cutting by Forest Dept/Contractor and MoU shall be signed betweeen them				
		Girth 30-60 Cm	No.	1,052	193	2,03,036
		Girth 60-90 Cm	No.	1,370	371	5,08,270
		Girth 90-180 Cm	No.	2385	683	16,28,955
		> Girth 180 Cm	No.	482	1261	6,07,802
A.3	Tree Plantation along the project road	Compensatory afforestation (minimum of 2 trees planted for every tree cut) including 3 years maintenance	No.	10,578	696	73,62,288
		Providing of Half Brick circular tree guard, in 2nd class brick, internal diametre 1.25 metres, and height 1.5 metres, above ground and 0.50 metre below ground, cement mortar 1:6 as per complete design.	No.	10,578	1915	2,02,56,870
					Total EMP cost (Rupees) during Pre-Construction Phase	**7,58,79,221**
B.	**CONSTRUCTION STAGE**					
B.1	Proposed Enhancement of Primary School at Bagchan Village at Km 9.300 (RHS)	Tree Plantation including maintenance for 1 year	No.	16	696	11,136
		Providing of Half Brick circular tree guard, in 2nd class brick, internal diametre 1.25 metres, and height 1.5 metres, above ground and 0.50 metre below ground, cement mortar 1:6 as per complete design.	No.	16	1,915	30,640

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
B.2	Proposed Enhancement of Primary School at Pipariya Sadak Village at Km 52.000 (LHS)	Tree Plantation including maintenance for 1 year	No.	15	696	10,440
		Providing of Half Brick circular tree guard, in 2nd class brick, internal diametre 1.25 metres, and height 1.5 metres, above ground and 0.50 metre below ground, cement mortar 1:6 as per complete design.	No.	15	1,915	28,725
B.3	Enhancement of Pond at Km 28.000 (LHS) as per Additional Technical Specification	Bathing Ghat of size 5m x 4m				
		(a) Excavation	Cum	37.50	57	2,138
		(b) PCC (M15)	Cum	3.00	7,361	22,083
		(c) Brick Work (1:3)	Cum	39.20	6,414	2,51,429
		(d) Tiles	Sqm	37.51	880	33,009
		Siting Bench (4 numbers) at Bathing Ghat				
		(a) PCC (M15)	Cum	0.632	7,361	4,652
		(b) RCC (M25)	Cum	0.276	8,484	2,342
		(c) Reinforcement (FE 500)	Kg	13.8	60.50	835
		(d) Brickwork (1:3)	Cum	0.92	6,414	5,901
		(e) Plaster 12 mm (1:3)	Sqm	4.564	1,386	6,326
B.4	Environmental Monitoring	(a) Ambient Air Quality monitoring as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	8,500	2,04,000
		(b) Ambient Noise level monitoring as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	4,000	96,000
		(c) Water Quality monitoring of surface water as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	7,500	1,80,000
		(d) Soil Quality monitoring of Agricultural lands as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	7,000	1,68,000
		(e) Water Quality monitoring of drinking water from construction camp (2 locations in the interval of 3 months for 2 Years)	No.	16	7,500	1,20,000

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
B.5	Rehabilitation of Cultural Properties	Rehabilitation of Impacted Cultural Properties/Common Resource Property	No.			Covered in RAP cost
B.6	Hand Pump	Rehabilitation of Impacted hand pump along the project road	No.			Covered in RAP cost
B.7	Rain Water Harvesting Structure	Rain Water Harvesting Structure along the Project road	No.	30	50,000	15,00,000
B.8	Environmental Training	EMP Orientation at construction site	Lump Sum			4,00,000
					Total EMP cost (Rupees) during Construction Phase	**30,77,654**
C.	**OPERATION STAGE**					
C.1	Environmental Monitoring	(a) Ambient Air Quality monitoring at Residential & Commercial locations along the project road (2 locations in the interval of 4 months for 1 Years)	No.	6	8,500	51,000
		(b) Surface Water Quality monitoring along the project road (2 locations in the interval of 4 months for 1 Years)	No.	6	7,500	45,000
		(c) Ambient Noise monitoring at sensitive receptors (3 locations in the interval of 4 months for 1 Years)	No.	9	4,000	36,000
		(d) Soil Quality monitoring of Agricultural lands (2 locations in the interval of 4 months for 1 Year)	No.	6	7,000	42,000
C.2	Tree plantation monitoring	Along the project corridor for 2 years	Lump Sum			2,50,000
					Total EMP cost during Operation Phase	**4,24,000**
					Total Cost (A+B+C)	**7,93,80,875**
					Contigency (10%)	**79,38,088**
					Total EMP Cost (Rupees)	**8,73,18,963**

ANNEXURES

ANNEXURE 5.1

PHOTO-CLIPS OF SAMPLING OF ENVIRONMENTAL QUALITY ATTRIBUTES AT SITE

Photo-1: Ambient Air Quality Sampling at Kanja Gola

Photo 2: Ambient Air Quality Sampling at Shahjahanpur

Photo 3: Surface Water Sampling from Gomti River

Photo 4: Water Sampling at Pond near Macchecha

Photo 5: Ground Sampling at Mohammadi

Photo 6: Ground Water Sampling at Shahjahanpur

Photo 7: Noise Level Monitoring at Mohammadi

Photo 8: Noise Level Monitoring at Gokan

Photo 9: Soil Sampling at Reserved Area

Photo 10: Soil Sampling at Mukrampur

ANNEXURE-5.2

VAN VIBHAG

MISCELLANEOUS

February 10,1960

No. 1115/XIV-331.50- Whereas the Governor, Uttar Pradesh, is of the opinion that the making of enquiry and record contemplated under sub-section (3) of section 29 of the Indian Forest Act, 1927 (Act no. XVI of 1927), will occupy such length of time as in the meantime to endanger the rights if the State Government. Now therefore, in exercise of the powers conferred by the proviso to the aforesaid sub-section and by sub-section (1) of the said section, read with section 80-A of the aforessid Act, the Governor of Uttar Pradesh is pleased to declare that pending such enquiry and record the provisions of Chapter IV of the said Act to be applicable to the lands specified in the Schedule hereto:

Schedule

District	Serial no.	Name of road	Mileage to be declared as Reserve or Protected Forest		Description of boundary
1	2	3	4	5	6
			From	To	
Kheri	1	Sitapur-Lakhimpur Road Milles 21 to 28	M. fg. ft. Mille 21 to 29=8 miles	M. fg. ft.	The boundary of the land has been demarcated on the ground by stone pillars.
	2	Lakhimpur-Shahjahanpur Road	Mile 1 to 52= 52 miles		Ditto
	3	Lakhimpur-Nighasan Road	Mile 1 to 22= 22 miles		Ditto
	4	Nighasan-Bellaraian Road	1 to 12(fg. 1 to 2)		Ditto
	5	Pallia-Trikulia-Khajuria Road	1 to 23		Ditto
	6	Allan Local Gola-Mohamdi Road (L.S. Road)	30 3 0	30 7 0	Ditto
	7	Ditto	30 8 0	31 5 0	Ditto
	8	Ditto	31 6 0	32 6 0	Ditto
	9	Ditto	36 6 0	36 6 0	Ditto
	10	Lakhimpur-Aira-Isanagr Road	Mile 2(fur. 4 to mile 30)		Ditto

By order,
R.K.TALWAR, *Sachiv*

15-11-1960

(J. P. JAIN)
Chief Engineer
World Bank Project (Roads)
P. W. D. Lucknow

सहील कुमार यादव
डेप्टी ऑफिसर
कार्यालय प्रोजेक्ट डायरेक्टर
वर्ल्ड बैंक रोड प्रोजेक्ट
पी.डब्लू.डी., लखनऊ

ANNEXURE 5.3

SUMMARY OF AFFECTED SPECIES GIRTHWISE (LHS)									
Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
0.000	1.000	Gular	3	0	0	0	1	1	1
		Kaner	2	0	1	0	0	0	1
		Neem	3	0	0	2	1	0	0
		Pakar	1	0	0	0	1	0	0
		Sheesham	6	1	1	2	2	0	0
		Siris	8	0	1	4	0	1	2
SUB- TOTAL			***23***	***1***	***3***	***8***	***5***	***2***	***4***
1.000	2.000	Eucalyptus	24	0	3	3	4	7	7
		Gular	1	0	1	0	0	0	0
		Gulmohar	2	0	0	0	2	0	0
		Kadambh	3	0	1	0	2	0	0
		Neem	11	0	2	5	2	1	1
		Pakar	2	0	0	0	0	1	1
		Sheesham	13	0	0	2	6	3	2
		Teak	1	0	1	0	0	0	0
SUB- TOTAL			***57***	***0***	***8***	***10***	***16***	***12***	***11***
2.000	3.000	Eucalyptus	22	0	2	0	8	5	7
		Gulmohar	1	0	1	0	0	0	0
		Kadambh	3	0	1	1	1	0	0
		Neem	17	2	10	1	2	1	1
		Pakar	5	0	1	0	2	2	0
		Peepal	4	0	0	0	0	0	4
		Sheesham	41	2	15	5	9	6	4
		Teak	1	0	0	0	0	0	1
SUB- TOTAL			***94***	***4***	***30***	***7***	***22***	***14***	***17***
3.000	4.000	Eucalyptus	13	0	0	0	2	5	6
		Mango	4	0	0	0	1	0	3
		Neem	5	1	2	2	0	0	0
		Pakar	2	0	1	0	0	1	0
		Peepal	2	0	0	0	0	0	2
		Sheesham	20	1	3	3	7	3	3
		Siris	1	0	0	0	0	0	1
SUB- TOTAL			***47***	***2***	***6***	***5***	***10***	***9***	***15***
4.000	5.000	Eucalyptus	32	1	1	4	10	7	9
		Mango	5	1	1	0	1	0	2
		Neem	4	0	2	2	0	0	0
		Pakar	3	0	0	1	2	0	0
		Sheesham	17	1	5	1	6	2	2
		Siris	3	0	3	0	0	0	0
SUB- TOTAL			***64***	***3***	***12***	***8***	***19***	***9***	***13***
5.000	6.000	Kadambh	6	0	0	0	5	1	0
		Mango	5	0	0	0	1	1	3
		Neem	7	0	0	2	3	0	2
		Peepal	2	0	0	1	0	0	1

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
		Sheesham	17	0	0	8	8	1	0
		Siris	10	0	0	4	4	1	1
SUB- TOTAL			***47***	***0***	***0***	***15***	***21***	***4***	***7***
6.000	7.000	Eucalyptus	27	0	0	3	11	5	8
		Mango	1	0	0	0	0	0	1
		Neem	4	0	0	2	1	1	0
		Peepal	3	0	0	0	1	2	0
		Pakar	3	0	0	0	0	0	3
		Sheesham	8	0	1	3	2	2	0
SUB- TOTAL			***46***	***0***	***1***	***8***	***15***	***10***	***12***
7.000	8.000	Banyan	2	0	0	0	0	0	2
		Eucalyptus	30	0	0	0	9	13	8
		Mango	10	0	0	0	2	3	5
		Neem	16	1	3	3	5	2	2
		Pakar	2	0	0	1	0	0	1
		Peepal	5	0	0	0	1	0	4
SUB- TOTAL			***65***	***1***	***3***	***4***	***17***	***18***	***22***
8.000	9.000	Eucalyptus	11	0	0	0	3	7	1
		Mango	4	0	0	0	0	1	3
		Neem	4	0	2	1	1	0	0
		Sheesham	11	0	4	1	3	2	1
SUB- TOTAL			***30***	***0***	***6***	***2***	***7***	***10***	***5***
9.000	10.000	Ashok	2	0	1	1	0	0	0
		Babool	4	0	3	0	1	0	0
		Eucalyptus	6	0	0	2	2	0	2
		Mango	15	1	4	0	0	2	8
		Neem	4	0	3	0	1	0	0
		Peepal	2	0	0	0	0	0	2
		Sheesham	5	0	3	1	0	1	0
		Siris	5	0	3	1	1	0	0
SUB- TOTAL			***43***	***1***	***17***	***5***	***5***	***3***	***12***
10.000	11.000	Ashok	2	0	1	1	0	0	0
		Babool	2	0	0	1	1	0	0
		Eucalyptus	21	0	2	3	7	4	5
		Mango	7	0	0	2	0	2	3
		Neem	1	0	1	0	0	0	0
		Peepal	22	3	17	1	1	0	0
		Sheesham	3	0	0	3	0	0	0
		Siris	5	0	2	2	1	0	0
SUB- TOTAL			***63***	***3***	***23***	***13***	***10***	***6***	***8***
11.000	12.000	Banyan	3	0	0	0	0	0	3
		Eucalyptus	15	0	0	1	3	9	2
		Gular	2	0	1	1	0	0	0
		Kadambh	3	0	3	0	0	0	0
		Mango	1	0	0	0	0	1	0
		Neem	3	0	3	0	0	0	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
		Palm	6	0	4	2	0	0	0
		Teak	25	1	11	9	3	1	0
SUB- TOTAL			***58***	***1***	***22***	***13***	***6***	***11***	***5***
12.000	13.000	Bakain	2	0	1	1	0	0	0
		Eucalyptus	1	0	0	0	0	1	0
		Kaner	3	0	1	0	2	0	0
		Mango	3	0	0	0	0	0	3
		Neem	5	0	4	0	1	0	0
		Plum	2	0	2	0	0	0	0
		Siris	6	0	0	1	3	2	0
		Teak	4	0	1	2	1	0	0
SUB- TOTAL			***26***	***0***	***9***	***4***	***7***	***3***	***3***
13.000	14.000	Banyan	2	0	0	0	0	0	2
		Pakar	1	0	0	0	1	0	0
		Sheesham	2	0	1	0	0	1	0
		Siris	6	0	1	4	1	0	0
		Teak	16	0	8	6	2	0	0
SUB- TOTAL			***27***	***0***	***10***	***10***	***4***	***1***	***2***
14.000	15.000	Junglee	5	0	1	0	0	1	3
		Neem	4	0	3	0	0	1	0
		Teak	34	2	20	8	4	0	0
SUB- TOTAL			***43***	***2***	***24***	***8***	***4***	***2***	***3***
15.000	16.000	Junglee	3	0	1	0	1	1	0
		Kadambh	1	0	0	0	1	0	0
		Mango	4	0	0	0	1	2	1
		Neem	4	0	2	2	0	0	0
		Teak	8	0	3	4	1	0	0
SUB- TOTAL			***20***	***0***	***1***	***0***	***1***	***1***	***0***
16.000	17.000	Ashok	2	0	2	0	0	0	0
		Eucalyptus	1	0	0	0	0	1	0
		Gulmohar	2	0	0	0	2	0	0
		Neem	1	0	1	0	0	0	0
		Pakar	1	0	0	0	1	0	0
		Sheesham	2	0	1	0	1	0	0
		SIris	3	0	1	2	0	0	0
SUB- TOTAL			***12***	***0***	***5***	***2***	***4***	***1***	***0***
17.000	18.000	Eucalyptus	18	0	0	3	4	8	3
		Junglee	2	0	0	2	0	0	0
		Mango	2	0	0	0	0	1	1
		Neem	2	0	1	1	0	0	0
		Peepal	1	0	0	0	0	0	1
		Sheesham	8	0	1	1	3	3	0
SUB- TOTAL			***33***	***0***	***2***	***7***	***7***	***12***	***5***
18.000	19.000	Eucalyptus	12	0	0	0	3	6	3
		Gulmohar	2	0	0	0	2	0	0
		Junglee	2	0	1	1	0	0	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
		Mango	4	0	0	0	1	0	3
		Neem	1	0	0	0	0	0	1
		Pakar	2	0	0	2	0	0	0
		Peepal	5	0	0	0	1	0	4
SUB- TOTAL			***28***	***0***	***1***	***3***	***7***	***6***	***11***
19.000	20.000	Babool	1	1	0	0	0	0	0
		Gulmohar	2	0	0	1	0	1	0
		Karanj	2	0	0	1	0	1	0
		Mango	4	0	0	0	0	1	3
		Neem	2	0	2	0	0	0	0
		Sheesham	13	0	6	4	1	2	0
		Siris	16	0	5	4	2	5	0
SUB- TOTAL			***40***	***1***	***13***	***10***	***3***	***10***	***3***
20.000	21.000	Junglee	3	0	1	2	0	0	0
		Mango	6	0	0	0	2	1	3
		Neem	14	0	6	4	3	1	0
		Pakar	4	0	0	0	2	1	1
		Peepal	4	0	0	0	1	0	3
SUB- TOTAL			***31***	***0***	***7***	***6***	***8***	***3***	***7***
21.000	22.000	Eucalyptus	14	0	1	0	2	6	5
		Mango	3	0	0	0	0	2	1
		Neem	3	1	2	0	0	0	0
		Pakar	4	0	1	1	0	1	1
		Peepal	2	0	0	0	0	0	2
		Sheesham	11	0	7	4	0	0	0
		SIris	3	0	1	2	0	0	0
SUB- TOTAL			***40***	***1***	***12***	***7***	***2***	***9***	***9***
22.000	23.000	Eucalyptus	11	0	0	0	3	4	4
		Mango	2	0	0	0	0	0	2
		Sheesham	5	0	1	2	1	0	1
SUB- TOTAL			***18***	***0***	***1***	***2***	***4***	***4***	***7***
23.000	24.000	Eucalyptus	4	0	0	0	1	0	3
		Mango	2	0	1	1	0	0	0
		Sheesham	17	1	7	4	1	2	2
		SIris	16	0	3	6	0	6	1
SUB- TOTAL			***39***	***1***	***11***	***11***	***2***	***8***	***6***
24.000	25.000	Palm	34	1	18	8	4	2	1
		Sheesham	9	0	5	2	2	0	0
SUB- TOTAL			***43***	***1***	***23***	***10***	***6***	***2***	***1***
25.000	26.000	Banyan	1	0	0	0	0	0	1
		Mango	3	0	0	0	1	1	1
		Sheesham	2	0	0	1	1	0	0
SUB- TOTAL			***6***	***0***	***0***	***0***	***0***	***0***	***0***
26.000	27.000	Mango	3	0	0	0	0	1	2
SUB- TOTAL			***3***	***0***	***0***	***0***	***0***	***1***	***2***
27.000	28.000	Mango	2	0	0	1	0	0	1

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
		Neem	6	0	4	1	1	0	0
		Sheesham	12	0	1	4	5	1	1
SUB- TOTAL			***20***	***0***	***5***	***6***	***6***	***1***	***2***
28.000	29.000	Mango	11	0	0	0	3	2	6
		Sheesham	5	0	1	3	1	0	0
		Teak	34	0	11	13	6	4	0
SUB- TOTAL			***50***	***0***	***12***	***16***	***10***	***6***	***6***
29.000	30.000	Gular	2	0	0	1	1	0	0
		Gulmohar	9	0	0	0	2	2	5
		Peepal	4	0	0	0	0	2	2
SUB- TOTAL			***15***	***0***	***0***	***1***	***3***	***4***	***7***
30.000	31.000	Jungle Jalebi	3	0	1	2	0	0	0
		Pakar	2	0	1	0	0	1	0
		Sheesham	21	0	1	9	7	2	2
		Siris	5	0	1	3	1	0	0
SUB- TOTAL			***31***	***0***	***4***	***14***	***8***	***3***	***2***
31.000	32.000	Ashok	2	0	0	2	0	0	0
		Gulmohar	6	0	0	0	2	2	2
		Mango	2	0	0	0	0	1	1
		Neem	3	0	1	2	0	0	0
		Pakar	1	0	0	1	0	0	0
		Sheesham	28	0	14	10	4	0	0
SUB- TOTAL			***42***	***0***	***15***	***15***	***6***	***3***	***3***
32.000	33.000	Mango	11	0	0	1	4	2	4
		Sheesham	23	2	10	5	1	2	3
		SIris	33	1	11	9	11	0	1
SUB- TOTAL			***67***	***3***	***21***	***15***	***16***	***4***	***8***
33.000	34.000	Gulmohar	2	0	0	0	2	0	0
		Mango	5	0	0	1	1	1	2
		Neem	2	0	2	0	0	0	0
		Pakar	1	0	1	0	0	0	0
		Sheesham	21	1	11	4	2	1	2
		SIris	16	0	4	5	3	2	2
SUB- TOTAL			***47***	***1***	***18***	***10***	***8***	***4***	***6***
34.000	35.000	Babool	27	1	11	8	4	1	2
		Neem	12	0	6	3	1	2	0
		Palar	1	0	0	1	0	0	0
		Plum	2	1	0	1	0	0	0
		Sheesham	41	1	19	7	4	7	3
SUB- TOTAL			***83***	***3***	***36***	***20***	***9***	***10***	***5***
35.000	36.000	Jamun	2	0	1	0	0	1	0
		Mango	3	0	0	0	0	1	2
		Neem	15	0	6	4	1	2	2
		Pakar	1	0	1	0	0	0	0
		Peepal	7	0	1	1	1	1	3

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
		Sheesham	34	2	16	4	7	3	2
		Siris	32	2	27	3	0	0	0
SUB- TOTAL			***94***	***4***	***52***	***12***	***9***	***8***	***9***
36.000	37.000	Mango	15	0	0	1	8	0	6
		Sheesham	13	0	2	1	9	0	1
		Siris	23	0	0	5	13	3	2
SUB- TOTAL			***51***	***0***	***2***	***7***	***30***	***3***	***9***
37.000	38.000	Mango	2	0	0	0	0	0	2
		Sheesham	13	0	0	1	8	4	0
		Siris	17	0	0	2	14	1	0
SUB- TOTAL			***32***	***0***	***0***	***3***	***22***	***5***	***2***
38.000	39.000	Mango	2	0	0	1	1	0	0
		Neem	3	0	0	0	3	0	0
		Sheesham	15	0	3	2	8	0	2
		Siris	3	0	0	1	2	0	0
SUB- TOTAL			***23***	***0***	***3***	***4***	***14***	***0***	***2***
39.000	40.000	Neem	3	0	2	1	0	0	0
		Sheesham	13	0	2	0	6	4	1
		Siris	6	0	1	2	2	0	1
SUB- TOTAL			***22***	***0***	***5***	***3***	***8***	***4***	***2***
40.000	41.000	Poplar	2	0	0	1	1	0	0
		SIris	6	0	2	0	2	1	1
SUB- TOTAL			***8***	***0***	***2***	***1***	***3***	***1***	***1***
41.000	42.000	Poplar	8	0	2	3	2	0	1
SUB- TOTAL			***8***	***0***	***2***	***3***	***2***	***0***	***1***
42.000	43.000	Jamun	1	0	0	0	1	0	0
		Mango	14	0	0	1	6	1	6
		Neem	5	0	1	2	2	0	0
		Poplar	5	0	0	2	3	0	0
		SIris	25	0	2	14	8	0	1
SUB- TOTAL			***50***	***0***	***3***	***19***	***20***	***1***	***7***
43.000	44.000	Eucalyptus	4	0	0	0	0	1	3
		Mango	2	0	0	0	1	0	1
		Pakar	2	0	0	0	2	0	0
		SIris	17	0	1	7	7	1	1
SUB- TOTAL			***25***	***0***	***1***	***7***	***10***	***2***	***5***
44.000	45.000	Jamun	3	0	2	0	0	1	0
		Mango	5	0	2	2	1	0	0
		Neem	10	0	3	3	2	2	0
		Pakar	1	0	0	0	0	0	1
		Sheesham	23	1	4	4	10	2	2
		Siris	1	0	0	0	1	0	0
SUB- TOTAL			***43***	***1***	***11***	***9***	***14***	***5***	***3***
45.000	46.000	Mango	4	0	0	0	0	1	3
		Poplar	4	0	2	2	0	0	0
		Sheesham	57	1	34	12	7	3	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
SUB- TOTAL			***65***	***1***	***36***	***14***	***7***	***4***	***3***
46.000	47.000	Jamun	2	0	0	1	0	0	1
		Mango	2	0	0	0	1	0	1
		Sheesham	19	0	0	10	5	3	1
SUB- TOTAL			***23***	***0***	***0***	***11***	***6***	***3***	***3***
47.000	48.000	Jamun	1	0	0	0	1	0	0
		Mango	1	0	1	0	0	0	0
		Neem	10	2	3	2	3	0	0
		Pakar	1	0	0	0	1	0	0
		Sheesham	19	0	4	6	3	3	3
SUB- TOTAL			***32***	***2***	***8***	***8***	***8***	***3***	***3***
48.000	49.000	Jamun	1	0	0	0	0	0	1
		Karanj	2	0	1	1	0	0	0
		Mango	1	0	0	0	1	0	0
		Neem	3	0	1	2	0	0	0
		Pakar	1	0	0	0	0	1	0
		Sheesham	14	1	5	2	5	0	1
SUB- TOTAL			***22***	***1***	***7***	***5***	***6***	***1***	***2***
49.000	50.000	Neem	1	0	0	0	0	1	0
		Sheesham	10	1	7	1	1	0	0
		Siris	20	0	4	8	6	2	0
SUB- TOTAL			***31***	***1***	***11***	***9***	***7***	***3***	***0***
50.000	51.000	Babool	13	0	0	4	6	1	2
		Mango	1	0	0	0	0	0	1
		Neem	2	0	1	1	0	0	0
		Sheesham	23	0	5	8	5	2	3
		SIris	31	0	5	10	12	0	4
SUB- TOTAL			***70***	***0***	***11***	***23***	***23***	***3***	***10***
51.000	52.000	Eucalyptus	21	0	0	5	5	2	9
		Jamun	1	0	1	0	0	0	0
		Mango	6	0	0	0	1	1	4
		Neem	5	0	2	2	1	0	0
		Pakar	1	0	0	0	0	0	1
		Peepal	2	0	0	0	0	0	2
		Sheesham	62	0	8	20	17	12	5
		SIris	36	1	4	15	6	9	1
SUB- TOTAL			***134***	***1***	***15***	***42***	***30***	***24***	***22***
52.000	53.000	Jamun	2	0	0	0	1	0	1
		Mango	3	0	0	0	1	1	1
		Neem	16	1	15	0	0	0	0
		Sheesham	41	2	19	10	1	7	2
SUB- TOTAL			***62***	***3***	***34***	***10***	***3***	***8***	***4***
53.000	54.000	Babool	4	0	1	0	3	0	0
		Mango	5	0	1	0	1	0	3
		Neem	10	0	7	2	1	0	0
		Pakar	1	0	0	1	0	0	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	<150
		Sheesham	12	1	11	0	0	0	0
SUB- TOTAL			***32***	***1***	***20***	***3***	***5***	***0***	***3***
54.000	55.000	Gulmohar	8	0	1	3	2	2	0
		Jamun	1	0	0	0	0	1	0
		Karanj	9	0	2	6	0	0	1
		Mango	4	0	1	3	0	0	0
		Neem	51	1	12	15	15	3	5
		Pakar	2	0	0	1	0	1	0
		Peepal	2	0	0	2	0	0	0
		Sheesham	40	0	13	15	7	4	1
SUB- TOTAL			***117***	***1***	***29***	***45***	***24***	***11***	***7***
55.000	56.000	Karanj	7	0	1	4	1	1	0
		Mango	12	0	2	0	2	2	6
		Neem	12	0	6	4	1	1	0
		Poplar	6	0	0	5	1	0	0
		Sheesham	21	0	7	8	4	1	1
SUB- TOTAL			***58***	***0***	***16***	***21***	***9***	***5***	***7***
56.000	57.000	Gulmohar	2	0	0	2	0	0	0
		Karanj	11	0	3	5	3	0	0
		Neem	1	0	0	0	1	0	0
		Sheesham	18	0	5	7	5	1	0
		Siris	30	0	3	15	7	4	1
SUB- TOTAL			***62***	***0***	***11***	***29***	***16***	***5***	***1***
57.000	58.000	Jamun	3	0	0	1	1	0	1
		Karanj	7	0	1	3	3	0	0
		Mango	3	0	0	1	1	0	1
		Neem	2	0	2	0	0	0	0
		Pakar	9	0	1	2	6	0	0
		Peepal	1	0	0	0	0	0	1
		Sheesham	12	0	4	5	3	0	0
		SIris	21	2	4	11	3	1	0
SUB- TOTAL			***58***	***2***	***12***	***23***	***17***	***1***	***3***
58.000	59.000	Karanj	16	0	3	4	6	2	1
		Sheesham	26	0	6	8	9	3	0
		SIris	11	2	1	3	4	1	0
SUB- TOTAL			***53***	***2***	***10***	***15***	***19***	***6***	***1***

ANNEXURE 5.3

SUMMARY OF AFFECTED SPECIES GIRTHWISE (RHS)									
Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
0.000	1.000	Eculyptus	2	0	0	1	1	0	0
		Mahogany	2	0	0	0	1	1	0
		Mahaneem	5	0	0	2	2	1	0
			9	0	0	3	4	2	0
1.000	2.000	Peepal	1	0	0	0	0	1	0
		Mahogany	8	0	0	3	3	2	0
		Eculyptus	26	0	0	8	12	6	0
		Neem	1	0	0	0	1	0	0
			36	0	0	11	16	9	0
2.000	3.000	Mango	2	0	0	0	1	1	0
		Eculyptus	12	0	0	4	6	2	0
		Peepal	1	0	0	0	0	1	0
			15	0	0	4	7	4	0
3.000	4.000	Eculyptus	6	0	1	3	2	0	0
			6	0	1	3	2	0	0
4.000	5.000	Eculyptus	60	0	10	24	14	12	0
		Gulmohar	1	0	1	0	0	0	0
		Mango	2	0	0	2	0	0	0
			63	0	11	26	14	12	0
5.000	6.000	Eculyptus	15	0	4	8	3	0	0
		Shisham	7	0	0	5	2	0	0
		Mango	4	0	0	2	2	0	0
		Gulmohar	1	0	1	0	0	0	0
		Neem	5	0	4	1	0	0	0
		Pakad	13	0	0	6	7	0	0
		Peepal	4	0	0	2	2	0	0
			49	0	9	24	16	0	0
6.000	7.000	Eculyptus	57	4	11	13	17	12	0
		Shisham	10	0	3	3	4	0	0
		Mango	9	0	0	4	4	1	0
			76	4	14	20	25	13	0
7.000	8.000	Eculyptus	38	0	8	16	8	6	0
		Shisham	22	2	4	6	4	6	0
		Karanj	4	0	0	2	2	0	0
		Mango	8	0	0	0	5	3	0
			72	2	12	24	19	15	0
8.000	9.000	Mango	16	0	0	2	11	3	0
		Shisham	10	0	0	4	2	4	0
		Eculyptus	13	0	3	2	4	4	0
		Karanj	1	0	0	0	1	0	0
			40	0	3	8	18	11	0
9.000	10.000	Neem	7	0	2	3	2	0	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
		Jamun	2	0	0	0	2	0	0
		Ashok	1	0	1	0	0	0	0
		Mango	4	0	0	0	2	2	0
		Eculyptus	6	0	0	0	2	4	0
		Shisham	6	0	0	0	2	4	0
		Mahogany	7	0	0	2	2	3	0
		Junglee	4	0	1	1	2	0	0
			37	0	4	6	14	13	0
10.000	11.000	Mahogany	28	0	6	7	13	2	0
		Eculyptus	26	0	3	7	4	8	4
		Teak	5	0	0	2	3	0	0
		Shisham	15	0	0	6	7	2	0
		Peepal	1	0	0	0	0	1	0
		Neem	2	0	0	0	0	2	0
		Pakad	2	0	0	0	0	2	0
			79	0	9	22	27	17	4
11.000	12.000	Babool	8	0	1	4	3	0	0
		Teak	21	0	4	5	4	8	0
		Eculyptus	3	0	0	0	0	3	0
		Karanj	5	0	0	2	3	0	0
		Shisham	15	0	2	6	5	2	0
		Siris	17	0	1	4	5	5	2
		Gulmohar	2	0	2	0	0	0	0
		Neem	14	0	0	5	4	5	0
		Peepal	1	0	0	0	0	1	0
			86	0	10	26	24	24	2
12.000	13.000	Mango	1	0	0	1	0	0	0
		Neem	1	0	0	0	1	0	0
		Mahogany	2	0	1	1	0	0	0
		Teak	60	0	5	14	16	18	7
		Siris	4	0	0	1	2	1	0
			68	0	6	17	19	19	7
13.000	14.000	Teak	42	0	0	6	15	19	2
		Mango	2	0	0	0	1	1	0
			44	0	0	6	16	20	2
14.000	15.000	Teak	9	0	0	2	2	3	2
		Mahogany	87	0	7	18	25	27	10
			96	0	7	20	27	30	12
15.000	16.000	Pakad	5	0	1	2	2	0	0
		Banyan	5	0	1	1	2	1	0
		Mahogany	4	0	1	2	1	0	0
		Jungle jalebi	13	1	3	3	4	2	0
		Shisham	4	0	1	2	1	0	0
			31	1	7	10	10	3	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
16.000	17.000	Pakad	6	0	2	1	1	2	0
		Shisham	4	0	1	1	1	1	0
		Eculyptus	23	0	3	6	3	7	4
		Neem	3	0	0	1	2	0	0
		Banyan	1	0	0	0	0	1	0
		Teak	3	0	0	2	1	0	0
			40	0	6	11	8	11	4
17.000	18.000	Eculyptus	66	0	5	15	19	20	7
		Shisham	59	0	8	14	17	18	2
		Mango	25	0	0	7	8	7	3
		Neem	5	0	0	1	1	2	1
			155	0	13	37	45	47	13
18.000	19.000	Eculyptus	16	0	4	6	3	3	0
		Neem	2	0	0	0	1	1	0
		Shisham	14	0	2	4	3	3	2
		Pakad	8	0	1	2	3	2	0
		Karanj	34	0	5	14	7	8	0
		Peepal	1	0	0	0	0	1	0
		Mahaneem	2	0	0	0	0	1	1
			77	0	12	26	17	19	3
19.000	20.000	Pakad	14	2	4	5	2	1	0
		Neem	11	0	2	5	2	2	0
		Shisham	20	0	5	4	5	4	2
		Peepal	1	0	0	0	0	0	1
		Mango	2	0	0	0	1	1	0
		Teak	7	0	0	2	5	0	0
		Siris	4	0	0	0	2	2	0
		Jungle jalebi	4	0	0	1	2	1	0
		Gulmohar	3	0	1	1	1	0	0
			66	2	12	18	20	11	3
20.000	21.000	Karanj	7	1	1	2	2	1	0
		Teak	5	0	0	0	2	3	0
		Neem	20	1	3	3	7	6	0
		Shisham	21	0	0	5	8	8	0
		Siris	3	0	0	0	1	2	0
		Pakad	23	0	2	3	7	11	0
		Mango	1	0	0	0	1	0	0
		Gulmohar	1	0	0	1	0	0	0
		Jungle jalebi	4	0	1	1	2	0	0
			85	2	7	15	30	31	0
21.000	22.000	Mango	1	0	0	0	0	1	0
		Eculyptus	4	0	0	1	1	2	0
		Neem	18	0	2	3	5	6	2
		Shisham	33	0	2	5	7	14	5

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
		Karanj	5	0	0	2	1	1	1
		Pakad	2	0	0	0	1	1	0
		Jamun	4	0	0	2	2	0	0
		Jungle jalebi	6	0	0	1	2	3	0
		Banyan	4	0	0	0	2	1	1
		Siris	4	0	0	0	1	1	2
			81	0	4	14	22	30	11
22.000	23.000	Karanj	11	0	4	5	2	0	0
		Awala	6	0	2	3	1	0	0
		Eculyptus	5	0	0	0	2	3	0
		Mahogany	5	0	0	1	2	2	0
		Shisham	9	0	2	2	3	2	0
		Mango	2	0	0	0	1	1	0
			38	0	8	11	11	8	0
23.000	24.000	Karanj	19	4	4	2	4	5	0
		Siris	17	0	2	5	3	2	5
		Shisham	18	0	4	5	5	2	2
		Jungle jalebi	4	0	1	1	1	1	0
			58	4	11	13	13	10	7
24.000	25.000	Jungle jalebi	2	0	1	1	0	0	0
		Pakad	5	0	0	1	2	2	0
		Shisham	6	0	0	2	2	2	0
		Mahogany	2	0	0	0	2	0	0
		Ber	5	0	1	1	2	1	0
		Neem	1	0	0	0	1	0	0
			21	0	2	5	9	5	0
25.000	26.000	Shisham	23	0	4	4	8	7	0
		Siris	11	0	1	4	4	2	0
		Karanj	8	0	0	2	2	2	2
		Neem	6	0	0	2	2	2	0
		Jungle jalebi	3	0	0	1	1	1	0
			51	0	5	13	17	14	2
26.000	27.000	Shisham	24	2	4	8	5	3	2
		Neem	4	0	1	1	2	0	0
		Siris	2	0	0	0	0	2	0
		Mahogany	10	0	2	4	1	1	2
		Pakad	2	0	0	1	1	0	0
		Mango	1	0	0	0	0	1	0
			43	2	7	14	9	7	4
27.000	28.000	Mango	9	0	2	1	2	2	2
		Shisham	13	0	1	2	2	4	4
		Junglee	2	0	0	1	1	0	0
		Karanj	2	0	0	0	1	1	0
		Mahogany	7	0	0	2	2	2	1

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
		Siris	9	0	0	2	2	2	3
			42	0	3	8	10	11	10
28.000	29.000	Siris	15	0	2	4	5	4	0
		Shisham	24	0	7	3	7	7	0
		Babool	1	0	0	1	0	0	0
		Mango	6	0	2	2	2	0	0
		Pakad	9	0	0	2	3	4	0
		Neem	7	0	2	2	2	1	0
		Karanj	6	0	0	2	2	2	0
		Peepal	1	0	0	0	1	0	0
		Ashok	7	0	3	2	2	0	0
			76	0	16	18	24	18	0
29.000	30.000	Siris	7	0	2	2	1	2	0
		Mango	4	0	0	0	2	2	0
		Shisham	24	0	7	6	4	4	3
		Gulmohar	10	0	2	2	2	2	2
		Neem	5	0	2	1	1	1	0
		Pakad	6	0	1	2	2	1	0
		Mahaneem	1	0	0	1	0	0	0
		Karanj	3	0	1	1	1	0	0
			60	0	15	15	13	12	5
30.000	31.000	Pakad	7	0	1	2	2	2	0
		Shisham	14	0	2	2	3	4	3
		Neem	4	0	0	2	1	1	0
		Ashok	3	0	1	1	1	0	0
		Mahaneem	6	0	1	2	2	1	0
		Gulmohar	5	0	1	2	1	1	0
		Mango	2	0	0	0	1	1	0
		Junglee	4	0	1	1	1	1	0
		Mahogany	2	0	0	1	1	0	0
			47	0	7	13	13	11	3
31.000	32.000	Siris	8	0	2	2	2	2	0
		Shisham	10	0	2	2	4	2	0
		Neem	0	0	0	0	0	0	0
		Pakad	0	0	0	0	0	0	0
		Peepal	0	0	0	0	0	0	0
		Mango	0	0	0	0	0	0	0
		Junglee	15	0	7	4	2	2	0
			33	0	11	8	8	6	0
32.000	33.000	Mahogany	42	0	6	19	11	6	0
		Mango	2	0	0	0	1	1	0
		Shisham	10	0	2	2	2	4	0
		Kanchan	10	0	0	4	2	2	2
		Siris	2	0	0	0	0	2	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
		Jungle jalebi	2	0	0	0	2	0	0
			68	0	8	25	18	15	2
33.000	34.000	Neem	11	2	2	2	3	2	0
		Shisham	9	0	2	2	1	2	2
		Siris	6	0	0	1	2	2	1
		Mango	3	0	0	1	1	1	0
		Gulmohar	1	0	0	1	0	0	0
		Pakad	2	0	0	1	1	0	0
		Peepal	1	0	0	0	1	0	0
			33	2	4	8	9	7	3
34.000	35.000	Neem	12	2	2	4	2	2	0
		Shisham	32	0	2	10	14	2	4
		Karanj	4	0	0	2	2	0	0
		Babool	3	0	0	1	1	1	0
		Pakad	6	0	2	2	2	0	0
		Ber	2	0	0	1	1	0	0
			59	2	6	20	22	5	4
35.000	36.000	Peepal	1	0	0	0	0	1	0
		Shisham	18	0	2	4	4	6	2
		Mango	15	0	2	3	4	6	0
		Siris	2	0	0	0	1	1	0
		Neem	4	0	0	2	2	0	0
		Mahogany	2	0	0	1	1	0	0
		Jamun	1	0	0	1	0	0	0
			43	0	4	11	12	14	2
36.000	37.000	Mango	15	0	3	5	4	1	2
		Shisham	18	0	0	5	9	4	0
		Karanj	4	0	0	1	1	1	1
		Mahogany	6	0	0	1	2	3	0
		Siris	1	0	0	0	0	1	0
		Bel	1	0	0	1	0	0	0
			45	0	3	13	16	10	3
37.000	38.000	Jamun	5	0	1	2	2	0	0
		Mango	4	0	0	0	3	1	0
		Siris	1	0	0	0	1	0	0
		Shisham	12	0	0	4	7	1	0
		Mahaneem	2	0	0	0	2	0	0
			24	0	1	6	15	2	0
38.000	39.000	Mango	7	0	1	1	2	3	0
		Babool	1	0	0	1	0	0	0
		Jamun	2	0	1	1	0	0	0
		Mahua	1	0	0	1	0	0	0
		Neem	1	0	0	0	1	0	0
		Karanj	1	0	0	0	1	0	0

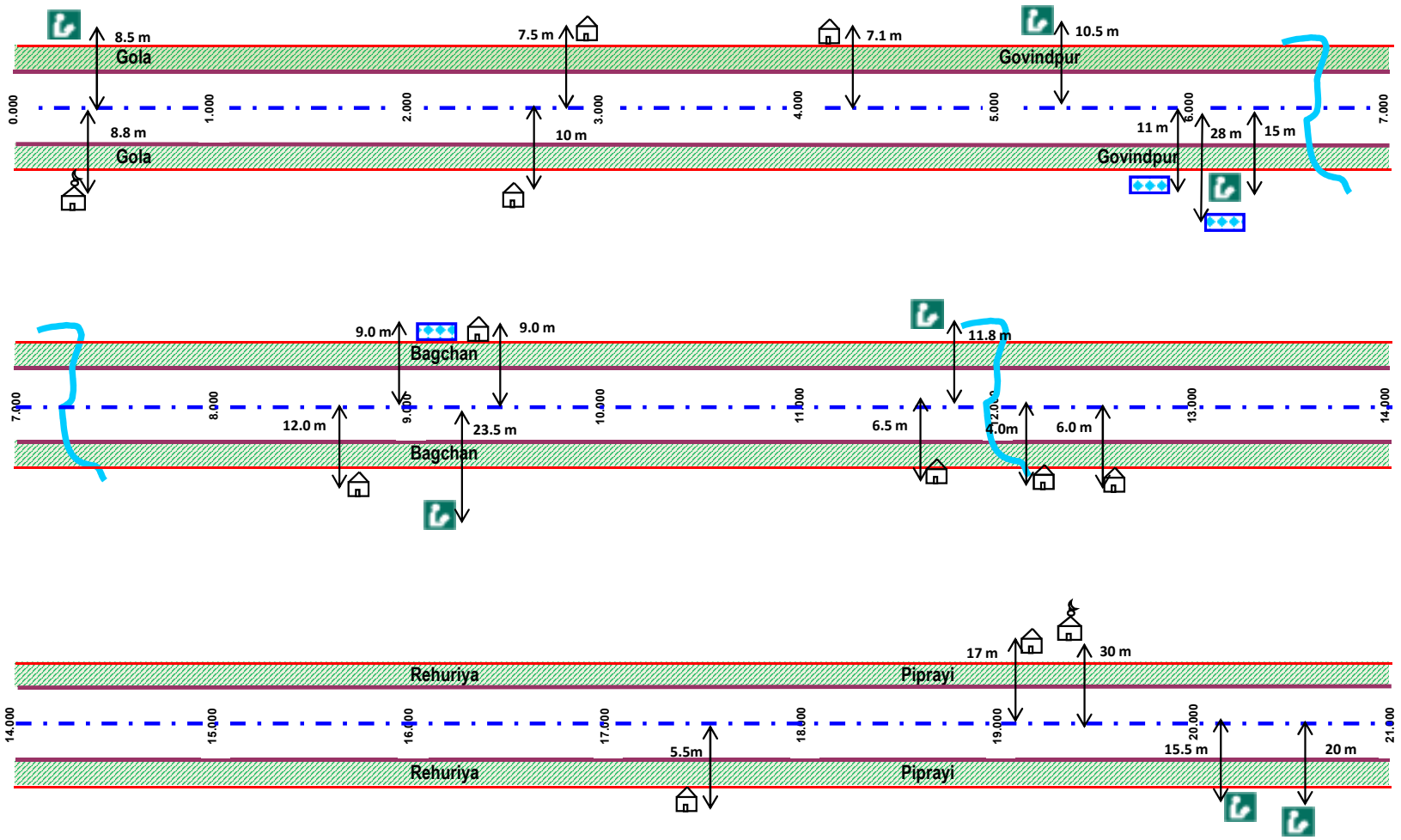
Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
			13	0	2	4	4	3	0
39.000	40.000	Neem	3	0	0	1	1	1	0
		Shisham	4	0	0	1	1	1	1
		Jamun	3	0	1	1	1	0	0
		Mango	1	0	0	0	0	1	0
		Ber	1	0	0	1	0	0	0
		Peepal	2	0	0	0	0	1	1
		Pakad	2	0	0	1	1	0	0
		Karanj	4	0	1	1	1	1	0
			20	0	2	6	5	5	2
40.000	41.000	Jamun	1	0	0	1	0	0	0
		Jungle jalebi	2	0	0	1	1	0	0
		Shisham	2	0	0	0	1	1	0
			5	0	0	2	2	1	0
41.000	42.000	Jungle jalebi	1	0	0	1	0	0	0
		Popular	1	0	1	0	0	0	0
		Shisham	8	0	1	2	1	2	2
			10	0	2	3	1	2	2
42.000	43.000	Mahaneem	1	0	0	1	0	0	0
		Pakad	10	0	2	4	2	2	0
		Eculyptus	2	0	0	1	1	0	0
		Mahogany	1	0	0	0	1	0	0
			14	0	2	6	4	2	0
43.000	44.000	Siris	1	0	0	0	1	0	0
		Mango	5	0	0	1	3	1	0
		Jamun	3	0	1	1	1	0	0
		Mahogany	3	0	0	1	1	1	0
		Pakad	26	0	4	12	6	4	0
			38	0	5	15	12	6	0
44.000	45.000	Pakad	7	0	2	2	1	2	0
		Jamun	2	0	0	1	1	0	0
		Neem	3	0	0	1	1	1	0
		Mango	13	0	0	6	6	1	0
			25	0	2	10	9	4	0
45.000	46.000	Mahogany	29	0	5	13	9	2	0
		Shisham	1	0	0	0	1	0	0
		Mango	4	0	0	1	2	1	0
		Jamun	3	0	0	2	1	0	0
		Pakad	2	0	0	0	2	0	0
			39	0	5	16	15	3	0
46.000	47.000	Mahogany	14	0	2	3	3	4	2
		Pakad	39	0	0	14	7	12	6
		Khajoor	2	0	0	0	1	1	0
		Neem	3	0	1	1	1	0	0

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
		Mahaneem	0	0	0	0	0	0	0
			58	0	3	18	12	17	8
47.000	48.000	Pakad	4	0	1	2	1	0	0
		Shisham	3	0	0	1	1	1	0
		Mango	27	0	7	8	12	0	0
		Neem	1	0	0	1	0	0	0
		Jamun	3	0	1	1	1	0	0
			38	0	9	13	15	1	0
48.000	49.000	Mango	7	0	2	2	3	0	0
		Neem	2	0	0	0	1	1	0
		Jamun	2	0	0	1	1	0	0
		Shisham	1	0	0	0	1	0	0
		Karanj	18	0	0	4	6	6	2
			30	0	2	7	12	7	2
49.000	50.000	Karanj	20	0	0	9	8	3	0
		Ber	2	0	0	1	1	0	0
		Babool	3	0	0	0	1	2	0
		Siris	2	0	0	0	1	1	0
			27	0	0	10	11	6	0
50.000	51.000	Jamun	3	0	1	1	1	0	0
		Karanj	10	0	0	2	6	2	0
		Mango	6	0	0	1	2	3	0
			19	0	1	4	9	5	0
51.000	52.000	Jamun	1	0	0	1	0	0	0
		Mango	7	0	3	2	2	0	0
		Eculyptus	19	0	0	4	6	4	5
		Pakad	3	0	0	1	1	1	0
		Shisham	8	0	0	2	3	2	1
		Peepal	1	0	0	0	0	1	0
			39	0	3	10	12	8	6
52.000	53.000	Pakad	5	0	0	2	1	1	1
		Mango	25	0	1	8	3	6	7
		Jamun	2	0	0	1	1	0	0
		Shisham	15	0	2	5	3	3	2
			47	0	3	16	8	10	10
53.000	54.000	Pakad	5	0	1	1	2	1	0
		Neem	1	0	0	0	1	0	0
		Mango	3	0	0	2	1	0	0
		Shisham	11	0	2	3	5	1	0
		Babool	1	0	0	1	0	0	0
		Jamun	3	0	1	1	1	0	0
			24	0	4	8	10	2	0
54.000	55.000	Shisham	21	0	0	5	8	8	0
		Karanj	31	0	2	8	16	2	3

Chainage (Km)		Local Name	Number	Girth Class (Cm)					
From	To			0-30	30-60	60-90	90-120	120-150	>150
		Mango	1	0	0	0	1	0	0
		Ashok	2	0	1	1	0	0	0
		Pakad	4	0	1	2	1	0	0
			59	0	4	16	26	10	3
55.000	56.000	Mango	13	0	0	2	5	6	0
		Jamun	2	0	0	1	1	0	0
		Pakad	5	0	1	2	1	1	0
		Shisham	27	0	0	4	8	12	3
		Karanj	8	0	2	2	2	2	0
		Peepal	1	0	0	0	1	0	0
			56	0	3	11	18	21	3
56.000	57.000	Shisham	14	0	2	5	2	2	3
		Mango	4	0	0	1	2	1	0
		Gulmohar	1	0	1	0	0	0	0
		Siris	2	0	0	0	1	1	0
		Karanj	2	0	0	0	1	1	0
		Peepal	1	0	0	0	0	1	0
			24	0	3	6	6	6	3
57.000	58.000	Pakad	20	0	2	4	6	8	0
		Mango	2	0	0	1	1	0	0
		Jamun	1	0	0	1	0	0	0
		Shisham	7	0	2	2	3	0	0
		Siris	2	0	0	0	1	1	0
		Karanj	5	0	1	2	1	1	0
		Ber	1	0	0	1	0	0	0
			38	0	5	11	12	10	0
58.000	59.000	Siris	12	0	2	3	6	1	0
		Karanj	13	0	0	4	7	2	0
		Shisham	8	0	0	2	3	3	0
		Pakad	6	0	2	2	2	0	0
			39	0	4	11	18	6	0
TOTAL			**2714**	**21**	**322**	**755**	**840**	**631**	**145**

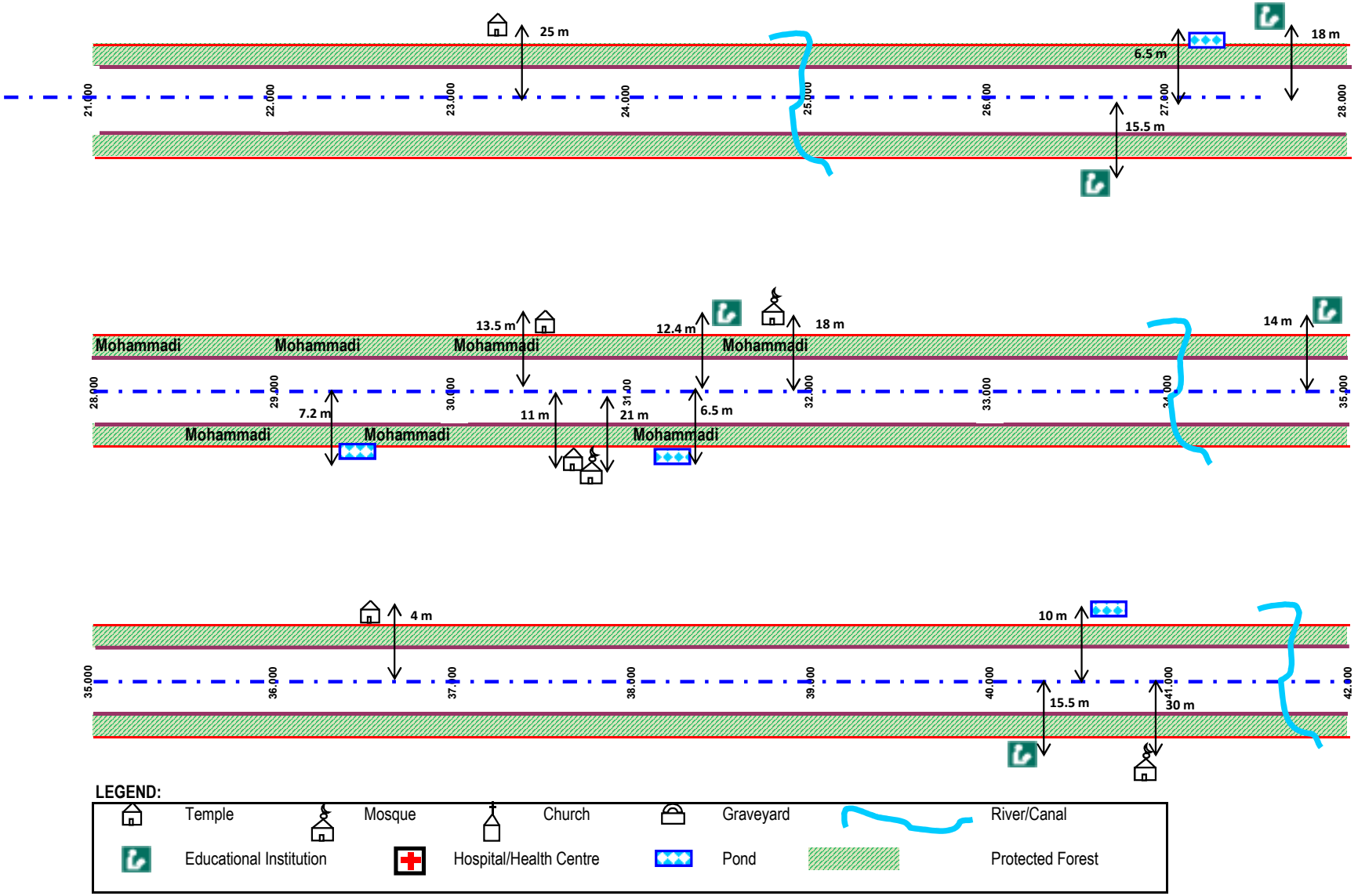
ANNEXURE 5.4

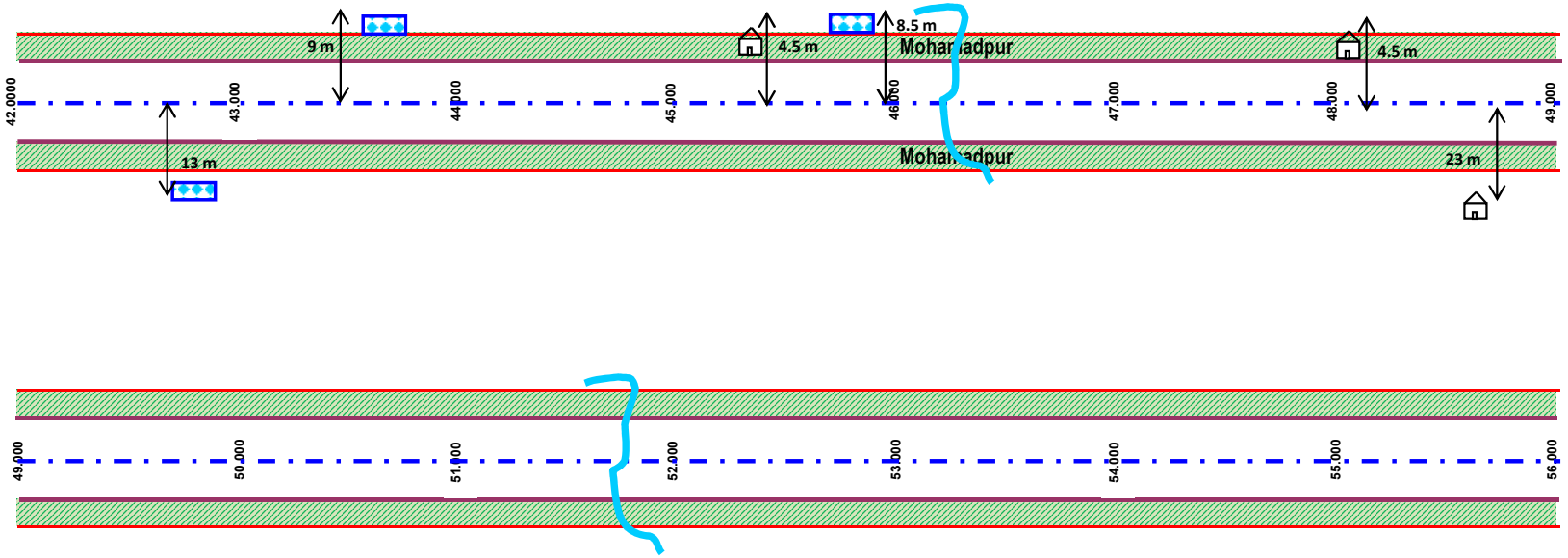
SRTIP-PLAN OF GOLA-SHAHJAHANPUR SECTION OF SH-93 SHOWING VARIOUS ENVIRONMENTAL FEATURES



LEGEND:

Temple	Mosque	Church	Graveyard	River/Canal			
Educational Institution	Hospital/Health Centre	Pond	Protected Forest				


25 m
6.5 m
18 m
15.5 m
21.000
22.000
23.000
24.000
25.000
26.000
27.000
28.000
13.5 m
12.4 m
18 m
14 m
Mohammadi
Mohammadi
Mohammadi
Mohammadi
28.000
29.000
30.000
31.000
32.000
33.000
34.000
35.000
7.2 m
11 m
21 m
6.5 m
Mohammadi
Mohammadi
Mohammadi
4 m
10 m
35.000
36.000
37.000
38.000
39.000
40.000
41.000
42.000
15.5 m
30 m
LEGEND:
Temple
Mosque
Church
Graveyard
River/Canal
Educational Institution
Hospital/Health Centre
Pond
Protected Forest



LEGEND:

Temple	Mosque	Church	Graveyard	River/Canal			
Educational Institution	Hospital/Health Centre	Pond	Protected Forest				

Annexure 8.1

ATTENDANCE SHEET OF PUBLIC CONSULTATION

1. Pipriya Dhani Village (Km 18.700)

egis India Format - Public Consultations on Environmental Issues of the Project

Client Name: UPCRNDP, PMC UPPWD	Project Name: SH-93 Shahjahanpur to Gola.
Name of the Person Interacting with the Public: A.K. Tripathi	Functional Area Expert: Air & water
Date of Meeting: 4/11/2014. Time: 15:00 to 00 hrs.	Location: Piparyadhani (Chainage 18.7 to 19.1)

Attendance sheet of public consultation

S.N.	Name of person	Address	Occupation	Signature
1.	Narendra Singh	Pipariya	Agriculture	
2.	Anuj Kumar	Pipariya Dhani	Agriculture	
3.	Bhilendra Singh	" "	Chairman of Sugar Industries	
4.	Manoj.	Pipariya Dhani	Gas weilder.	
5.	Jageshwar Prasad.		Agriculture	
6.	Lalaram.	Pipariya Dhani	Multi trade	
7.	Hemraj Yadav	Pipariya Dhani	Shop	
8.	Munna.	Pipariya Dhani	Cycle repair	
9.	Nirmal Singh	Pipariya Dhani	Battery shop.	
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				

Note: Please attach photographs of the public consultations (in softcopy and hardcopy formats)

2. Mohammadi (Km 30.000)

egis india Format - Public Consultations on Environmental Issues of the Project

Client Name: UPCRNDP - PMC UPPWD	Project Name: SH-93 Shahjahanpur to Gola
Name of the Person Interacting with the Public: A.K. Tripathi	Functional Area Expert:
Date of Meeting: 6/11/2014 Time: 15:00 to 15 h	Location: Mohammadi (Chainage 30:000)

Attendance sheet of public consultation

S.N.	Name of person	Address	Occupation	Signature
1.	Nasser Ahmad	Business	Mohammdi	
2.	Mohd Umar.	Agriculture	Mohammdi	
3.	Jalab	Mohammdi	Transport Co.	
4.	Guddu Khan	Mohammdi	Agriculture	
5.	Chotu	Mohammdi	Driver.	
6.	Mohd. Sayeed.	Mohammdi	Driver.	
7.	Prem Kumar Gupta	Mohamdi	Business.	
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				

Note: Please attach photographs of the public consultations (in softcopy and hardcopy formats)

Anand.
6/11/2014
(Anand Tripathi)

3. Mohammadpur Tajpur (Km 46.500)

egis India Format - Public Consultations on Environmental Issues of the Project

Client Name: UP CRNDP – PMC UP PWD	Project Name: SH-93 Shahjahanpur to Gola.
Name of the Person Interacting with the Public: A. K. Tripathi	Functional Area Expert: Air Quality
Date of Meeting: 5/11/2014 Time: 4.00 h to 00 h pm	Location: Mohammadpur (Chainage 46.500 - 47.300) Tajpur

Attendance sheet of public consultation

S.N.	Name of person	Address	Occupation	Signature
1.	Ikrar Khan	Mohamadpur	Labour	
2.	Mushir Khan	"	Labour	
3.	Manshoor Khan	"	Labour	
4.	Babuli Shah	"	Labour	
5.	Sharaft Ali	"	Labour	
6.	Jabbar Khan	"	"	
7.	Nasir Ali	"	"	
8.	Shafiq Khan	"	"	
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				

Note: Please attach photographs of the public consultations (in softcopy and hardcopy formats)

Anand 5/11/2014
(Anand Tripathi)

Annexure 8.2

PHOTOGRAPHS OF PUBLIC CONSULTATION

1. Pipriya Dhani Village (Km 18.700)


2. Mohammadi (Km 30.000)


3. Mohammadpur Tajpur Village (Km 46.500)


ANNEXURE-9.1

TREE PLANTATION STRATEGY

The sustainable economic development depends on the rational use of environmental resources and minimizing, to the extent possible, adverse environmental impacts through improved project selection and more responsible project planning and design. Under this strategy the development must be environmentally sound in the broadest sense. In highway development, environmental planning is concerned with good blending of improvements of physical, social, and economic parameters. It involves not only the environmental (land, water, and air) but is also concerned with integration to local, regional and national socio-economic development.

Road development can have wide ranging environmental impacts. This is because roads extend over long distance and by promoting rapid communication they can catalyze dramatic changes in land use patterns. Soil degradation, loss of top soil and reduction of the productive capacity of the soil covered by the road, which is significantly reduced further as a result of compaction with heavy machinery during construction, is one of the most immediate effects. Landscape and aesthetic distortions due to road development leads to modifications in the regional landscape and changes in the natural relief and morphology of the, vegetation, inclusive of avenue trees and recreational areas. But these impacts can often be significantly reduced through environmentally-sound construction and operation management practices. Careful consideration and assessment of the surrounding environment in road construction and improvement will reduce disruption costs and harmful effects while increasing usage and benefits. Therefore a proper landscape plan should be made which will protect the road from soil erosion, sinking and also to maintain the aesthetic beauty. It will also reduce land, water, air and noise pollutions as well.

Aim and Objective of Tree Plantation:-

- To create green belt and avenues for meeting aesthetic recreational needs to the people.
- To beautify the areas for scenic beauty.
- To reduce the surface run-off discharge and checking soil erosion along the embankments.
- To reduce the encroachment of road reserve areas.
- To reduce temperature and increase humidity.
- To reduce noise pollution to the neighboring household population.
- To reduce the impacts of air pollution and dust as trees and shrubs are known to be natural sink for air pollutants.
- To provide much needed shade on glaring hot roads during summer.
- Moderating the effect of wind and incoming radiation.
- To define the ROW especially highlight sharp horizontal curves during night.
- To promote road development as eco friendly activity.

Tree Plantation Strategy

Plantation is one of the most important constituents of soft landscaping. Trees, shrubs and climbers have been used to enhance the soft natural ambience against harsh elements in most of the enhancement schemes. The planting species are decided based on the physical growth characteristics of trees, like form and shape, foliage pattern, growth rate, branching pattern, soil characteristics etc. While selecting the species of trees for landscaping a great care should be taken

to choose the species, which already exist on the project corridor. The tree plantation will be carried out in accordance with the IRC: SP: 21:2009 guidelines and specifications.

Plantation Pattern

Depending on the availability of the ROW, plantation pattern is worked out as follows:-

1. The first row along the highway to be planted with small to medium sized ornamental trees.
2. Subsequent rows depending on the availability of land will comprise of ornamental or shade bearing species of more height than those in the first row. Since the proposed Highway section is passing through the rural sections, the last row will always be of shade bearing tall trees. Five rows of trees are proposed to be planted on either side.
3. Planting of shrubs in the median.
4. Planting of herbaceous species as ground cover in the median, special landscapes on embankment slopes.
5. Turfing with grasses in the median and embankment slopes.
6. The last row to be planted with tall shade bearing trees for better road safety and for enhancing aesthetics.

Tree Plantation along the Highway Section

1st Row

The first row of plantation along the highway section should be worked out by ornamental species. Since the proposed highway section is passing through the rural areas, the following species are recommended for the 1st row of avenue plantation.

Table 1.0 Species recommended for 1st row plantation

S. No.	Botanical Name	Local Name
1	*Cassia fistula*	Amaltas
2	*Terminalia arjuna*	Arjun
3	*Delonix regia*	Gulmohar
4	*Bauhinia sps*	Kachnar
5	*Cassia nodusa*	Cassia

2nd Row

The 2nd row of plantation along the Project stretch should be worked out by ornamental species of more height i.e. medium height trees, than the first row. The following species are recommended:-

Table 2.0: Species recommended for subsequent row plantation

S. No.	Botanical Name	Local Name
1	*Melia azadiracta*	Bakain
2	*Pongamia pinnata*	Kanji
3	*Gravillea robusta*	Silver Oak
4	*Albizzia lebbek*	Kala siris
5	*Dalbergia sissoo*	Shisham

Subsequent Rows

The subsequent rows of plantation along the Highway section have been worked out. The tall shade trees like Peepal, Neem, Mango, Shisham etc have high crown and secure better visibility. They have a long gestation period and has rapid growth and capacity to resist disease and pests attack are therefore ideal. These shaded trees should be planted at a spacing of 12m C/C.

The tree species recommended as shade plants for roadside avenues are given the following table:-

Table 3.0: Species recommended for Subsequent rows

S. No.	Botanical Name	Local Name
1	*Ficus religiosa*	Peepal
2	*Ficus infectoria*	Paker
3	*Madhuca indica*	Mahua
4	*Dalbergia Sissoo*	Shisham
5	*Azadirachta indica*	Neem
6	*Mangifera indica*	Mango
7	*Tamarindus indica*	Imli
8	*Syzynium cuminij*	Jamun

Shrub plantation for Median

The species to be planted in median would be of low or medium height with ornamental value to enhance the visual experience of the road corridor. It will also act as a screen to prevent glare from the incoming vehicles. Depending on the width of the median, which is 6.0 m, two rows of flowering shrubs will be provided. Some herbaceous species may also be planted as a ground cover on the median.

Table 4.0: Species recommended for Median

S. No.	Botanical Name	Local Name
1	*Thaventia nerifolia*	Kaner
2	*Bouganvillea sps.*	Bouganvillea
3	*Ipomia*	

Plantation along the Embankments

On the embankment slopes, some herbaceous species followed by grasses turf will be provided. The species proposed for the purpose of turfing are Cynodon dactylon, Cythocline perpurea, Solanum Nigrum, Alternanthera, Chlorophytum, Eupatorium, Wedelia, Duranta, Portulacca, Ipomea, Pelia Cadrii, Asparagus, Opheopogon grass etc.

Technical specifications for planting along the Highway section are as follows:

1. Ornamental plants except last row

- Distance from embankment : 1.0m away from the toe of the embankment
- Spacing between plant to plant : 3m
- Spacing between rows : 3m
- Size of the pits : 60x60x60 cms
- For alkaline soils : By auger
- Water logged areas : mounds with height varying depending on the water level
- Species recommended : Listed in **Table 1.0** and **Table 2.0.**
- No of plants per Km : 333
- Height of plant : 1.5 to 2m

2. Shaded plants (Last row)

- Distance from the preceding row : 3.0m
- Spacing between plant to plant : 12m
- Size of the pits
- Normal size : 60x60x60 cms

- For alkaline soils : By auger
- Water logged areas : mounds
- Species recommended : Listed in **Table 3.0**
- No of plants per Km : 84
- Height of plant : more than 2m

In localities where a really bad patch of USAR occurs recommendations are to be strictly followed for better survival of plants. Deep pits to be dug and soil amender Gypsum 1 Kg to 3 kg with 2 kg compost and sand are to be filled before planting the plants.

For multiple row plantations, five strand barbed wire fencing, with cross strands, stretched on angle iron poles fixed at a distance of 4 meters from one another are to be provided as per recommendations. Live fencing/ bamboo fencing/ thorn fencing may also be used where protection can be ensured through these.

3. Shrubs (For Median/ Embankment)

The surface is to be prepared adequately for shrubs planting or grass sowing. The grasses and shrub planting is done to provide a strong surface cover but needs a well-prepared surface. All masses of loose debris will be removed.

- Size of the pits for planting shrubs : 45x45x45 cms
- Species recommended : Listed in **Table 4.0**
- No of plants per Km : 666 (For two rows in the median)
- Use of compost and manure : 1/3 of volume of pit mixed with soil and refilled

The contractor will be required to water the area in case of insufficient rains after planting.

Plantation at Road Junctions/ Intersection and Traffic Islands

Road intersections are main nodal spaces and are of vital importance in terms of road aesthetics. Proper landscaping of the traffic islands and the surrounding areas shall integrate these features with surrounding landscape. The layout of traffic intersections shall be fixed by the traffic needs of the junction.

Plantation at the Sensitive noise receptors

All along the project corridor were sensitive receptors for noise such as educational institutions, hospitals, religious structure of community importance situated, the trees known for behaving as "noise barrier" will be proposed like- Neem (*Azadirachta indica*), Shisham (*Dalbergia sisso*), Imli (*Tamarindus indica*). Some flowering trees like Amaltas, Gulmohar, Kachnar, Asoka etc. can also done. Tall trees with thick canopies create a wind screen through which the air can be filtered and noise levels be considerably reduced. Some such trees are *Acacia auriculiformis* and *Greavillea Robusta*. At the sensitive noise receptors, tall shrubs of 1.5 – 3 m height like *Cassia biflora*, *Hamelia Patens* etc. can also be provided for maximum possible screening.

ANNEXURE-9.2

PLANT SITE MANAGEMENT

For the construction purpose the major construction plants such as Hot mix plant, Stone Crusher Plants, batch mix plants, etc. will be required to be established. In case the Contractor establishes their own plan they have to follow all the applicable statutory norms. The objective of this plan is

- To ensure that statutory / regulatory requirements are complied with
- To ensure that safeguard measures are taken to avoid / mitigate / minimize environmental impacts.

The present section provides general guidelines for siting of plants and environmental safeguard measures based on the statutory requirements:

1. Site selection criteria for Hot Mix Plant/ Stone crusher Plant:

- 1.0 km away from settlement, school, hospital towards downwind directions
- 1.0 km from any archaeological site
- 1.0 km from forest area;
- 10.0 Km from national park, Wildlife sanctuary or any notified eco-sensitive zone etc.
- 1.0 rivers, streams and lakes
- 500 m from ponds
- 500 m from National Highway, 250 m from State Highway, 100 m from District roads and other roads (The distance are to be measured from edge of Road to boundary of site).
- Preference to barren land

2. Statutory Requirements:

- Obtaining NOC [Consent-to-Establish(CtE) and Consent to Operate(CtO)] under Air and Water Acts from the Uttar Pradesh Pollution Control Board (UPPCB) before start of installation.
- Complying with the terms and conditions laid down in the CtE and CtO, which generally include providing Dust containment cum suppression system for the equipment, Construction of wind breaking walls along periphery of plant sites, construction of the metalled roads within the premises, regular cleaning and wetting of the ground plantation, periodic (monthly) pollution monitoring i.e. ambient air, noise and stack emission
- The suspended particulate matter contribution value at a distance of 40 m from a controlled isolated as well as from a unit located in a cluster should be less than 600 $\mu g/m^3$ or as shall be stipulated by UPPCB.
- Obtain certificates from manufacturer for Type Approval and Conformity of Production for Diesel Generator (DG) set/s. For DG sets of capacity up to 1000 KVA, the noise level at 1m from the enclosure surface shall not exceed 75 dB (A)

3. Pollution control measures

- For HMP, ensure adequate stack height as stipulated in CtE, install emission control devices such as bag house filters, cyclone separators, water scrubbers etc., as attached with the plant by the manufacturer or stipulated in CtE.

- Prefer bulk bitumen storage with mechanized handling facilities that storage in drums with manual operation at HMP to prevent / minimize bitumen spillage and thereby contaminating soil and water.
- Impervious platform for storage of bituminous and other liquid hazardous chemical
- Bag house filter / multi-cone cyclone for emission control. For bag house, cartridge filters reported to be more efficient than fabric filters.
- The stone crusher plants should be installed with operational water sprinklers over jaw crusher, conveyor belts and vibratory screens.
- Pollution control measures for Diesel Generator (DG) set i.e. stack height, acoustic enclosure etc.
- Periodical maintenance of all the plant and equipments to keep the plants in order.
- Damaged bag-house and filters should be immediately replaced.
- All the workers shall use all the time helmets, footwear, earplugs, nasalmasks etc. when the plants are operational. During maintenance of plants also the workers involved in maintenance will not enter the plant premises without PPE.
- No workers should be allowed to work in loose clothes near conveyor belts.
- Proper lighting arrangement shall be made around plant site if the plants are operated during dark hours.
- Provision of readily available first aid kit, fire fighting equipments at the plant site at appropriate location to respond in case of accident.
- Periodical monitoring of air quality and noise levels as per conditions stipulated under the statutory clearance from UPPCB. Whenever the emission exceeds the permissible level the plants should be stopped and necessary repairing works of faults will be done to bring down the emission levels.
- The office complex, residential units shall be constructed on upwind direction from the plant site.

ANNEXURE-9.3

GUIDELINES FOR REDEVELOPMENT OF BORROW AREAS

BACKGROUND

The guidelines provide basic information to the contractor on how to redevelop the borrow areas to ensure compliance with the environmental requirements of MoEFCC, MORTH and as specified in IRC: 10-1961. The following section provides the guidelines to the contractor for the identification, siting of borrow areas and also the enhancement measures to redevelop the areas with community participation.

IDENTIFICATION OF THE BORROW AREAS

Specific locations of borrow areas will be identified by contractor. The selection and recommendations of borrow areas; will be based on environmental as well as civil engineering considerations. Location of source of supply of material for embankment or sub-grade and the procedure for excavation or transport of material shall be in compliance with the environmental requirements of MoEFCC, MoRTH and as specified in IRC:SP10-1961.

Certain precautions have to be taken to restrict unauthorized borrowing by the contractor. No borrow area shall be opened without permission of the Engineer. The borrowing shall not be carried out in cultivable lands, unless and until, it shall be agreed upon by the engineer that there is no suitable uncultivable land in the vicinity for borrowing or private landowners are willing to allow borrowing on their fields.

Borrow Area Identification:

- Identify areas having present land use as barren land, riverside land.
- Prefer areas of highland with respect to surroundings;
- Avoid locating borrow area close to any road (maintain at least 30m distance from ROW and 10 m from toe of embankment, whichever is higher);
- Should be at least 1.0 km away from inhabited areas;
- Minimum distance of about 1.0 km from ecologically sensitive area i.e. Reserve Forest, Protected Forest, Sanctuary, wetland etc.;
- Minimum distance of about 1.0 km from school, hospital and any archaeological sites;
- Having adequate approach road with minimum length of earthen road;
- Ensure that unsuitable soft rock is not prominent within the proposed depth of excavation which will render rehabilitation difficult;
- Controlled operation as per agreed / approved plan
- Prior approval of Rehabilitation Plan considering terrain, land use and local need;
- Restricting operation as agreed by landowner and approved by the

Statutory Clearance for Borrow Area

Regarding the borrow area for ordinary soil, the Contractor has to obtain environmental clearance from State Environmental Impact Assessment Authority (SEIAA) of MoEFCC in compliance to the Supreme Court's order and MoEF conditions vide their circular no. L-11011/47/2011-IA.II(M) dated 20th June, 2013. If the area of a borrow area is less than 5 Ha then this will be treated as Category-B-2 Project and will be appraised and approved based of only Form-1. No EIA study will be required for such area. However if the size of the borrow area is more than 5 Ha then it will be categorized as

"Category-B1" and therefore will require EIA study, based on which the SEIAA will give clearance for the same.

OPERATION

No borrow area will be operational without written consent of the land owner. To avoid any embankment slippage, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the engineer. The contractor shall evolve site-specific redevelopment plans for each borrows area location, which shall be implemented after the approval of the Supervision /Independent Consultant.

Precautionary measures as the covering of vehicles will be taken to avoid spillage during transport of borrow materials. To ensure that the spills, which might result from the transport of borrow and quarry materials do not impact the settlements, it will be ensured that the excavation and carrying of earth will be done during day time only. The unpaved surfaces used for the haulage of borrow materials will be maintained properly. A general guidelines will be followed in the line of MoEF conditions as follows:

- The borrowing/excavation activity shall be restricted to a maximum depth of 2 m below general ground level at the site.
- The borrowing/excavation activity shall be restricted to 2 m above the ground water table at the site.
- The borrowing/excavation activity shall not alter the natural drainage pattern of the area.
- Appropriate fencing will be provided all around the borrowed/excavated pit made to prevent any mishap.
- Measures shall be taken to prevent dust emission by covering of borrowed/excavated earth during transportation.
- Safeguards shall be adopted against health risks on account of breeding of vectors in the water bodies created due to borrowing/excavation of earth.
- Workers / labourers shall be provided with PPE. The use of PPE at all time during works will be ensured.
- A berm shall be left from the boundary of adjoining field having a width equal to at least half the depth depth of proposed excavation.
- A minimum distance of 15 m from any civil structure shall be kept from the periphery of any excavation area.

Borrowing of earth shall be carried out at locations recommended as follows:

Non- Cultivable Lands: Borrowing of earth will be carried out up to a depth of 2.0 m from the existing ground level. Borrowing of earth shall not be done continuously. Ridges of not less than 8 m width shall be left at intervals not exceeding 300m. Small drains shall be cut through the ridges, if necessary, to facilitate drainage. Borrow pits shall have slopes not steeper than 1 vertical in 4 horizontal.

Productive Lands: Borrowing of earth shall be avoided on productive lands. However, in the event of borrowing from productive lands, under circumstances as described above, top soil shall be preserved in stockpiles. At such locations, the depth of borrow pits shall not exceed 45 cm and it may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil aside.

Elevated Lands: At locations where private owners desire their fields to be leveled, the borrowing shall be done to a depth of not more than 2m or upto the level of surrounding fields.

Borrow pits along Roadside: Borrow pits shall be located 5 m away from the toe of the embankment. Depth of the pit should be such that the bottom of the pit shall not fall within an

imaginary line of slope 1 vertical to 4 horizontal projected from the edge of the final section of the bank. Borrow pits should not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300m. Small drains should be cut through the ridges to facilitate drainage.

Borrow pits on the riverside: The borrow pit should be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood.

Community/ Private Ponds: Borrowing will be carried out at locations, where the private owners (or in some cases, the community) desire to develop lands (mostly low-lying areas) for pesciculture purposes and for use as fishponds.

Borrow Area near Settlements: Borrow pit location shall be located at least 0.8km from village and settlements. If unavoidable, they should not be dug for more than 30 cm and should be drained.

BORROW AREA REDEVELOPMENT:

Each borrow area should be rehabilitated immediately after completion of extraction of materials to the satisfactions of the land owner and the Engineer. The borrow area shall be redeveloped appropriately as per approved plan and landowner's requirement. The borrow pits may be developed into pond after leveling the bottom and slope maintenance. The borrow pits may be refilled with earth materials covered with fertile to soil. The upland used as borrow area shall be leveled matching with the level of surrounding area. No scare created due to borrowing of earth should be left unattended. The Contractor should provide completion certificate of redevelopment of each borrow pit issued by the land owner.

ANNEXURE-9.4

QUARRY AREA MANAGEMENT PLAN

Quarries generally required to provide material for road construction sites, can have significant adverse environmental effects, especially on ecologically sensitive areas. Quarries can become environmental hotspots and can significantly affect the visual appearance of an area. Special mitigation and management measures are often required to avoid or minimise the environmental and impacts of due to quarry operations. The EMP stipulations will be applicable for new quarries to be identified and operated by Contractors. In case contractor use the existing licensed quarry a copy of the valid quarry license and lease / sub-lease agreement should be submitted to the Project Proponent. Contractor shall submit a plan delineating how he shall comply with requirements stipulated in this plan and elsewhere in the EMP on quarrying activity.

The guidelines for quarries cover:

- Statutory approvals
- Environmental and social impacts of quarries
- Selection of quarries
- Operation of quarries
- Rehabilitation of quarries

The guidelines seek to ensure that Contractors:

- Comply with the regulatory requirements in force at the time
- Reasonably manage any impacts
- Reinstate and rehabilitate the land appropriately
- Consult with affected communities

Impacts

Some of the potential impacts of quarries are:

- Rock blasting causing air pollution, and noise and vibrations
- Trucks transporting materials to the site causing air pollution, and noise and vibrations
- Ponds of stagnant water forming in excavated areas giving rise to the breeding of
- Mosquitoes and the spreading of malaria and other mosquito-borne diseases
- Aestatics of the landscape being affected by excavations and the removal of vegetation
- natural drainage systems in the area being affected by excavations

The procedure for identification and finalization of quarry site/s shall be as given below:

The quarry area identified during Feasibility study are mainly operational government stone quarry. For using these quarry areas, the Contractor have be obtain necessary statutory permission from the concern department. However, selection of new quarry following guidelines should be followed:

- Only licensed quarry will be used.
- New quarry will be at least 1.5km away from the settlement, forest and other ecologically sensitive areas
- Minimum 500m away from water bodies
- The Contractor shall identify alternative quarry sites along the whole corridor based on required quantity and environmental consideration and obtained approval from the Engineer(PMC) / UPPWD
- The Contractorobtain Quarry Lease Deed / License from the Department of Mines and Geology and provide copy of the same to the PIU-UPPWD prior to start of the material extraction.
- The Contractor shall estimate water requirement for dust suppression at quarry sites during

- operation and for water spraying on *kutcha* (non-metal) haul road and ensure
- availability water by identifying sources and obtaining necessary permission;
- The Contractorshall prepare quarry sites operation and redevelopment plan considering surrounding land uses, local needs and agreement with the landowner;
- Only licensed blaster i.e. short-firer certificate holder will be responsible for quarry Blasting
- Permits for transportation, storage and use of explosive, as will be required, shall be obtained from the Controller of Explosive;
- Whenever so advised by the R&B Engineer, controlled blasting e.g. using less charge, restricting depth and dia or drill holes, cut-off blasting etc., and shall be undertaken.
- Quarry operation will be undertaken in stages with adequate benching

Quarry Operation:

The procedure for environmentally sound operation and management of quarry sites is given below:

- Estimating the quantity of quarry material to be collected from each quarry area;
- Demarcating the entire quarry area by fencing and putting red-flag poles;
- Providing adequate metallic access road;
- Preserving topsoil from the quarry compound, if any, by stripping and stacking aside separately at corners;
- Overburden shall be removed and disposed in environmentally sound manner.
- All workers safety measures such as helmets, footwear, earplugs, facemasks etc. shall be undertaken.
- The contractor shall ensure maintenance of crushers regularly as per manufacture schedule.
- Water sprinkling shall be done to minimize dust generated due to crushing/Vehicle movement.
- Carrying out blasting as per agreed operational plan complying with the requirements of MoRTH Specification (Clause 302 & 303) and Ministry of Environment & Forests (MoEF)
- Maintaining a Quarry Material Collection Register on daily material collection for each of the quarry area, which shall be produced to Engineer's representative as and when requested;
- Redeveloping the area within 2 months (or as will be agreed upon) of completion of quarry material collection;

Redevelopment of Quarry Area:

All the quarries are should be rehabilitated as per approved rehabilitation plan immediately after completion of quarry material extraction. The restoration of Quarry will be done as per the conditions of the owner before handing over the site back to the owner.

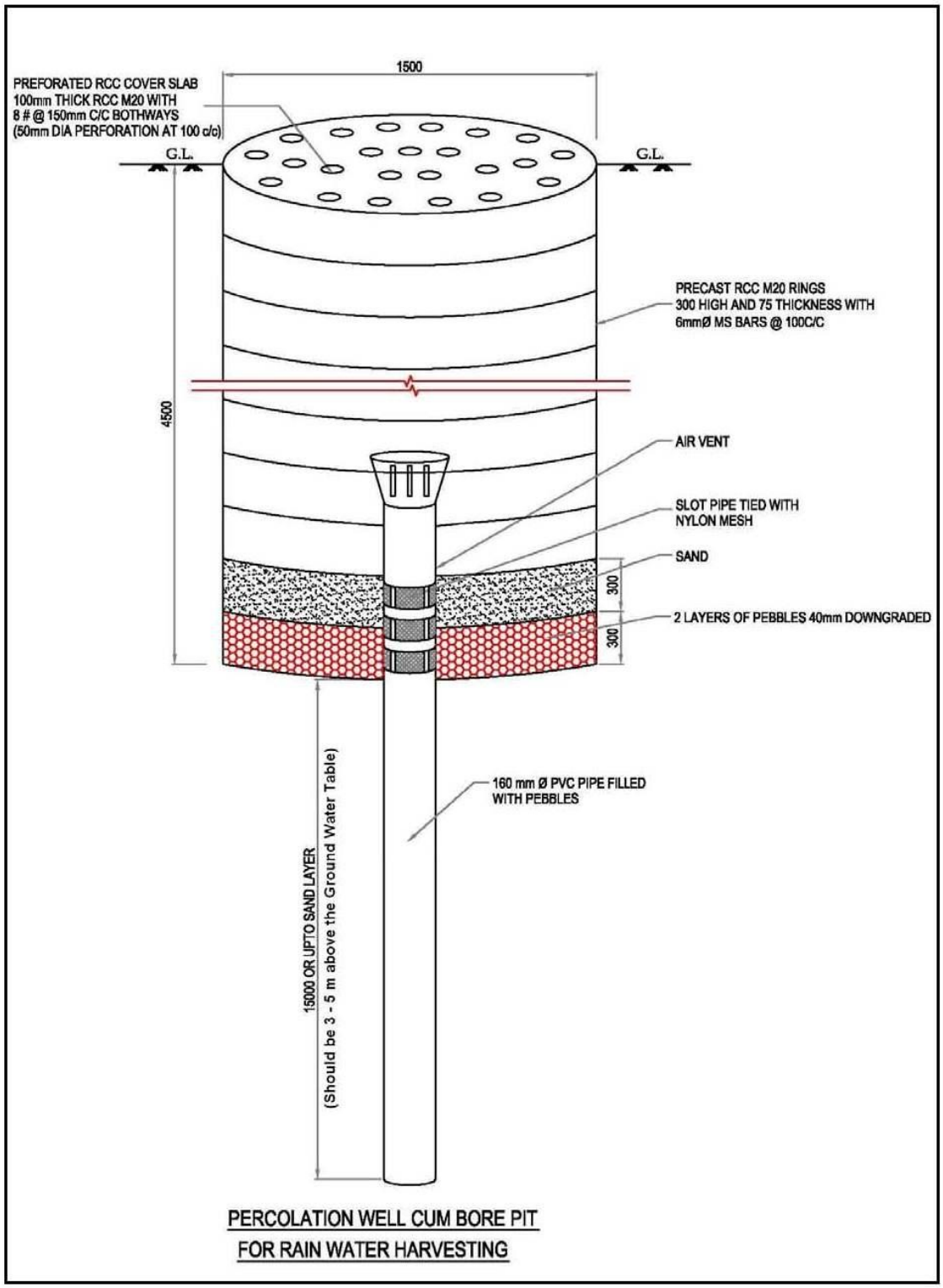
Following rehabilitation works may be taken up with the consent of owner:

Option A: Revegetating the quarry to merge with surrounding landscape. This is done by conserving and reapplying the topsoil for the vegetative growth.

Option B: Development exhausted quarries as water bodies: The pit shall be reshaped and developed into pond, for harvesting rainwater. This option shall only be considered where the location of quarry is at the lowest point, i.e. surrounding area/natural drainage slopes towards it.

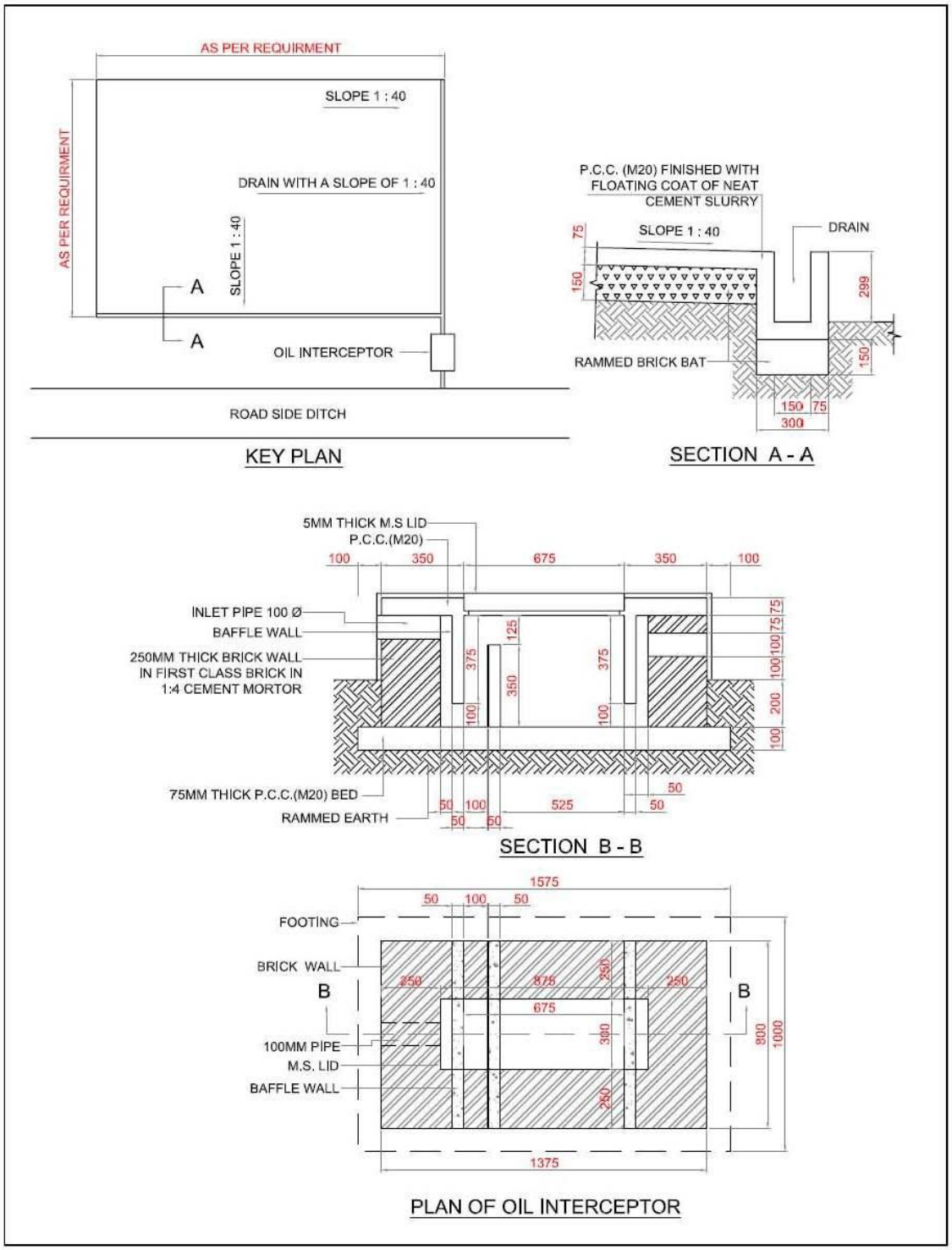
ANNEXURE-9.5

SCHEMATIC PLAN OF RAIN WATER HARVESTING PIT



ANNEXURE-9.6

SCHEMATIC PLAN OF OIL INTERCEPTOR FOR REMOVAL OF OIL & GREASE FROM SURFACE RUNOFF WATER



ANNEXURE 9.7

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Method of Measurement
(1)	Sulphur Dioxide (SO_2) $\mu g/m^3$	Annual*	50	20	Improved West and Geake Method Ultraviolet Fluorescence
		24 hours**	80	80	
(2)	Oxides of Nitrogen (NO_x) $\mu g/m^3$	Annual*	40	30	Jacob & Hochheiser Modified (Na-Arsenite) Method Chemiluminescence
		24 hours**	80	80	Gas Phase Chemiluminescence
(3)	Particulate Matter (Size less than 10 µm) or PM_{10} $\mu g/m^3$	Annual*	60	60	Gravimetric TOEM Beta attenuation
		24 hours**	100	100	
(4)	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$ $\mu g/m^3$	Annual*	40	40	Gravimetric TOEM Beta attenuation
		24 hours**	60	60	
(5)	Ozone (O_3) $\mu g/m^3$	8 hours**	100	100	UV Photometric Chemiluminescence Chemical Method
		1 hour**	180	180	
(6)	Lead (Pb) $\mu g/m^3$	Annual*	0.5	0.5	ASS/ ICP Method after sampling on EPM 2000 or equivalent Filter paper ED – XRF using Teflon filter
		24 hours**	1.0	1.0	
(7)	Carbon Monoxide (CO) mg/m^3	8 hours**	02	02	Non Dispersive Infra Red (NDIR) Spectroscopy
		1 hour**	04	04	
(8)	Ammonia (NH_3) $\mu g/m^3$	Annual*	100	100	Chemiluminescence Indophenol blue method
		24 hours**	400	400	
(9)	Benzene (C_6H_6) $\mu g/m^3$	Annual*	05	05	Gas Chromatography based continuous analyzer Adsorption and Desorption followed by GC analysis
(10)	Benzo (a) pyrene (BaP) – Particulate phase only, ng/m^3	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
(11)	Arsenic (As) ng/m^3	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
(12)	Nickel (Ni) ng/m^3	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

*Annual Arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval.

**24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Source: *National Ambient Air Quality Standards, Central Pollution Control Board Notification No. 29016/20/90/PCI-I dated 18 November, 2009*

ANNEXUREC 9.8

NATIONAL AMBIENT NOISE MONITORING STANDARDS

Area/Class	Noise Level (Leq dB (A))*	
	Day Time	Night Time
Industrial	75	70
Commercial/Mixed	65	55
Residential/Rural	55	45
Sensitive	50	40

Note-:

1. Day time shall mean from 6 a.m. to 10 p.m.

2. Night time shall mean from 10 p.m. to 6 a.m.

3. Silence Zone is an area comprising not less than 100 meters around hospitals, education institutions, courts, religious places or any other area, which is declared as such by Competent Authority.

4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the Competent Authority.

**dB(A) Leq denotes the time weighted average of the level of decibels on scale A which is related to Human Beings*

A "decibel" is the unit in which noise is measured

"A" in dB(A) Leq, denotes the frequency weighted in the measurement of the noise corresponds to frequency response characteristics of the human ear.

Leq: It is an energy means of the noise level over a specified period.

ANNEXURE 9.9

WATER QUALITY STANDARD AS PER BIS (IS: 10500:1991)

S. No.	Parameters	Desirable Limit	Max. Permissible Limits in the absence of alternate source
Essential Characteristics:			
1.	Colour	5	25
2.	Odour	Unobjectionable	Unobjectionable
3.	Taste	Agreeable	Agreeable
4.	Turbidity, NTU	5	10
5.	pH Value	6.5 to 8.5	No relaxation
6.	Total Hardness (as $CaCO_3$), mg/l	300	600
7.	Iron as Fe, mg/l	0.3	1.0
8.	Chloride as Cl, mg/l	250	1000
9.	Residual free Chlorine, mg/l	0.2	-
Desirable Characteristics			
10.	Dissolved Solids, mg/l	500	2000
11.	Calcium as Ca, mg/l	75	200
12.	Copper as Cu, mg/l	0.05	1.5
13.	Manganese as Mn, mg/l	0.10	0.3
14.	Sulphate as SO_4, mg/l	200	400
15.	Nitrate as NO_3, mg/l	45	100
16.	Fluoride as F, mg/l	1.0	1.5
17.	Phenolic Compounds as C_6H_5OH, mg/l	0.001	0.002
18.	Mercury as Hg, mg/l	0.001	No relaxation
19.	Cadmium as Cd, mg/l	0.01	No relaxation
20.	Selenium as Se, mg/l	0.01	No relaxation
21.	Arsenic as As, mg/l	0.05	No relaxation
22.	Cyanide as CN, mg/l	0.05	No relaxation
23.	Lead as Pb, mg/l	0.05	No relaxation
24.	Zinc as Zn, mg/l	5.0	15.0
25.	Anionic detergent as MBAS, mg/l	0.2	1.0
26.	Chromium as Cr^{6+}, mg/l	0.05	No relaxation
27.	Polynuclear aromatic hydro carbon as PAH, g/l	-	-
28.	Mineral Oil, mg/l	0.01	0.03
29.	Pesticide, mg/l	Absent	0.001
30.	Radioactive materials: Alpha Emitters, Bq/l Beta Emitters, Bq/l	 - -	 0.1 1.0
31.	Alkalinity, mg/l	200	600
32.	Aluminum as Al, mg/l	0.03	0.2
33.	Boron, mg/l	1.0	5.0

ANNEXURE 9.10

USE BASED CLASSIFICATION OF SURFACE WATERS IN INDIA

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfections	A	i. Total Coliforms Organism MPN/100ml shall be 50 or less ii. pH between 6.5 and 8.5 iii. Dissolved Oxygen 6mg/l or more iv. Biochemical Oxygen Demand 5 days 20^{o}C 2mg/l or less
Outdoor bathing (Organized)	B	i. Total Coliforms Organism MPN/100ml shall be 500 or less ii. pH between 6.5 and 8.5 iii. Dissolved Oxygen 5mg/l or more iv. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Drinking water source after conventional treatment and disinfections	C	i. Total Coliforms Organism MPN/100ml shall be 5000 or less ii. pH between 6 to 9 iii. Dissolved Oxygen 4mg/l or more iv. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Propagation of Wild life and Fisheries	D	i. pH between 6.5 to 8.5 ii. Dissolved Oxygen 4mg/l or more iii. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	i. pH between 6.0 to 8.5 ii. Electrical Conductivity at 25oC micro mhos/cm Max.2250 iii. Sodium absorption Ratio Max. 26 iv. Boron Max. 2mg/l

Source: Guidelines for Water Quality Management – CPCB 2008.

ANNEXURE 9.11

PROPOSED ENVIRONMENTAL ENHANCEMENT MEASURES

Chainage (Km) : 9.300 of SH-93

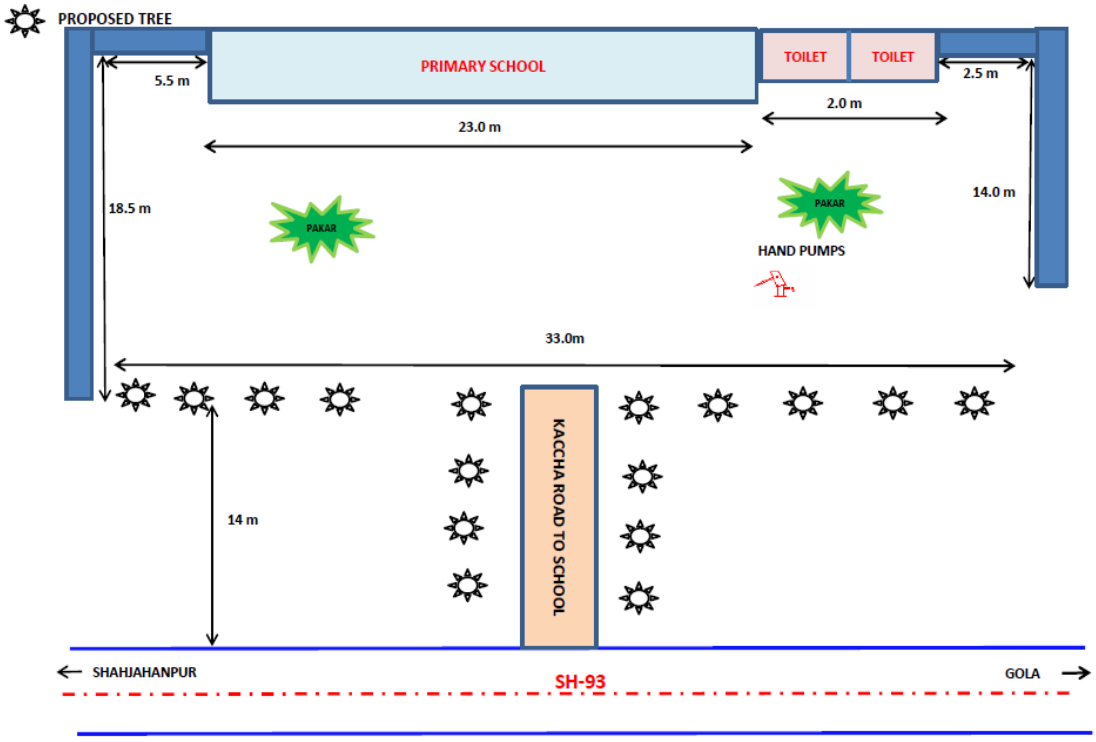
Village : Bagchan

Side : RHS

Place : Village Primary School

Distance from ECL : 36.0 m

Proposed widening : Concentric



Proposed Enhancement at Km 9.300 (RHS)

S. No	Description	Unit	Quantity	Rate	Amount (INR)
1	Trees Plantation with maintenance of 1 year	No.	16	696	11,136.00
2	Providing of Half Brick circular tree guard, in 2nd class brick, internal diametre 1.25 metres, and height 1.5 metres, above ground and 0.50 metre below ground, cement mortar 1:6 as per complete design	No.	16	1915	30,640.00
TOTAL COST (INR)					**41776.00**

Chainage (Km) : 28.000 of SH-93

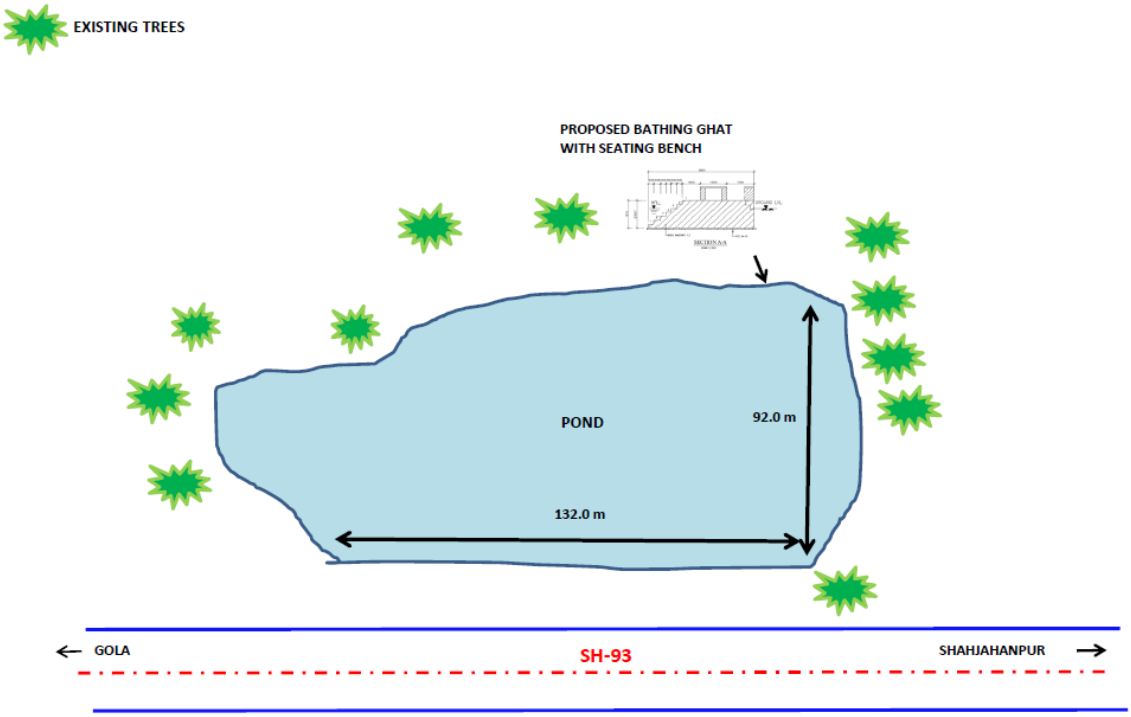
Village : Mohammadi

Side : LHS

Place : Pond

Distance from ECL : 6.5 m

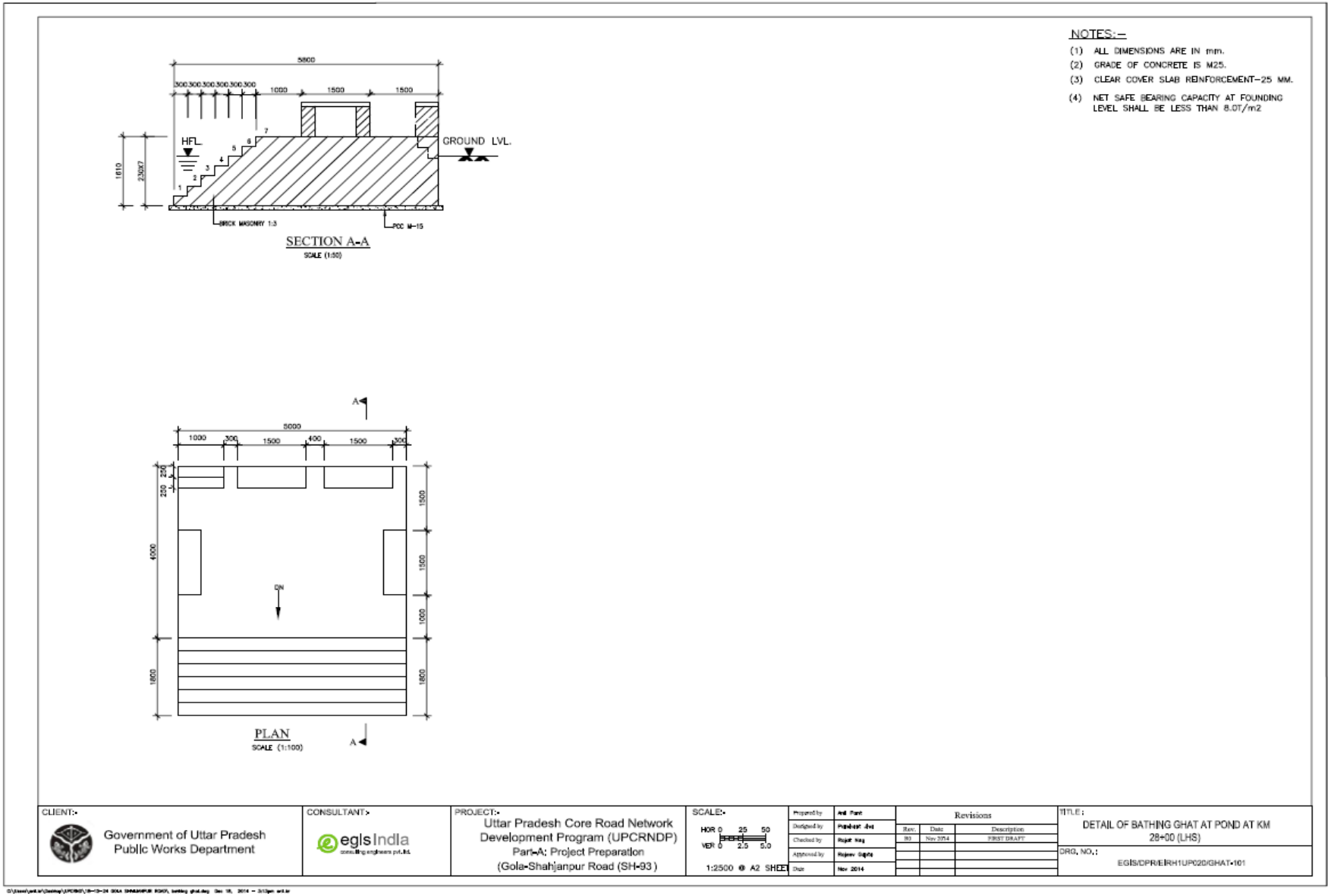
Proposed widening : Concentric



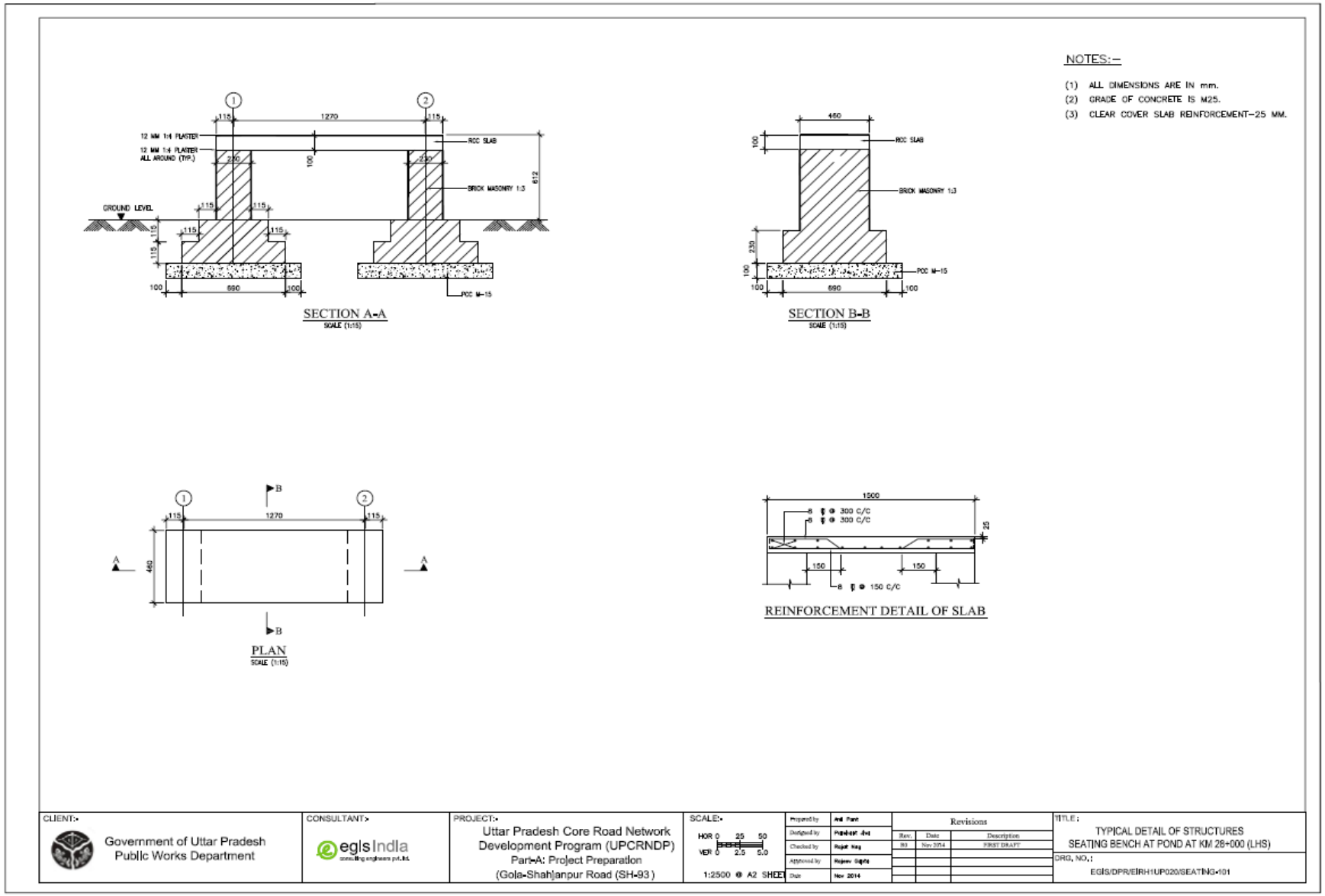
Proposed Enhancement at Km 28.00 (LHS)

S. No	Description	Unit	Quantity	Rate	Amount (INR)
1	Bathing Ghat of size 4m x 5m				
	Excavation	Cum	37.50	57	2,138.00
	PCC (M15)	Cum	3.0	7361	22,083.00
	Brick Work (1:3)	Cum	39.20	6414	2,51,429.00
	Tiles	Sqm	37.51	880	33,009.00
2	Sitting Bench (4 numbers) at Bathing Ghat				
	PCC (M15)	Cum	0.632	7,361	4,652
	RCC (M25)	Cum	0.276	8,484	2,342
	Reinforcement (FE 500)	Kg	13.8	60.50	835
	Brickwork (1:3)	Cum	0.92	6,414	5,901
	Plaster 12 mm (1:3)	Sqm	4.564	1,386	6,326
TOTAL COST (INR)					**3,28,713.00**

Cross-section of Bathing Ghat:



Cross-section of Seating Bench:



Chainage (Km) : 52.000 of SH-93

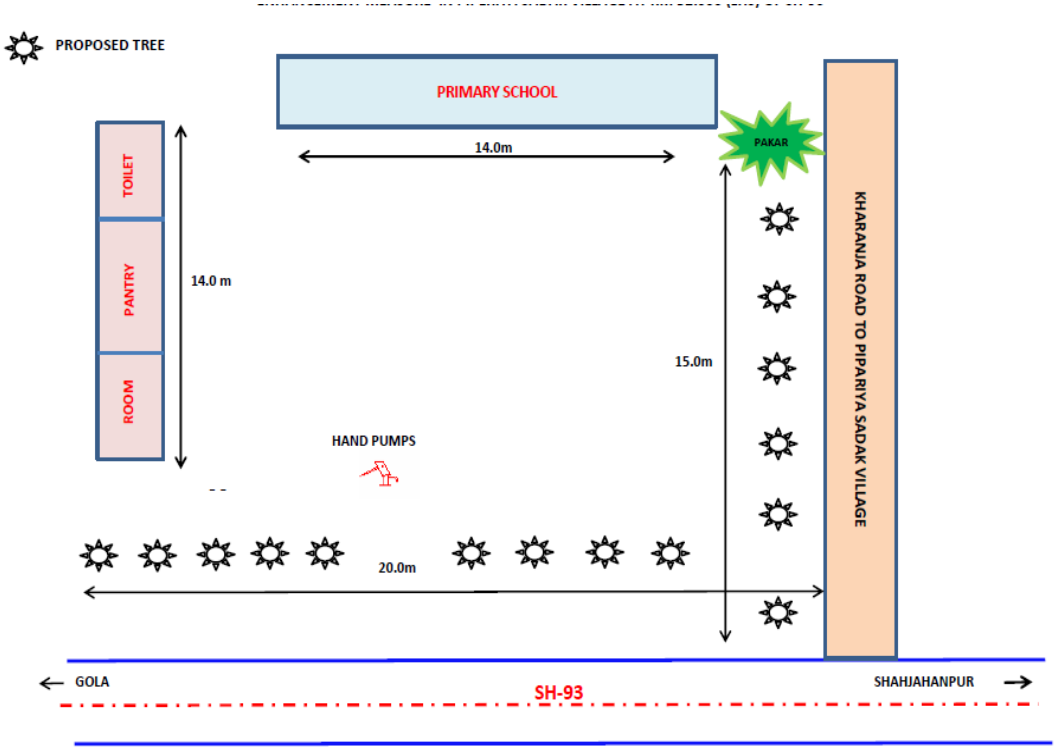
Village : Piperiya Sadak

Side : LHS

Place : Village Primary School

Distance from ECL : 18.0 m

Proposed widening : Concentric



Proposed Enhancement at Km 52.000 (LHS)

S. No	Description	Unit	Quantity	Rate	Amount (INR)
1	Trees Plantation with maintenance of 1 year	No.	15	696	10,440.00
2	Providing of Half Brick circular tree guard, in 2nd class brick, internal diametre 1.25 metres, and height 1.5 metres, above ground and 0.50 metre below ground, cement mortar 1:6 as per complete design	No.	15	1915	28,775.00
TOTAL COST (INR)					**39,165.00**

APPENDIX – 9.1

APPENDIX 9.1

DISASTER MANAGEMENT AND EMERGENCY RESPONSE PLAN

1.1 GENERAL

The Disaster Management and Emergency Response Plan is aimed to ensure safety of life, to protect environment, to safeguard installation and rescue operations in order of priorities. The objective of a Disaster Management and Emergency management plan is to localize a Disaster and contain its effect to the greatest extent so as to minimize its impact on life, environment and property. Response to Disaster, in the absence of a well-defined plan, would be arbitrary, leading to overemphasis of actions of some actions and absence of other critical actions. A formal plan for managing Disaster is, therefore, necessary.

The purpose of the Disaster and emergency response plan is to identify potential probable accidents/ emergency situations, establish and maintain procedures to address or prevent such situations, as well as to test the effectiveness/ review/ revise such procedures periodically. Generally the most of the accidents will be confined within the construction camp boundaries during construction phase and within the RoW of Highways during operation phase. This section of the report presents an outline of disaster management and emergency response plan for the Bridge construction zone as how to deal with any emergency situation leading to disaster.

1.2 POSSIBLE TYPE OF DISASTER

In roads & highways project, during construction and operation phases, disaster may occur due to the following:

- Floods
- Earthquake
- Biological Disaster or Epidemic of Human/ livestock/ crops
- Fire
- Explosion
- Fuel Oil spillage
- Electrocution
- Accidnetal fall of workers from height
- Collapse of piers and work flatform at height
- Hazardous materials releases
- Transportation accidents
- Terrorism / War

Some of the hazards will be dealt with Government procedure for Natural hazards and calamities.

1.3 EMERGENCY PREPAREDNESS PLAN

Emergency Preparedness Plan (EPP) should be prepared in advance to minimize the after effects of disaster, following the national environmental Emergency plan and OSHA guidelines.

The basic approach towards preparedness for any major disaster or emergency situation will comprise of the following activities:

Identify the potential disasters which can occur

↓

Establish an Disaster Management Committee to implement emergency procedures with defined role and responsibilities among the authorities, participating agencies and coordination team

↓

Linkage / Relationship with other emergency plans

↓

Develop a detailed Emergency/ Disaster Response Plan with details regarding the course of action to be followed in order to minimize personal injury and property damage in the event of fire, flood, loss of ground or natural disaster

↓

Train the personnel in planning and responding to an emergency

↓

Response operations; should always cover these four phases –

- Discovery and alarm
- Evaluation, notification and plan invocation
- Containment and countermeasures
- Cleanup and disposal

↓

Directions on the necessary emergency provisions applicable to the handling, treatment or disposal of certain pollutants

↓

Support measures, such as procedures for providing public information, carrying out surveillance, issuing post incident reports, review and updating of the plan, and periodic exercising of the plan

↓

Carry out audits of individual establishments on a regular basis to monitor the Emergency Response Plans and the corresponding procedures. The audits will include review of the following:

- The roles and responsibilities of the respective Emergency Response Team and support organizations;
- Adherence of individual project activities to safe practices; and
- Resource requirements, condition of equipments and their availability

1.3.1 Identification of Hazardous Area during construction:

The following areas are sites for potential hazardous during construction:

- Construction camps/ stockyards of contractors where fuel oil and other hazardous materials are planned to be stored.
- Tankers / Vehicles carrying explosives and hazardous materials
- Refueling Stations
- Bridge construction zone

1.3.2 Organizational Structure

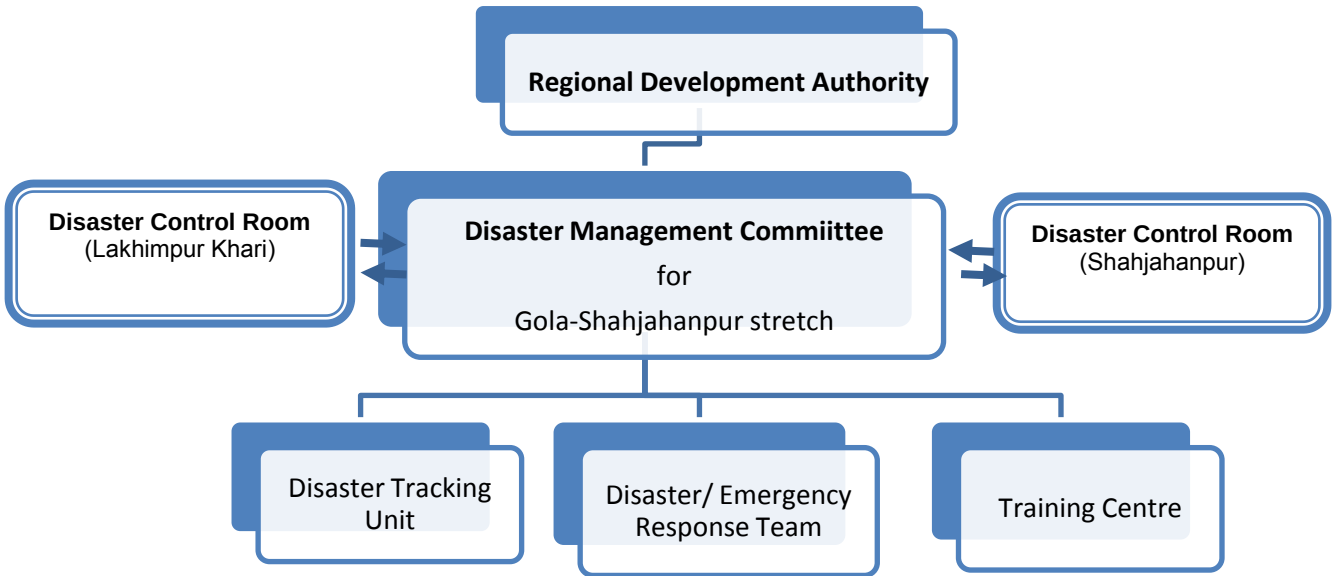
The Regional Development Authority shall constitute a Disaster Management Committee (DMC). The DMC will be the apex planning body and will play a major role in preparedness and mitigation of any disaster. The cell will have the following key functions:

- Preparation of comprehensive Disaster Management Plan for bridge construction site.

- Setting up of Emergency Control Centre during emergency situations
- Coordination with District Disaster Control Room of Lakhimpur Kheri and Shahjahanpur districts
- To supervise emergency response measures in case of any emergency
- Keep track of predictable natural hazard events such as floods, fire and earthquakes etc.
- Organize training and capacity building programmes on disaster management for individual establishments in the Region
- Periodic monitoring of Emergency Response Plans and the corresponding procedures of individual establishments
- Organize post-Disaster evaluation and update DMP accordingly
- Prepare reports and document on Disaster events of Bridge construction zone and surrounding areas and submit the same to District Control Room The documents shall include:
    - ✓ Source & Cause of Disaster
    - ✓ Description of the response efforts.
    - ✓ Recommendation for preventive &mitigation measures.
    - ✓ Plan for upgrading emergency preparedness and response plan

The organizational structure of Disaster Management Committee is presented in **Figure.**

Figure 1: Organisational Structure for DMC



The Disaster Management Committee will have the following departments/ teams:

1.3.2.1 Disaster Tracking Unit

The primary function of this unit shall be to keep track of predictable natural hazards such as floods, drought, fire and earthquakes, etc. The unit shall continuously coordinate with the Regional Meteorological Centre (RMC) and Indian Meteorological Department (IMD), Lakimpur Kheri and Shahjahanpur in order to monitor disaster warnings and weather conditions in the region. On account of any extreme event predictions, the unit shall communicate the same to the DMC which will issue warnings in the entire Investment Region.

1.3.2.2 Disaster/ Emergency Response Team

The Disaster/ Emergency Response Team shall perform the following functions:

- Advise the DMC as to whether the declaration of an emergency is recommended;
- Advise the DMC on the need to designate all or part of road section of SH-93 from Km 0.000 to Km 50.000 as an emergency area;
- Appoint an Emergency Control Centre;
- Determine if the location and composition of the Emergency Control Centre are appropriate;

The Emergency Response Team shall form an Emergency Control Centre in case of any emergency situations. The Team shall coordinate with other agencies such as:

- Fire Brigade
- Police Department
- Hospitals / Ambulance
- Technical Departments such as Factory Inspectorate, Pollution Control Board etc
- Local Authorities/ District Administration

1.3.2.3 Training Centre

The training centre shall be responsible for the following activities:

- Dissemination of information about the Comprehensive Disaster Management Plan developed for Gola-Shahjahanpur road section highlighting the bridge construction zones.
- Organize capacity building workshops for the personnel of Disaster Management Cell
- Organize training programs such as mock drills, emergency evacuation procedures at construction camps

Apart from the above teams, information dissemination between Disaster Control Room and Disaster Management Committee will be there.

1.3.2.4 Disaster Control Room

In order to control the disaster more effectively a Disaster Control Room will be established at construction camps of contractor. During operation phase, it will be established as far as possible at midway of road length. The planned facilities at Disaster Control Room are as follows:

During Construction Phase:

- Layout of construction camp showing all areas specially oil storages, transfer locations, oil dispensers, etc.
- Alignment Map of Project roads/ Bridges
- Hazard identification chart, names of personnel working in each shift, assembly points at construction camp
- List of habitations and industrial installations and their population in the vicinity of construction camp in a radius of 3 km
- Mobile Telephone numbers of all key personnel
- External telephone connections
- Public address system
- Rechargeable and battery operated torch lights and invertors
- List of Medical Facilities available within 10 km of the construction camp

- Muster Roll of employees
- First Aid kits in 5-10 numbers
- One ambulance at each 'Emergency Control Centre'
- Tie up with the neighbouring hospitals for referring any accidental victims to the hospital
- Oil absorbing material in portable sand bags to absorb minor oil spillage at site. The recommended oil absorbing materials are sand and vermiculite
- Portable fire extinguishers carry to accidental site.
- Note pads and ball pens to record message received and instructions to be passed through runners through designated persons
- The blow up copy of Layout plan showing areas where accident could occur
- Accident drill is to be made part of routine exercise

1.3.3 Emergency Response

Effective command and control starts with a clear definition of the overall command and control structure, and description of the duties of key personnel with specific responsibilities for emergency response. The control of emergencies will consider the minimum number of persons required to provide an adequate response to emergencies.

All emergencies occurring as a result of project activities shall be managed as per following order of priorities:

- Preservation of Life (self, team, community)
- Protection of the Environment
- Protection or Property/ assets
- Preservation of Evidence

The roles and the responsibilities of various departments during emergency situations as defined in Section have been discussed in the following

1.3.3.1 Emergency Control Centre (ECC)

The emergency control centre shall be formulated in case of emergency situations by the Disaster Management Committee. The ECC shall be chaired by the head of Regional Development Authority head and will have representatives from Police, Fire Department, Hospitals, Factory Inspectorate and District Administration. The ECC shall perform the following functions:

- Co-ordinate the acquisition, distribution and scheduling of various modes of transport (i.e. construction vehicles, public transit, trucks etc) for the purpose of transporting persons and/or supplies, as required;
- Determine if additional transport is required for evacuation or transport of persons and/or supplies;
- Discontinue utilities or services provided by public or private concerns without reference to any consumers in the region, or when continuation of such utilities or services constitutes a hazard to public safety within an emergency area;
- Disperse people not directly connected with the operations who by their presence are considered to be in danger or whose presence hinders in any way the efficient functioning of emergency operations;
- Authorize the evacuation of construction area within an emergency area which are themselves considered to be dangerous or in which the occupants are considered to be in danger from some other source;

- Authorize casualty collection and evacuation in support of emergency health care authorities;
- Coordinate with other departments such as Police, Fire Department etc.
- Arrange for services and equipment from local agencies not such as private contractors, volunteer agencies etc.;
- Arrange for accommodation and welfare, on a temporary basis, of any residents who are in need of assistance due to displacement as a result of the emergency;
- Arrange assistance from senior levels of Government as per requirements

The following information and equipment shall be available at ECC:

- Intercom, telephone
- P and T telephone
- Breathing apparatus
- Fire suit/ gas tight goggles/ gloves/ helmets
- Hand tools, wind direction/ velocities indications
- Public address megaphone, hand bell, telephone directories (internal, P and T)
- Emergency lamp/ torch light/ batteries
- Emergency shut-down procedures
- List of key personnel and list of Emergency Co-ordinators
- Duties of key personnel
- Address with telephone numbers and key personnel, emergency coordinator, essential employees.
- Important address and telephone numbers including Government agencies, neighbouring industries and sources of help, outside experts, chemical fact sheets population details

1.3.3.2 Police Department

The Police Department shall perform the following actions:

- The overall responsibility of police shall be to maintain law and order during and post disaster situation in the context of disaster management.
- Prepare a departmental disaster response plan and Standard Operating Procedure in which roles and responsibilities are clearly defined. The plan and SOP shall be submitted to the DMC;
- Prepare a database of nodal person at State, District and Taluka level and share with DMC;
- Police personnel shall be trained in search and rescue (flood rescue, collapse structure, rope rescue, etc) during normal time and database of such trained personnel shall be shared with the DMC;
- Overall traffic management (access roads to disaster site, roads to be made one-way, to be blocked, alternate routes, etc) and patrolling
- Provide security in transit and relief camps, affected areas, hospitals and medical centers and identify areas to be cordoned off;
- Establish communication with the ECC, District Control Room and nearest Police station to the disasters site;
- Additional deployment of police, if required, to inquire into and record of deaths;
- Provide convoys for relief materials;
- A public information system to be activated for passing information related to injured, dead, missing persons, etc.

- Regularly conduct mock drill by simulating different disasters to check preparedness, coordination and scope of improvement and a report shall be submitted to the DMC;
- Assist DMC and ECC in evacuation of people from the vulnerable areas.

1.3.3.3 Fire Department

The Fire Department shall perform the following actions:

- The overall responsibility of fire department shall be to undertake the emergency fire evacuation procedures effectively and efficiently;
- Prepare a departmental disaster response plan and Standard Operating Procedure in which roles and responsibilities are clearly defined. The plan and SOP shall be submitted to the DMC
- Prepare a database of nodal person at State, District and Taluka level and share with DMC;
- Fire personnel shall be trained in fire evacuation procedures during normal time and database of such trained personnel shall be shared with the DMC;
- Establish communication with the ECC, District Control Room and nearest Fire station to the disasters site;
- Additional deployment of fire safety personnel, if required, to inquire into and record of deaths;
- Regularly conduct mock drill by simulating different disasters to check preparedness, coordination and scope of improvement and a report shall be submitted to the DMC;
- Assist DMC and ECC in evacuation of people from the vulnerable areas;

1.3.3.4 Health Department

The Health Department shall perform the following actions:

- The overall responsibility of health department is to undertake the emergency heath activities in the aftermath of disasters and take measures to check the outbreak of epidemic in the post disasters situation effectively and efficiently;
- Prepare a departmental Emergency Health Management Plan including, hospital specific plan shall also be prepared. Apart from plan, SOP shall be prepared which clearly delineates the roles and responsibilities;
- The plan shall cover mass casualty management, triage (prioritization of patients), trauma counseling, mobile team which may be deployed at sites, procedure for coordinating with private hospitals and availing its services, etc.
- A database of nodal officer at State, district and hospital specific shall be prepared for emergency health services and shared with the DMC;
- Periodic review of the stock emergency medicines and equipment required during the disasters;
- The epidemic surveillance and water quality monitoring shall be done at transit camps, relief camps, affected areas and feeding centers;
- The central warehouse shall be kept informed for dispatch of supplies likely to be needed, to hospitals, on an emergency priority basis;
- Establish communication with the ECC District Control Room, Police and the medical team at the disasters site;
- A public information system to be activated for passing information related to patients admitted at the hospital;
- Mock drill on mass casualty management at hospital level shall be organized twice in year. The mock drill shall check the activation and response time of emergency

medical teams, coordination with other agencies, areas of improvement, etc. The report shall be submitted to the DMC;
- The medical officers and staffs shall be trained in triage (system for prioritization of patients).

1.3.3.5 Electricity Department

The Electricity Department shall perform the following actions:

- The overall responsibility of Electricity Board is to restore the power supply at the earliest in the aftermath of disasters and ensure uninterrupted power to all vital installation, facilities and sites;
- Prepare a departmental and district specific disaster management plan and submit it to the DMC. In addition to the plan, SOP shall be prepared which clearly delineates the roles and responsibilities;
- The plan shall basic information, vulnerability analysis, response plan, preparedness measures and long-term measures. The long-term measures include construction of multi-hazard resistant future power facilities and premises and retrofitting of existing department buildings;
- A disaster management team and emergency tool kit comprising cable cutters, pulley blocks, jungle knives, axes, crowbars, ropes, hacksaws and spanners shall be kept in the state of readiness at each sub-station. Tents for work crews shall also be part of the kit;
- A database of nodal officer at State and district shall be prepared for emergency power services shall be prepared and shared with DMC respectively;
- Standby arrangements for temporary electric supply or generators made for hospitals, water department, Collect orate, police stations, telecommunications buildings, transit camps, feeding centers, relief camps and other critical buildings and installations in case warning for disaster is received.
- Immediately undertake inspection of high tension lines, towers, substations, transformers, insulators, poles and other equipment from the time of receipt of alert warning;
- Establish communication with the ECC, District Control Room and teams at the disasters site;
- Mock drill on mass casualty management at state and district level shall be organized twice in year. The mock drill shall check the activation and response time of emergency power restoration teams, coordination with other agencies, areas of improvement, etc. and a report shall be submitted to DMC;
- The officers and staffs shall be trained in emergency management.

1.3.3.6 Water Supply Department

The Water Supply Department shall perform the following actions:

- The overall responsibility of Water supply department is to ensure supply of regular water;
- Prepare a departmental and district specific disaster management plan and submit it to the DMC. In addition to the plan, SOP shall be prepared which clearly delineates the roles and responsibilities;
- Plan shall cover basic information, water supply plan in the event of disasters, prioritization of water supply services to the critical installations, water supply restoration plan in the event of disaster, formation of emergency team;

- A database of nodal officer at State and district shall be prepared for emergency power services shall be prepared and shared with DMC respectively;
- Several teams of engineers and assistants for restoration of water supply services shall be constituted as precautionary measure;
- It shall also make provisions to acquire tankers and establish other temporary means of distributing water on an emergency;
- Required stock of lengths of pipe, connections, joints, hydrants and bleaching powder; adequate tools shall be on hand to carry out emergency repairs and generator shall also be identified for the emergency;
- In case of receipt of disaster warning, wells, intake structures, pumping stations, buildings above ground, pumping mains and treatment plant shall be monitored;
- After any repair on the distribution system, the repaired main shall be flushed and disinfected with a chlorine solution;
- Establish communication with the ECC, District Control Room and teams at the disasters site;
- A public information centre shall be established with a means of communication, to assist in providing an organized source of information, which may keep the community informed of its potential and limitations in disaster situations;
- Mock drill on emergency water management shall be conducted at State and district level at least once in year and a report shall be submitted to DMC.

1.3.3.7 UP PWD, World Bank Division

The UPPWD shall perform the following actions:

- The overall responsibility of UPPWD, World Bank Division is to restore the damaged structures;
- Prepare a departmental and district specific disaster management plan and submit it to the DMC. In addition to the plan, SOP shall be prepared which clearly delineates the roles and responsibilities;
- The plan shall cover basic information, response structure of UPPWD, World Bank Division team, restoration plan for public utility structures in case of disasters, formation of emergency team;
- A database of nodal officer at State, district and hospital specific shall be prepared for emergency health services and shared with the DMC;
- Several teams of engineers and assistants for restoration of NHAI structures & roads shall be constituted as precautionary measure;
- UPPWD, World Bank Division shall prepare database and stock the emergency equipment such as cranes, dumpers, earth movers, crosscut saws, axes, power chain saw with extra fuel, oil, sharpening files, chains and tightening wrenches, pulley with chain, ropes etc.
- Establish communication with the ECC, District Control Room and teams at the disasters site;
- A public information centre shall be established with a means of communication, to assist in providing an organized source of information. It may keep the community informed of its potential and limitations in disaster situations.
- Mock drill on emergency management shall be conducted at State and district level at least once in year and a report shall be submitted to DMC

1.4 EMERGENCY CONTROL PROCEDURES

1.4.1 For Natural Calamity

In the event of occurrence of natural calamity during the construction phase, all work will be suspended and all construction material will be shifted to the safer location. In order to minimize losses/ damages to pavement, incomplete CD/ bridge structures during the heavy rains the inventory of material storage at site will be kept to a minimum during rainy period i.e. May to September. During the operation phase, in the event occurrence of Natural Calamity the contractor will stop traffic on the highway and will guide the traffic at time of closure for follow up of safer route. The traffic will be regulated right from receipt of warning. The emergency control centre will be in direct contact with the district administration for their advice for the steps taken for the traffic control and other assistance.

1.4.2 For Hazard

The onset of emergency will in all probability commences with a major fire or explosion and shall be detected by the member of staff on duty at construction camp/on Highways. If located by a staff member on duty, he (as per site emergency procedure of which he is adequately briefed) will go to the nearest fire alarm call point, break glass and trigger off the fire alarms. He will also try to inform about location and nature of fire/ accident to the Site Main Controller on mobile phone.

In accordance with work emergency procedure, the following key activities will immediately take place to intercept and take control of emergency:

- The fire group will arrive at the site of incident with fire fighting controls
- Site Main Controller will commence his role from the Control Centre
- The First Aid Group will take care of injured
- Site Main Controller will be directing and deciding a wide range of desperate issues. In particular DMC has to decide and direct:

o Whether fire fighting and first aid groups require reinforcement of man power and facilities

o Whether the facility is to be shut down or more importantly kept running

- Respond to any large size complaints from outside public and to assess an offsite impact arising out of the onsite emergency.
- When the incident has eventually been brought under control as declared by the fire fighting group, the Site Main Controller shall visit himself personally for:

o An assessment of total damage and prevailing conditions with particular attention to possibility of re escalation of emergency, which might of the time being, be under control.

o Inspection of other facilities, which might have been affected by impact of incident.

o Based on visit, Site Main Controller will finally declare and communicate termination of emergency and authorize step by step restoration of normal operation of the refuelling and storage facility. The fire siren will be sounded with all CLEAR SIGNAL.

- During entire period of emergency the site will remain out of bounds to external visitors except:

o External Fire Personnel;

o External hospital ambulance staff;

o Local Government;

o Insurance authorities;

1.4.2.1 Alarm System to be followed during Disaster

Suitable alarms will be developed after establishment of construction camp/opening of Highways for traffic and these will be explained to each personnel working at the Highways. The alarm will also be displayed at office for the information of visitors.

1.4.2.2 Actions to be Taken on Hearing the Warning Signal

On receiving the disaster message following actions will be taken:

- Fire Fighting group, first aid group shall reach the ECC
- Team members will remain ready in their respective sections for further instructions

1.4.3 For Petroleum Product Leakage

In the event of massive spillage of HSD/ Gasoline/ Kerosene/ Furnace oil the spilled quantity Emergency Response Plam should be reclaimed from the storm drainage channels/ rain water harvesting pits. The traces of the products may be absorbed in sand or cotton rags. The spilled area at main carriageway/ service road should be thoroughly washed with water or any neutral solvent to avoid any slippage or skidding. All effect should be made that spilled oil does not enter surface water body.