# **Environmental Assessment Report**

Initial Environmental Examination Document Stage: Final Project Number: 37143-013 February 2013

# India: North Eastern State Roads Investment Program

Udaipur-Melghar Road Section in Tripura (TR 02): Tranche 2 Subprojects

Prepared by the Ministry of Development of North Eastern Region (MDONER), Government of India for the Asian Development Bank

# CURRENCY EQUIVALENTS

(as of 21	February 2013)
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(400		
Currency unit	_	Indian rupee (Rs)
Rs1.00	=	\$0.0184145106
\$1.00	=	Rs 54.305000

#### ABBREVIATIONS

ADB	-	Asian Development Bank
BGL	-	Below Ground Level
BOD	-	Biological Oxygen Demand
BIS	-	Bureau of Indian Standard
CPCB	-	Central Pollution Control Board
DO	-	Dissolved Oxygen
DoE	-	Department of Environment
DPMC	-	Design and Project Management Consultant
EA	-	Executing Agency
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EMoP	_	Environmental Monitoring Plan
ESO	_	Environmental and Safety Officer
GDP	-	Gross Domestic Product
Gol	_	Government of India
IFF	_	Initial Environmental Examination
IMD	_	Indian Meteorological Department
IRC	_	Indian Road Congress
IS	_	Indian Standard
	_	Ministry of Development of North Eastern Region
MDRs	_	Major District Roads
MEE	_	Multi Tranche Financial Facility
MoEE	_	Ministry of Environment and Ecrests
MoRT&H	_	Ministry of Road Transport and Highways
MSI	_	Mean Sea Level
	_	Mean Watt
NEC	_	North Eastern Council
NER	_	North Eastern Region
NESRIP	_	North Eastern State Road Improvement Program
NGO	_	Non Government Organization
NH	_	National Highway
NOv	_	Oxides of Nitrogen
NSDP	_	Net State Domestic Product
NTPC	_	National Thermal Power Corporation
OTPC	_	ONGC Tripura Power Corporation
PILI	_	Project Implementation   Init
PRF	_	Proposed Reserve Forest
	_	Public Works Department
RE	_	Reserve Forest
ROW	_	Right of Way
	_	Special Accelerated Road Development Program in the
	-	North Eastern Degion
80		Supervision Consultant
<u>с</u>	-	Supervision Consultant
	-	State Dollution Control Board
	-	Suspended Particulate Matter
SCINI	-	Subpended Falliculate Mattel Subpur Diovido
	-	Small Scale Industries
	-	State Dellution Control Roard
	-	

TA	-	Technical Assistance
TDS	-	Total Dissolved Solids
TSS	-	Total Suspended Solid
TPWD	-	Tripura State Public works Department
UGF	-	Unclassified Government Forest

#### NOTES

- (i) In this report, "\$" refers to US dollars.
- (ii) "INR" and "Rs" refer to Indian rupees

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#### EXECUTIVE SUMMARY

1. The project road (TR 02: Udaipur-Melaghar) is part of North Eastern State Road Improvement Program (NESRIP) –Tranche 2, being implemented with funding support from Asian Development Bank (ADB). Ministry of Development of North Eastern Region (MDONER) is the executing agency at centre and will be implemented by State Public Works Department (PWD). Proposed improvement will not result to significant adverse environmental impacts. Most of impacts are site-specific and can be addressed through proven mitigation measures. Hence, the road section was classified as **Category B** and warranting an initial environmental examination (IEE) as per Safeguard Policy Statement

2. The road improvement will cover 20.3 kilometres of the existing state highway which starts at Uadaipur at its junction with NH-44 near Ramesh Chaumuhani and terminates at trijunction near Melaghar forest range office covering a total distance of 20.3 Km. Project road improvement involves: (i) widening/strengthening of the road up to 2-lane with 2.5 m earthen shoulders; (ii) improving road geometry; (iii) rehabilitation and construction of cross drainage structures and side drains (iv) Junctions/intersections improvement (vi) provision of way side amenities and incorporating road safety measures. Road improvement work will ensure fast and efficient connectivity between two population centres, stimulate the local economy and promote international trade between India and Bangladesh.

3. Project road is not located in any environmentally sensitive areas. However, it passes along/through some reserve forest areas. No encroachment/diversion of forest land is involved. All widening and improvement will be accommodated within available right-of -way (ROW) varying from 24-26 m. Moreover, formation width is limited to 12-14m.

4. The significant environmental impacts attributable to the upgrading of the road sections pertains to tree cutting, temporary deterioration of ambients during construction phase from land clearing, silt run off, borrowing of earth, camp operations and community and occupational health and safety. These impacts are mitigable by adopting good construction practices and effective implementation of Environmental Management Plan (EMP). During operation stage, the main impacts are increase in mobile emissions, noise level, accident risk to motorist, pedestrian and animals. Road safety measures are proposed as per IRC: SP: 44-1996 like road delineators, signage, metal beam crash barriers and guide posts etc. Toe walls and stone pitching has been proposed on embankment slopes where ponds are abutting to avoid seepage into sub grade and erosion of road embankment.

5. Several consultations were organized during the project preparation to engage major stakeholder representatives to incorporate their concerns in the overall design. These involved officials of executing agencies, Forest department, State Pollution Control Board, Fishery and others. likely affected persons and village heads in the project area. Most of the people interviewed strongly support the project.

6. TPWD, through its Project Implementation Unit (PIU), will ensure the effective implementation of the environmental management plan. There is a need for the PIU to organize its environmental unit to provide close support to the Project Director to ensure the contractors maintain environmental compliance. To provide regular monitoring information and technical advice to the PIU are the supervision consultant and the contractor's environment and social officer.

7. This initial environmental examination (IEE) ascertains that upgrading is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed subproject, all of which are localized and temporary in nature and can be easily mitigated with minor to negligible residual impacts. No additional studies or need of undertaking detailed EIA is envisaged at this stage.



Map 1: Project Location Map

#### I. INTRODUCTION

#### A. Project Background

1. Road is the dominant mode of transport in the North-Eastern part of the country. Road conditions in the region are very poor both in terms of coverage and riding quality. Approximately 70% roads in the region are in poor condition and hardly 20% in serviceable condition causing high transport cost and excessive travel time. This is also a main factor constraining the socio-economic development of the region and impeding country's goal of regionally balanced growth.

2. Recognizing the importance of road in providing momentum for accelerating economic development in the region, Government of India (GOI), through its dedicated Ministry (Ministry of Development for North Eastern Region-MDONER) started a national investment program - Special Accelerated Road Development Program in the North Eastern Region (SARDP-NE). This aims to improve national highways and state roads in the region, providing connectivity to the state capitals and district headquarters. In this series, GOI approached Asian Development Bank (ADB) for its assistance to develop secondary road network by improving intrastate connectivity, of administrative and economic importance under North Eastern State Roads Investment Program (NESRIP).

3. North Eastern State Road Investment Program (NESRIP). The NESRIP is an ADB's multi tranche financing facility (MFF) intended to improve about 430 kilometres (km) of priority roads in six states, namely: Assam, Manipur, Meghalaya, Mizoram, Sikkim, and Tripura in the North Eastern region (NER) of India; and provide capacity building support to the executing agencies, the MDONER and the state public works departments (PWDs) or its equivalent in the six project states. The investment program targets the secondary road network and aim to enhance the performance of state roads sector in NER through investment project implementation and dedicated capacity building measures. The improved secondary road network will provide important linkage between the primary and tertiary road networks in the region, for which there are ongoing national programs for improvement. The MFF is structured in two tranches as detailed in Table 1.

Package Code	Tranche/Road Name	State	Length (km)
Tranche 1			
AS-11	Futkibari – Bilasipara (NH-31)	Sikkim	16.2
AS-37C	Barpeta - Kalitakuchi	Assam	58.5
ML-N1	Garobadha – Dalu (NH-51)	Meghalaya	93.4
SK-01	Melli (NH-31A) - Nayabazar	Sikkim	14.5
SK-02	Nayabazar – Namchi (19km point)	Sikkim	19.7
Subtotal for Tranche 1			202.3
Tranche 2			
AS-02	Tamulpur – Paneri	Assam	43.0
AS-03	Paneri – Udalguri	Assam	18.6
AS02-03	Major Bridges	Assam	1.3
MN-06	Tupul (NH53) - Kasom-Khullen	Manipur	93.2
MZ-02	Serchhip – Buarpui	Mizoram	55
TR-02	Udaiphur (NH-44) - Melaghar	Tripura	20.3
Subtotal for Tranche 2			231.4
Grand Total for investment program			433.7

Table 1: Road Sections under North Eastern State Roa	ad Improvement	Program
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Source: Report and Recommendation of the President to the Board of Directors, June 2011

# B. Purpose and Objectives of the Study

4. The environmental assessment study was conducted from September 2005 to January 2006 as part of feasibility study under ADB financed technical assistance to meet ADB requirements. The report was updated in 2008, and again in 2010 as part of detailed design. This 2013 final version disaggregates this section road from a bigger civil works package and provides more detailed environmental baseline and assessment of of **Udaipur-Melaghar-TR 02** road section in the state of Tripura, one of the six roads under Tranche 2 of NESRIP prior to initiation of civil works. It has been categorized as **Category 'B'** and hence this initial environmental examination (IEE) has been conducted.

5. The IEE report covers the general environmental profile of the study area and includes an overview of the potential environmental impacts and their magnitude on physical, ecological, economic, and social and cultural resources within the project's influence area during design, construction, and operation stages. An Environmental Management Plan (EMP) was prepared to provide necessary mitigation measures to be implemented to address significant environmental impacts during implementation of the project. An environmental monitoring plan (EMOP) accompanies the EMP that defines protocols like paramaters, reponsible entities, and reporting to ensure measures are implemented. The IEE has four basic objectives; (i) identify the environmental issues that should be taken into account due to project interventions (ii) determine the magnitude of potential environmental concerns and to ensure that environmental considerations are given adequate weight at planning/design stage (iii) identify need for further environmental studies or Environmental Impact Assessment (EIA) and (iv) suggest enhancement measures, if any.

# C. Extent of the IEE Study

6. This IEE report has been prepared on the basis of detailed engineering design, field investigations and stakeholder consultations to meet the requirements for environmental assessment process and documentation as per ADB's Safeguard Policy Statement (SPS, 2009). IEE extent has been decided considering all likely impacts and risks analyzed in the context of the project's area of influence encompassing (i) the primary project site(s) and related facilities like site clearance, utility shifting etc. (ii) associated facilities project viz. Borrowing, quarrying, disposal of debris, construction camp etc. (iii) areas and communities potentially affected by cumulative impacts and (iv) potential impact from unplanned but predictable developments caused by the project that may occur at later stage or at a different location. The core zone of impact is taken as 15 m on the either side of the alignment. However, the study area is considered up to 10 km on either side of road alignment for larger analysis of landuse and other environmental features.

# D. IEE Methodology

7. IEE commenced with the review of technical details provided by the DPR team and preceding environmental assessment reports conducted for the project road. This was followed by a reconnaissance site visit and discussion with the implementing agency to reconfirm the technical details of the project road improvement work. This helped to identify those environmental attributes which may get altered with the passage of time and incorporate additional information to the baseline environmental scenario/environmental setting of the project to meet the ADB Safeguard requirement. Further steps followed for IEE has been concisely described in following paragraphs.

# 1. Primary Data Collection

8. Inventory of all environmental features viz. terrain, geologically unstable areas, waterways/water bodies, road side vegetation, sensitive receptors, common property

resources, utilities, flooding/water logging, and industries was conducted along the project road within the area of interest/core zone. Since some portion of the project road is passing through the reserved forest areas though outside the right of way, a rapid bio-diversity study was also undertaken. The data collection from the field was completed with the help of trained enumerators / investigators.

#### 1. Secondary Data Collection

9. Published reports, government websites, recognized institutions and relevant government departments were consulted to gather information and maps of the project influence area. Since there is no baseline data on air, water, soil, and noise available with State Pollution Control Board, environmental Impact assessment (EIA) report of "1082.4 MW (3x360.8 MW) Combined Cycle Gas Turbine Thermal Power Project at Palatana village was referred to establish the same.<sup>1</sup>

#### 2. Public Consultation

10. Besides consultations with the government agencies, consultation with local people/beneficiary population was held at all major habitations with intent to collect baseline information, for better understanding of the potential impacts and appreciate the perspectives/concerns of the stakeholders. Information gathered was used to integrate it in project design and formulating mitigation measures and environmental management plan.

#### 3. Other Tools

11. Remote sensing and GIS based landuse map of the study area has been prepared through recent satellite imagery. Unsupervised classification was done combined with ground verifications.

12. Information collected from both primary and secondary sources has been summarised in **Table 2**.

Information	Sources	
Technical Details	PWD and Design and Project Management Consultant (DPMC)	
Inventory of road features	Ground Physical surveys	
Climatic condition	Indian Meteorological Department Websites	
Geology, Seismicity, Soil and Topography	State of Environment Report, Pollution Control Board, DPR and Primary Surveys	
Land Use/ Land Cover	Satellite Imagery based land use analysis	
Drainage Pattern	Google Image, Detail Project Report and onsite observations	
Roadside Forest/Vegetation	Forest Range Offices/State Forest Department, Agartala	
Biodiversity Assessment	Local Professionals/investigators from ICFRI	
Status of fishing activity	District Fisheries offices	
Air quality Noise, Soil and Water	EIA conducted for Combined Cycle Gas Turbine Thermal Power Project at Palatana by OTPC	
Borrow areas, quarries and other construction material source	PWD, Detailed Project Report and Consultation	
River geo-morphology, hydrology, drainage, flood patterns,	Detailed Project Report, Consultation and site verification	
Socio-economic environment	Different Govt. agencies/civic bodies, official websites maintained by state govt., census of India 2001, and public Consultation during the Field survey	

	Table 2: Primary	y and Secondary	Information Sources
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<sup>&</sup>lt;sup>1</sup> This project is located adjacent to the project road near Paltana Village and significant part of the study area overlaps with the study area of Udaipur- Melaghar project road.

# 4. Assessment of Potential Impacts

13. Potential significant impacts were identified on the basis of: analytical review of baseline data; review of environmental conditions at site; analytical review of the underlying socio-economic conditions with the project influence area.

# 5. Preparation of the Environment Management Plan (EMP)

14. An EMP for the project is prepared to specify the steps required to ensure that the necessary measures have been taken and the same will be incorporated during construction and operation stage of the project. The EMP includes the monitoring plan giving details of the resources budgeted and the implementation arrangements.

# E. Structure of the report

15. The IEE has been structured as recommended in SPS, 2009. An introduction section has been included to have a general overview of the project. Executive Summary describing critical facts, significant findings, and recommended actions has been presented in the beginning of the report. The report has been compiled and presented as follows.

- Chapter 1-Introduction
- Chapter 2- Policy, Legal and Administrative Framework
- Chapter 3- Description of Project
- Chapter 4- Description of the Environment
- Chapter 5- Anticipated Impacts and Mitigation Measures
- Chapter 6- Information Disclosure, Consultation, and Participation
- Chapter 7-EMP and Grievance Redress Mechanism
- Chapter 8 Conclusion and Recommendation.

#### II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

16. The chapter presents a review of the existing institutions and legislations relevant to the project at the National and State level. The Environmental Assessment process needs to adopt environmental regulations and guidelines of Government of India (GoI) and ADB safeguard requirements.

#### A. Country's Legal Framework and Regulatory Requirements

17. The Government of India has laid out various policy guidelines, acts and regulations for the safeguard and conservation environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Ministry of Environment and Forests (MoEF) and the Central Pollution Control Board (CPCB)/Tripura State Pollution Control Board (TSPCB) in the present context.

#### 1. Recent Policy Initiatives

18. Ministry of Environment & Forest (MoEF) vide O.M. No. L-11011/47/2011-IA.II(M) dated 18th May, 2012 in view of the Order of Hon'ble Supreme Court dated 27.2.2012 in I.A. no. 12-13 of 2011 in SLP (C) no. 19628-19629 of 2009 in the matter of : Deepak Kumar etc. Vs State of Haryana and others has informed that it has been decided in the MoEF that: (i) All mining projects of minor minerals including their renewal, irrespective of the size of the lease would henceforth require prior environment clearance. (ii) Mining projects with lease area up to less than 50 ha including projects of minor mineral with lease area less than 5 ha would be treated as category "B as defined in the EIA Notification, 2006 and will be considered by the respective State/ UT Level Environment Impact Assessment Authority (SEIAAs). (iii) All the respective SEIAAs in dealing with the applications regarding environment clearance should be disposed within ten days from the date of receipt of the applications in accordance with law. All State Governments should take action as per the decision of the MoEF. **Table 3** presents all relevant policies/acts/rules and regulations and its applicability to the project.

SR. No	Act / Rules	Purpose	Ар	Reason for Applicability	Authority
1	Environment Protection Act- 1986	To protect and improve overall environment	yes	It is umbrella legislation and notifications, rules and schedules are promulgated under this act.	MoEF. Gol; DoE, Tripura State Gov. SPCB
2	Environmental Impact Assessment Notification 14th Sep-2006 <sup>2</sup>	To provide environmental clearance to new development activities following environmental impact assessment	No	This notification is not applicable to the project road since this state highway is neither located above 100msl nor in ecologically sensitive area	MoEF. SEIAA

Table 3: Environmental Regulations and Legislations and its Applicability to the
Project

<sup>2</sup> Category A -i) New National High ways; and ii) Expansion of National High ways greater than 30 KM, involving additional right of way greater than 20m involving land acquisition and passing through more than one State. Category B-i) All State High ways; and ii) Expansion projects in hilly terrain (above 100 m msl and or ecologically sensitive areas)

Note: A general condition applies to both of the above category: "Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries".

SR. No	Act / Rules Purpose		Ар	Reason for Applicability	Authority
3	Fly Ash Notification, 1999 as amended upto 17th August 2003:	Reuse large quantity of fly ash discharged from thermal power plant to minimize land use for disposal	NO	No thermal power Plant located within 100 Km radius	MoEF
4	Coastal Regulation Zone(CRZ) Notification 1991 (2002)	Protection of fragile coastal belt	NO	Road is not located along coastal belt	SCZMA and MOEF
5	National Environment Appellate Authority Act (NEAA) 1997	Address Grievances regarding the process of environmental clearance.	Yes	Grievances if any will be dealt with, within this act.	NEAA
6	The Land Acquisition Act 1894	Set out rule for acquisition. of land by government	Yes	This act will be applicable to as there may be some acquisition of land for widening, geometric improvements	Revenue Department State Government.
7	Forest Conservation Act (1980)	To check deforestation by restricting conversion of forested areas into non- forested areas	No	Diversion of forestland is not involved. Only permission for tree felling and its transit permission is required	Tree removal will be guided as per state government rules.
8	Wild Life Protection Act 1972	To protect wildlife through certain of National Parks and Sanctuaries	No	This act is not applicable since no wild life protected areas within 10 km radius	Principal Chief Conservator Wildlife,
9	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by & Transport controlling emission of air Department. Pollutants as per the prescribed standards.	Yes	This act will also be applicable during construction; for obtaining NOC for establishment of hot mix plant, workers' camp, construction camp, etc.	SPCB
10	Water Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	This act will be applicable during construction for (establishments of hot mix plant, construction camp, workers' camp, etc.	SPCB
11	Noise Pollution (Regulation and Control Act) 1990	The standards for noise for day and night have been promulgated by the MoEF for various land uses.	Yes	This act will be applicable as vehicular noise on project routes required to assess for future years and necessary protection measure need to be considered in design.	SPCB
12	Ancient Monuments and Archaeological Sites and Remains Act1958	Conservation of cultural and historical remains found in India	No	No impact on such structures	Archaeological Dept Gol,
13	Public Liability and Insurance Act 1991	Protection form hazardous materials and accidents.	Yes	Contractor need to stock hazardous material like diesel, Bitumen, Emulsions etc.	
14	Explosive Act 1984	Safe transportation, storage and use of explosive material	Yes	For transporting and storing diesel, bitumen etc.	Chief Controller of Explosives
15	Minor Mineral and concession Rules	For opening new quarry.	Yes	Regulate use of minor minerals like stone, soil, river sand etc.	District Collector

SR. No	Act / Rules	Act / Rules Purpose		Reason for Applicability	Authority
16	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	To check vehicular air and noise pollution.	Yes	These rules will be applicable to road users and construction Machinery.	Motor Vehicle Department
17	National Forest Policy1952 National Forest Policy(Revised) 1988	To maintain ecological stability through preservation and restoration of biological diversity.	Yes	This policy will be applicable as project intervention requires forest land to be acquired.	Forest Department, Gol and GoB
18	The Mining Act	The mining act has been notified for safe and sound mining activity.	Yes	The construction of project road will require aggregates. These will be procured through mining from riverbeds and quarries	Department of mining. State Gov.

# B. ADB's Safeguard Requirement

19. The Asian Development Bank has defined its Safeguard requirements under its "Safeguard Policy Statement" (SPS 2009). Project categorisation has been done using REA checklist and the project is categorised as category B. As per SPS 2009, category B projects warrants preparation of an IEE which has been conducted in consistent to it.

# III. DESCRIPTION OF THE PROJECT

# A. Location

20. The project road is located in Gomati (14.2 km) and Sepahijala (6.1 km) districts of Tripura. It takes off near Udaipur at its junction with NH-44 near Ramesh Chaumuhani and terminates at tri-junction near Melaghar forest range office covering a total distance of 20.3 Km. Project road lies between 23° 31' 51.9" N, 91° 29' 13.4" E, and 23° 29' 56.7" N, 91° 20' 20.6" E. Project location map is given as **Map 1**.

# B. Type, Category and Need

21. **Type:** Project road improvement involves: (i) widening/strengthening of the road up to 2-lane with 2.5 m earthen shoulders (ii) improving road geometry (iii) rehabilitation and construction of cross drainage structures (iv) construction of side drains (v) Junctions/intersections improvement (vi) provision of way side amenities and incorporating road safety measures in consistent to Indian Road Congress (IRC) guidelines.

22. **Category**. Project categorisation has been done using Rapid Environment Assessment (REA) Checklist **(Appendix 1)**. Project road is not passing through any wildlife sanctuary, national park, tiger reserve, wildlife movement corridor or any other similar ecosensitive areas. Some sections of the project road pass along/through reserve forest with its boundary outside the existing and proposed right of way. Diversion of forest land is not involved for the project. The Project components will only have temporary and localized impacts on the environment mainly during construction period. Hence, the project has been categorised as Category 'B' in accordance with ADB's Safeguard Policy Statement, 2009. Such projects require an IEE to identify and mitigate the impacts, and to determine the need for further study.

23. **Need**. The project road warrants widening and improvement to: (i) maintain all weather, fast and efficient connectivity between Udaipur, the district headquarter of Gomti district and Melaghar, and further to Bangladesh border; (ii) meet increased traffic load due to recently set up mega captive power plant at Palatana village; (iii) improved connectivity to the National Highway 44 and Melaghar-Agartala and Melaghar-Sonamura road; and (iv) stimulate the local economy and enhance the living conditions of local people by improved connectivity to various social and physical infrastructure and providing easy access to market for villagers who are constrained to sell their local produce at farm gate prices. The project road improvement will also promote international trade between India and Bangladesh.

# C. Description of the Project Corridor

# 1. General

24. The existing road is a state highway with single to intermediate lane carriageway with 1.0 m shoulder on either side. It lies in plain and rolling terrain. The alignment is highly curvilinear particularly in rolling terrain with many sub standard curves. The abutting landuse is mixed type with agriculture, plantation/vegetation, water bodies and intermittently spread over built-up-areas. Few portions of the road section passes along forest area with its boundary outside the right of way. There is large no. of ponds along the road corridor.

#### 2. Engineering Features

25. **Right of Way:** As per revenue records, the available ROW is 24-26 m which reduces near settlement areas. Land acquisition for the project is bare minimum.

26. **Cross Section and Pavement Condition:** The average formation width varies between 7.0 to 9.0 m. The earthen shoulders vary between 0.75 to 1.00 m in width. The road is in embankment, with height varying between 1.0 to 2.0 m, except in sags/dips, where the embankment is low. The condition of the shoulders is good to fair.

27. The existing road is of flexible pavement with bituminous wearing course. The condition of the existing road pavement is generally fair. In a few stretches the pavement has been damaged due to cracks, depressions, ruts and pot holes. Shoulders in major length of the project road are brick paved in a width of about 50 to 80 cm.

28. **Horizontal and Vertical Alignment:** The existing Project road alignment generally follows the topography of the adjoining land through plain & rolling terrain. The road is aligned along natural drainage slope necessitating a very few cross drainage structures. The road lies in a major stretch of its length in rolling terrain, having curvilinear horizontal alignment with numerous curves of low degree of curvature and undulating vertical profile, with summits and dips and steep gradients in some sections. In the plain terrain, the horizontal alignment is generally straight and has flat vertical profile

29. **Bridges and Culverts**: There is 1 major and 1 minor bridge on the project road at Km 12.870 and Km 4.750 respectively. In general, the overall condition of the existing bridge superstructures and substructures is good. It was observed that both the bridges on the project road are wide enough to carry 2-lane traffic over them and therefore retained. There are 21 culverts and most of them are old and narrow. The Hume pipe culverts are small, 0.6 m to 0.9 m diameter and unfit for heavy vehicles. Stone/Slab type culverts are damaged and hydraulically inadequate in a number of cases.

30. **Drainage/Causeway**: No reliable data is available on submergence of the road sections during heavy rains or floods. In small sections constituting dips/sags, the road gets submerged in short lengths for a brief period. Between km 6.380 to km 6.460, the road pavement functions as causeway during heavy rains, with submergence depth of about 50 cm. The natural drainage flow is oblique from northeast to southwest, necessitating not too many cross drainage structures

31. **Junctions and Intersections:** There are 32 junctions/intersections on the project road. Most of them are of bituminous and brick soling roads meeting or crossing the Project road which connect the villages in the area. Junctions at start point with NH-44 and terminating point with Sonamura –Melaghar-Tripura MDR are only two major junctions.

32. **ROB/RUB:** There is no level crossing on the project road. One rail under bridge at Km 2.450 is under construction on proposed Agartala-Sambroom broad gauge railway line.

33. **Service Roads, Wayside Amenities/Utilities:** There are no service roads on the Project road. No incidence of vehicle parking and truck parking has been observed during moving observer studies by the traffic team. There are no parking areas and lay byes. A few passengers' shelters exist on the road side. The buses are parked on the road while embarking / disembarking passengers. Utilities and services, i.e., electric / telephone poles etc. have been observed, close to the formation edge. Generally electric poles/ transformers exist within the shoulders of the project road in built-up areas.

# D. Proposed Improvement Components

# 1. Traffic Considerations

34. The appreciation of traffic characteristics is one of most important activity to evaluate the potential of the existing network and identify the major issues to develop various components of the proposed improvement work. Capacity analysis as per IRC: 64:1990 establishes that the existing single lane configuration has already reached capacity saturation in the year 2012. The intermediate lane configuration shall be adequate enough till the years 2026 for the road section. The road needs to be widened further to 2-lane during design period of 20 years. Hence, it has been decided to upgrade the road to 2-lane.

# 2. Proposed Improvements

- (i) Widening of road from the existing single/intermediate lane to 7.0 m wide 2lane carriageway with 2.5 m wide shoulders on either side. Total formation width required is 12.0 m to 14 m depending on the requirement of side drains. Typical cross-sections of road, both for open areas and urban areas are given as Fig 1 and Fig 2 respectively.
- (ii) Widening and improvement will be accommodated mostly within available ROW. Additional land requirement is envisaged at few curve locations and some congested market areas like Kakraban and Jhamjuri.
- (iii) Horizontal alignment will follow existing alignment. In general, concentric widening has been proposed to contain the road geometrics within the available ROW. One side widening is proposed in some locations where available land on either side permits a design without acquisition of land to avoid important cultural/social structures and loss of trees.
- (iv) Horizontal geometry will be based on IRC: 38-1988 "Guidelines for Design of Horizontal Curves for Highways and Design Tables (First Revision)" and vertical geometry will be based on IRC: SP 23-1993 ".
- (v) All existing bridges being in good conditions and wide enough to cater 2-lane traffic are proposed to be retained. Out of 21 culverts, 10 are proposed to be retained, 11 reconstructed and 1 new to be included.
- (vi) Lined drains (for a length of 2.275 Km) are proposed in built up areas to intercept sullage flow from the adjoining properties/streets and from the surface run off from the road carriageway and discharge into nearest outfall. In open areas, unlined drains ( for a length of 1.4 km) are proposed at ROW boundary away from the toe of embankment
- (vii) 2 major Junctions at km 0.000 and km 20.300 will be improved as per geometrics, laid down in IRC:SP:41-1994, subject to constraints due to existing road side structures
- (viii) Pavement profile will have a 180mm, 250mm, 50mm, and 40mm thicknesses for GSBC, WMM, DBM, and BC respectively.
- (ix) Presently there are no bus bays on the project road. Bus bays have been proposed at 5 locations. Their locations are however, subject to confirmation by the State PWD with State Transport Department and the local authorities
- (x) In view of large no. ponds along the alignment, it is proposed to provide toe walls for protection of the embankment passing by the side of such ponds.

(xi) Road safety measures are proposed as per IRC: SP: 44-1996 like road delineators, signages, metal beam crash barriers (at sharp curves and bridge approaches) and guide posts (to delineate the edge of formation).



Fig 1: Typical Cross Section for Open Areas



Fig 1: Typical Cross Section for Open Areas

# 3. Construction Material Sourcing

35. Earth is available locally, there are 2 potential borrow areas that has been identified by DPMC at km. 1.600 and 18.650 on right side close to the project road. These are uncultivated barren land. Stone aggregates are scarce in Tripura, hence it is proposed to use brick aggregates obtained from over burnt bricks and crushed to require grading. This is the normal practice in the State PWD. If need be, aggregates will be procured from Silchar located at approximately 247 km. Sand will obtained from Bagma and Barjola quarry located at a distance of 8 km and 21 km respectively after requisite permissions.

The lead involved for the project road and the investigation is quite representative, and more extensive investigation must be conducted by the contractors at the time of construction.

#### E. Cost and Implementation Schedule

36. The project will be implementing in 18 months in one construction package. The estimated project cost is Rs51.78 crores.

#### III. DESCRIPTION OF THE ENVIRONMENT

#### A. Physical Resources

#### 1. Administrative Boundaries

37. Project is located in Gomati and Sepahijala, two newly created districts hat separated from erstwhile south Tripura and West Tripura districts, respectively. Major portion of the project road, about 14.2 kms, lies in Gomati district and the rest (6.1 Km) in Sepahijali district. Gomati district is bounded by Khowai District in North, South Tripura District, in South, Dhalai District in east and Shipahijala District in west. Whereas, Sepahijala district is bounded by West Tripura district in north, South Tripura in south, Gomati district in east and Bisramganj, the district headquarters of Gomati and Sepahijala districts are located at a distance of 60 kms and 32 kms respectively from Agartala and well connected by National Highway - 44.

38. The geo-coordinates for the road section from Udaipur (Ramesh Junction) to Melagarh (Forest Range office) lie between  $23^{\circ} 31' 51.9"$  N,  $91^{\circ} 29' 13.4"$  E, and  $23^{\circ} 29' 56.7"$  N,  $91^{\circ} 20' 20.6"$  E. Elevation at Udaipur and Melaghar is 45 m. and 39 m., respectively.

39. Since the project districts are newly created, bifurcated information are yet to be compiled by the government agencies. Hence, district level information presented in this IEE particularly on socio-economic and demography has been extracted from erstwhile South and West Tripura district.

# 2. Topography and Drainage

40. **Topography:** The terrain of the state consists of parallel hills and ridges running from the northwest to the southeast direction, with alternating narrow valleys. Study area is bounded by low hills or hillocks (Tillas) which form the western foothills of Baramura-Deotamura range. Deotamura is the principal hill range in South Tripura. Project corridor lies in plain and mainly rolling terrain with an average elevation of 33m above mean sea level.

41. **Drainage:** The anticlinal hill ranges forms the watersheds from which various drainage channels emerged. Drainage of the project area is mainly controlled by River Gomati. The common drainage patterns are sub-parallel to parallel and dendritic. The road is aligned along natural drainage slope (oblique from northeast to southwest) necessitating a very few cross drainage structures. Only one major river, Gomati, crosses the road at Ch. Km 12.870. Other streams / nallahs are minor and so are the cross drainage structures.

# 3. Geology and Soil

42. **Geology:** The geological formations in the state are classified as alluvial, Tipam and Dupitila formations. Alluvial formations occurs along the banks of main rivers and its thickness varies from 10 to 15 m. Dupitila formation is nearly horizontal in disposition and its thickness varies from 10 to 30m. The formation consists of mainly clay and silt with some intercalations of gritty and ferruginous sandstones. It is exposed in the central portion of Udaipur valley. Tipam formation consists of sub-rounded, fine to medium grained, friable sandstone with intercalated clay. It is found in the majority of the valley portion.

43. **Soil**: Soils can broadly be classified, from the point of view of agriculture, into two categories, viz. i) soils of high land and ii) soils of the low land. Soils ,[WHERE, IN HIGH OR LOW are acidic in nature, their pH varying from 4.84 to 5.85. The total soluble salts vary between 0.21% to 0.063%. The soils have high (about 0.75%) to medium (0.5%-0.7%) organic carbon content and medium (224.55 to 561.37kg per hectare) available nitrogen.

More than 50% of the soils are low (below 22.4 kg per hectare) in available phosphorus and 80% are low (below 112.3 kg per hectare) in available potash. Soil along the project corridor are predominantly deep, moderately well drained, fine loamy on gently sloping undulating plains with low mounds having loamy surface with moderate to high erosion hazard associated with deep to very deep, poorly to imperfectly drained fine loamy soils with slight erosion hazards on nearly level narrow valleys under paddy cultivation.

# 4. Natural Hazards

44. **Earthquake:** According to Seismic Zone Map of India prepared by Bureau of Indian Standard, Tripura lies in seismic Zone V which is very high damage risk zone.

45. **Flood:** Due to relatively high rainfall, the state faces recurrent flood during monsoon and flash floods in hill areas. Higher rainfall occurring during this period causes floods in low lying areas and erosion of river banks/land throughout most of the State. However, the project area road is not prone to flooding due to steep gradient. Submergence of the project road was not reported. However, in small sections constituting dips/sags, the road gets submerged in short lengths for a brief period. Between km 6.380 to km 6.460, the road pavement functions as causeway during heavy rains. Water-logging was reported during monsoon at Jamjhuri, Kamrangtali and Kakraban market area due to absence of side drains.

46. **Cyclone/Wind Storms:** Owing to its proximity to Bay of Bengal, the region is prone to high wind and cyclone. The design wind speed in the whole State is cyclonic, 55m/s (198km/h) which could occasionally be reached when cyclonic winds reach the state after crossing Bangladesh.

# 5. Climate

47. The state has a tropical climate and climate difference between summer and winter months are pronounced. December to February is the cold season which is followed by the summer from March to May. June to September is the period under influence of south-west monsoon when the weather normally remains sultry. October and November constitutes the post monsoon seasons.

48. **Temperature:** The highest temperatures recorded in the Agartala Observatory in the in the summer month of April and May range between 35°C and 37°C. In January, the coldest month of the year, the mean temperature of the state seldom goes down below 10°C. Monthly mean of daily average temperature is in the range of 18.7°C to 28.9°C, lowest in January and highest in June. The highest maximum temperature recorded at Agartala was 42.2°C on May 1, 1960 and the lowest minimum was 3.9°C on January 2, 1955.

49. **Rainfall:** The average annual rainfall in the state is 2,100.07 mm. However, in the project region, this figures to 2,432.8 mm. The rainfall generally increases from the south-west to the North-west. About 63% of the total annual precipitation is received between month of June and September. Rain fall of the project districts (erstwhile south and west Tripura districts) during last five years have been summarised in **Table 4**.

MONTHE	Rainfall in South Tripura District (in mm)				Rainfall in West Tripura District (in mm)					
MONTHS	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
January	0.0	28.8	0.0	0.0	0.9	0.0	40.8	0.0	0.0	1.2
February	70.2	4.0	4.0	28.0	3.4	39.4	21.1	3.2	7.9	1.7
March	12.5	37.3	8.4	56.1	40.0	20.8	56.1	2.0	98.1	55.5
April	154.3	7.5	119.6	36.0	48.7	339.6	24.0	46.1	134.8	50.3
Мау	127.5	267.5	421.6	295.1	328.2	285.0	215.3	284.2	377.1	409.9
June	625.5	380.0	306.9	500.9	399.4	631.1	234.8	281.1	455.8	407.8
July	967.5	527.8	673.2	240.5	268.8	694.9	352.5	499.5	160.4	228.1
August	353.7	379.6	345.9	217.5	392.5	214.4	302.4	379.4	195.1	341.9
September	571.1	159.5	163.5	164.9	249.4	265.9	152.7	214.2	224.1	169.7
October	309.7	288.0	261.1	323.7	70.4	239.9	198.1	113.6	279.3	63.7
November	78.3	0.0	10.1	0.1	0.0	104.8	0.0	39.1	5.3	0.3
December	0.0	0.0	0.0	14.4	0.0	0.0	0.1	0.0	34.3	0.1
Total	3270.3	2080	2314.3	1877.2	1801.7	2835.8	1597.9	1862.4	1972.2	1730.2

Table 4: Monthly Rainfall in the Project Districts during last five years (in mm)

Source: Indian Meteorological Department

50. **Humidity and Wind:** Humidity is generally high throughout the year. In summer the relative humidity is between 50 to 75 percent while during the monsoon months it is generally above 85%. Average of mean relative humidity is 73.8%. The mean wind speed is 7.1 km per hour, with maximum of 13.1 km per hour in May and minimum of 3 km per hour in December. Wind direction is south-easterly south during March to October. For remaining months, it is northerly. Wind generally calm during post monsoon and winter.

#### 6. Air Quality

51. In absence of air quality data of the project area available with State Pollution Control Board, the EIA report of "Combined Cycle Gas Turbine Thermal Power Project at Palatana village" was referred to establish the baseline air quality status. The ambient air quality levels **(Table 5)** with respect to suspended particulate matter (SPM), respirable particulate matter (RPM) and nitrogen oxides (NOx) range from 126-135  $\mu$ g/m3, 45-48  $\mu$ g/m3, 4.9-5.9  $\mu$ g/m3 and 13.7 to 16.7  $\mu$ g/m3 respectively in the project area. All values conform to the prescribed National Ambient Air Quality Standards.

Parameters Locations	Suspended Particulate Matter	Respirable Particulate Matter (PM10)	SO <sub>2</sub>	NOx			
Paltana	126	45	4.9	13.7			
Purbu Paltana	135	47	5.9	16.7			
Khilpara	142	48	5.4	14.5			
Dudhpuskarmi	130	45	5.0	13.9			
NAAQ Standard for industrial,		60	80	80			

Table 5: Ambient Air Quality in the Project Area

Source: EIA conducted for "1082.4 MW (3x360.8 MW) Combined Cycle Gas Turbine Thermal Power Project at Palatana village" by OTPC. All units are in µg/m3, SO2= Oxides of Sulphur, NOX=Oxides of Nitrogen

#### 7. Noise Level

52. There is no major noise generating sources in the project area other than vehicular traffic. Noise level at all monitored locations (during EIA of the above captive power project) confirms the prescribed limit to all corresponding landuse category viz. industrial, commercial and silence zone. **Table 6** provides the equivalent noise level (Leq) in dB (A) both during day and night time.

Noise Level	Day Time	Night Time
Locations	(6.00 am-9.00 pm)	(9.00 pm-6.00 am)
Jamjuri Market (Commercial)	50	45
Khilpara Market (Commercial)	45	43
Dudhpusparini (Commercial)	44	41
Magpuskarmi (Commercial)	47	40
Khilpara Village (Residential)	45	44
Dudhpusparini Village (Residential)	41	40
Purba Paltana (Residential)	47	45
Paltana Village (Residential)	43	39
Sur Sundari Siksha Kendra (Silence)	48	43
Paltana Primary Village (Silence)	49	52
Standard (Commercial	65	55
Standard (Residential Zone)	55	45

Table 6:	Noise Leve	l in the Pro	ject Area
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Source: EIA conducted for Combined Cycle Gas Turbine Thermal Power Project at Palatana village" by OTPC

#### 8. Waterways/Water Bodies

53. Project road is aligned parallel to River Gomati, the only perennial stream for considerable length. At some places it comes closer and crosses at Km 12.870. A 2-lane bridge is already constructed over it and wide enough to cater the projected traffic of 2-lane configuration. Besides, there are a number of nallahs/drains/canals being intersected by the project. Most of them are season. All waterways have been listed in **Appendix 2**. Project road is abutting large number of ponds. Most of them contain water during all seasons. These ponds are mainly used for domestic purpose other than drinking. Fishery is limited to household consumption. Very few ponds are being used for commercial fisheries. A list of all ponds with its usages has been appended as **Appendix 3**.

#### 9. Surface Water Quality

54. As per the state of the environment report, the river water samples monitored by SPCB shows TDS, TSS, Chloride, Fluoride, Sulphate, Calcium Magnesium, Sodium Arsenic, Cadmium, Copper, and Lead etc. to be all within permissible limit. Among organic pollutants, BOD remains within the limit; DO level show little higher value than permissible limit at some locations. However, all the river water samples appear highly polluted from bacteriological standard and coliform bacterial loads including faecal coliform exceed the tolerance limit. The pond water samples meet the prescribed limit except phenolic compounds and oil and grease exceeds tolerance limit at some locations. This is attributed to dumping of waste product. Total coliform and faecal coliform also exceeds the tolerance limit.

55. Results of surface water monitoring **(Table 7)** reported in the EIA of the Captive Power Plant of Palantana ascertains that Gomati river water samples conforms the Tolerance Limits for Inland Surface Waters (as per IS:2296) except Class A; drinking water source without conventional treatment due to high level of total coliform and faecal coliform.

SN	Parameter and Unit	Gomti	Gomti	Tolerance Limits				
		River	River	Class A	Class B	Class C	Class D	Class E
1.	Colour (Hazen Units)	BDL	5	10	300	300	-	-
2.	pH (max) (min:6.5)	7.0	7.28	8.5	8.5	8.5	8.5	8.5
3.	Conductivity (µmhos/cm)	140	200	-	-	-	1000	2250
4.	DO (mg/L)(min)	6.9	7.7	6	5	4	4	-
5.	BOD (3 days at 27°C) (mg/L)	0.400	1.6	2	3	3	-	-
6.	Coliforms (MPN/100 mL)	150	240	50	500	5000	-	-
7.	TDS (mg/L)	90	126	500	-	1500	-	2100
8.	Oil and Grease (mg/L)	BDL	BDL	-	-	0.1	0.1	-
9.	Mineral Oil (mg/L)	BDL	BDL	0.01	-	-	-	-
10.	Free CO2 (mg/L CO <sub>2</sub> )	BDL	BDL	-	-	-	6	-
11.	Free Ammonia (mg/L as N)	BDL	BDL	-	-	-	1.2	-
12.	Cyanide (mg/L as CN)	BDL	BDL	0.05	0.05	0.05	-	-
13.	Phenol (mg/L C <sub>6</sub> H <sub>5</sub> OH)	BDL	BDL	0.002	0.005	0.005	-	-
14.	Total Hardness as CaCO <sub>3</sub> )	40.2	56.1	300	-	-	-	-
15.	Chloride (mg/L as Cl)	15.5	24.0	250	-	600	-	600
16.	Sulphate (mg/L as SO <sub>4</sub> )	BDL	BDL	400	-	400	-	1000
17.	Nitrate (mg/L as NO <sub>3</sub> )	BDL	BDL	20	-	50	-	-
18.	Fluoride (mg/L as F)	BDL	BDL	1.5	1.5	1.5	-	-
19.	Calcium (mg/L as Ca)	8.0	15.2	80	-	-	-	-
20.	Magnesium (mg/L as Mg)	4.0	6.83	24.4	-	-	-	-
21.	Copper (mg/L as Cu)	BDL	BDL	1.5	-	1.5	-	-
22.	Iron (mg/L as Fe)	0.050	0.18	0.3	-	50	-	-
23.	Zinc (mg/L as Zn)	BDL	BDL	15	-	15	-	-
24.	Boron (mg/L as B)	BDL	BDL	-	-	-	-	2
25.	Barium (mg/L as Ba)	BDL	BDL	1	-	-	-	-
26.	Silver (mg/L as Ag)	BDL	BDL	0.05	-	-	-	-
27.	Arsenic (mg/L as As)	BDL	BDL	0.05	0.2	0.2	-	-
28.	Mercury (mg/L as Hg)	BDL	BDL	0.001	-	-	-	-
29.	Lead (mg/L as Pb)	BDL	BDL	0.1	-	0.1	-	-
30.	Cadmium (mg/L as Cd)	BDL	BDL	0.01	-	0.01	-	-
31.	Chromium (VI) (mg/L as Cr)	BDL	BDL	0.05	0.05	0.05	-	-
32.	Selenium (mg/L as Se)	BDL	BDL	0.01	-	0.05	-	-
33.	Sodium Absorption Ratio	nil	2.06	-	-	-	-	26

Table 7: Surface Water Quality and its Tolerance Limit as per IS: 2296

Class-A: Drinking water source without conventional treatment but after disinfection.

Class-B: Outdoor bathing.

Class-C: Drinking water source with conventional treatment followed by disinfection.

Class-D: Fish culture and wild life propagation.

Class-E: Irrigation, industrial cooling and controlled waste disposal.

#### 10. Groundwater

56. **Occurrence and Yield:** Ground water in the area is mostly used for domestic and irrigational purposes. As per the findings of Central Ground Water Board (CGWB), ground water occurs under unconfined condition in shallow depth in major part except in some small isolated zones. Depth to water level varies from 1.42 - 5.82 m bgl during pre-monsoon and 0.90 - 5.10 mbgl during post monsoon. The seasonal fluctuation of water level varies between 0.20 to 1.04 m. The discharge of the wells varies from 12 to151 m3/hr (3 to 42 lps) and the drawdown varies from 5 to 25 m.

57. **Groundwater Quality:** As per CGWB study, ground water quality in the area is potable and range of all the chemical constituents are within the permissible limit set by BIS (1991), except iron. Results of groundwater quality water monitoring **(Table 8)** reported in the EIA of the Captive Power Plant of Palantana establishes that groundwater of the project area meet the drinking water standard of IS: 10500-1991.

SI.No.	Parameter and Unit	GW-1	GW-2	GW-3	IS: 10	500-1991.
					Desirable Limit	Permissible Limit
1.	Colour (Hazen units)	BDL	BDL	BDL	5	25
2.	Turbidity (NTU)	BDL	2.0	BDL	5	10
3.	рН	6.79	7.69	7.07	5-8.5	No relaxation
4.	TDS (mg/L)	66.0	248	201	500	2000
5.	Mineral Oil (mg/L)	BDL	BDL	BDL	0.01	0.03
6.	Free Residual Chlorine (mg/L)	BDL	BDL	BDL	0.2	-
7.	Cyanide (mg/L as CN)	BDL	BDL	BDL	0.05	No relaxation
8.	Phenol (mg/L C <sub>6</sub> H₅OH)	BDL	BDL	BDL	0.001	0.002
9.	Total Hardness (mg/L as CaCO <sub>3</sub> )	20.3	109	76.7	300	600
10.	Total Alkalinity (mg/L as CaCO <sub>3</sub> )	34.0	166	111	200	600
11.	Chloride (mg/L as Cl)	16.0	94.0	51.5	250	1000
12.	Sulphate (mg/L as SO <sub>4</sub> )	BDL	BDL	BDL	200	400
13.	Nitrate (mg/L as NO <sub>3</sub> )	BDL	BDL	BDL	45	100
14.	Fluoride (mg/L as F)	BDL	BDL	BDL	1	1.5
15.	Calcium (mg/L as Ca)	4.8	19.2	13.1	75	200
16.	Magnesium (mg/L as Mg)	2.0	16.7	10.7	30	100
17.	Copper (mg/L as Cu)	BDL	BDL	BDL	0.05	1.5
18.	Iron (mg/L as Fe)	BDL	0.264	0.076	0.3	1
19.	Zinc (mg/L as Zn)	BDL	0.030	0.006	5	15
20.	Boron (mg/L as B)	BDL	0.050	0.014	1	5
21.	Aluminium (mg/L as AL)	BDL	BDL	BDL	0.03	0.2
22.	Arsenic (mg/L as As)	BDL	BDL	BDL	0.05	No relaxation
23.	Mercury (mg/L as Hg)	BDL	BDL	BDL	0.001	No relaxation
24.	Lead (mg/L as Pb)	BDL	BDL	BDL	0.05	No relaxation
25.	Cadmium (mg/L as Cd)	BDL	BDL	BDL	0.01	No relaxation
26.	Chromium (VI) (mg/L as Cr)	BDL	BDL	BDL	0.05	No relaxation
27.	Selenium (mg/L as Se)	BDL	0.030	0.014	0.01	No relaxation

Table 8: Groundwater Quality in the Project Area and Drinking Water Standards

Source: EIA conducted for "1082.4 MW (3x360.8 MW) Combined Cycle Gas Turbine Thermal Power Project at Palatana village" by OTPC. GW-1: Paltana Market, GW-2: North East of Palatana, GW-3: Dudhpushkarini

#### 11. Landuse/Land cover

58. As per state of environment report, the state of Tripura with 1.05 million hectare of land is dominated by forest cover/vegetation (58%) followed by agricultural land with 27% and rest is shared by cultivable wasteland, fallow land, habitation, water bodies and miscellaneous land use. Prominent landuse of the study area is also forest cover (24.24%) and vegetation (26.12%). Second largest landuse category is agriculture with 21.32%. Landuse map of the study area based on recent satellite imagery couple with ground



verifications has been illustrated in Fig 3.

# Fig 3: Landuse/Land Cover of the Study Area

#### B. Ecological Resources

59. The state is located in the bio-geographic zone of 9B-north-east hills and possesses an extremely rich bio-diversity. There are 379 species of trees, 320 shrubs, 581 herbs, 165-climbers, 16-climbing shrubs, 35 ferns, 4-epiphytes and 4 parasites. Rare plants of Tripura have been put to 18 numbers. There are 266 species of medicinal plants in the state.

60. The forests in Tripura are mainly tropical evergreen, semi-evergreen and moist deciduous. Substantial area is covered with bamboo. It had undergone retrogression through various anthropogenic activities resulting into brakes with tall grasses. The landscape generally presents a forest with occasional trees of deciduous nature and extensive brakes of degraded bamboos or further degenerated forest of tall unpalatable grasses. Total area

under forest cover is 59.98%, of which 34.20% is reserve forest (RF), 4.85% is proposed reserve forest (PRF) and 20.93% is unclassified Govt. Forest (UGF)

# 1. Ecologically Sensitive Areas

61. The state's protected area network is comprised of 2 national parks and four wildlife sanctuaries. None of them is located in either he vicinity of the project corridor or within 10 km radius. There is no other similar eco-sensitive/protected area.

# 2. Forest in the Project Area

62. Project corridor in following stretches, passes along/through the reserve forests. However, diversion of forest land or clearance of vegetation inside the forest area is not envisaged since the improvement work (limited to 12-14m) will be accommodated within the available ROW of 24-26 m. There is also one eco-park located adjacent to the road near Kakraban. No interface with this eco-park is envisaged due to project activities.

# (a) Chandrapur Reserve Forest

- (i) Km. 5.300 to Km. 6.115 (LHS)
- (ii) Km. 6.400 to Km. 6.865 (LHS),
- (iii) Km. 6.560 to Km. 6.890 (RHS) and
- (iv) Km. 7.240 to Km. 10.200 (intermittently on both Sides)

# (b) East Chandigarh Reserve Forest

- (i) Km. 18.800 to Km 18.850 (RHS) and
- (ii) Km 19.000 to Km 19.100 (RHS)

# 3. Flora/Vegetation

The road side plantation is mixed type and 63. natural regeneration. Some natural regeneration has however been supported by manmade plantation programs. Common species found along road are Rubber, Mango, Supari, Kathal, Khejur, Krishnachura Coconut, Sirish, Koroi, Kadam, BEL, Shagun, Devdaru etc. A total of 1,852 trees were enumerated within ROW by the Design and Project Management Consultant. However, actual felling of trees will be restricted to formation width. This figure is likely to be reduced significantly since tree cutting



will be limited to formation width. Further, geometric realignment will made to minimise tree cutting. As per consultation held with forest range offices, no rare or endangered species are present along roadside. This was also ascertained by rapid bio-diversity assessment. Transect analysis was done to determine for vegetation density and tree species along the project road. Summary of the transect analysis is presented in **Table 9**.

Transects	Geographic Location	Specific location	No. of Tree Species	Important Species				
1	N 23 <sup>0</sup> 31' 48.6" E 91 <sup>0</sup> 29'09.3" El. 31 m	Near Ramesh H/S School	>20	Khejur ( <u>Phoenix sylvatica</u> ), Krishnachura ( <u>Samanea</u> <u>saman</u> ), Kadam ( <u>Anthocephallus cinensis</u> ), Bot ( <u>Ficus</u> <u>religiosa)</u> , and Aam ( <u>Magnifera</u> i <u>ndica</u>				
2	N 23 <sup>0</sup> 31' 38.5" E 91 <sup>0</sup> 28' 52.6"	Rajdarnagar	>15	Aam, Krishnachura, Chaitani ( <u>Alstonia</u> <u>scholaris</u> ) etc.				
3	N 23 <sup>0</sup> 30' 40.4"	Near Jamjuri	>19	Koroi ( <u>Albizia procera</u> ), Aam, Kadam,				

#### Table 9: Summary of Transect analysis for Tree species

Transects	Geographic Location	Specific location	No. of Tree Species	Important Species
	E 91 <sup>0</sup> 27' 01.8" El. 31m	H/S Schoool		Jam ( <u>Syzygium</u> <u>cumini</u> ), Shagun ( <u>Tectona grendis</u> ) etc.
4	N 23 <sup>0</sup> 30' 21.5" E 91 <sup>0</sup> 26' 42.4" El. 30 m	Phul Sundhari Primary School	>30	Sal( <u>Shorea robusta</u> ), Kathal ( <u>Artocarpus</u> <u>heterophyllus</u> ), Lichu( <u>Litchi</u> <u>cinensis)</u> , kanak, Kadam, Aam, Supari etc.
5	N 23 <sup>0</sup> 29' 50.2" E 91 <sup>0</sup> 25' 48.9" El. 32m	Palatana	>40	Garjan ( <u>Dipterocarpus</u> <u>turbinatus</u> ), Bamboo ( <u>Bambusa balcooa</u> ), Devdaru ( <u>Polyalthia</u> l <u>ongifolia</u> ), Rangin, Acasmani ( <u>Acacia</u> <u>auriculiformis</u> ), champa, Khejur, Bot, Ortui, Rubber etc.
6	N 23 <sup>0</sup> 29' 58.9" E 91 <sup>0</sup> 24' 35.1"	Kakraban	>22	Supari, Aam, Rangin, Tula ( <u>Bombax</u> <u>ceiba)</u> , Khejur, Kathal, Kola etc.
7	N 23 <sup>0</sup> 29' 08.9" E 91 <sup>0</sup> 22' 37.1" El. 21m	Kamarangatali	>55	Supari, Tal, Sajna ( <u>Moringa</u> <u>oliefera</u> ), Khejur, Kola, Shagun, Rangi, Kesiar, Bamboo patch, Boroi, Bel, Bot etc.
8	N 23 <sup>0</sup> 29' 43.7" E 91 <sup>0</sup> 21' 24.1" El. 43m	Purva Chandigarh	>10	Kamaranga, Mehagun, Pawra bas, Bel, Jam, Acasmani etc.
9	N 23 <sup>°</sup> 29' 55.7" E 91 <sup>°</sup> 20' 55.8" El. 50m	Melagarh Junction	>18	Kanak, Jam, Aam, Akeshi, Kathal, Tal, Koroi, Narikel ( <u>Cocus</u> <u>nucifera</u> ), Borak Bas ( <u>Bambusa balcooa</u> ) etc.

Source: Primary survey

#### 4. Fauna

64. **Terrestrial:** According to latest estimates, there are 90 mammal species in Tripura from 65 genera and 10 orders. These make up for about 19, 48 & 100% of the total species, genera, and orders of the land-mammals record for India, respectively. Seven primate species have been documented in Tripura out of a total 15 found in India.

65. Ornithofauna comprises 342 reported species in the state, of which about 58 are migratory species one near threatened species – the darter. There is high diversity of birds of prey, frugivorous birds, marsh birds and flower peckers. The reptilian fauna of Tripura is composed of 32 species under 28 genera and 11 families. These include 3 species of turtles and tortoise, 13 species of lizards, and 15 species of snakes. At least three species of reptiles are listed as endangered under Indian Wildlife (Protection) Act., 1972.

66. **Aquatic:** the aquatic ecosystem 14 (fourteen) species of fish have been recorded, of which 2 are endangered (<u>Anguilla bengalensis</u> and <u>Psuedeatroptus</u> <u>alterinoides</u>) and 12 vulnerable. Due to silting of river beds and filling up of wetlands, different species of marsh birds and fishes are on decline.

67. Project area is larley devoid of wildlife. Forest area close to the project road barely forms any habitat for wildlife. No wildlife movement was either reported or observed during site visit. As per consultation held with the forest officials, wildlife is limited to the deeper portion of the forest. Common wildlife species found are Python, Monkey, Wild Cat, Red Jungle Fowl, Wild Boar, and Indian.

#### C. Economic Development

68. The economy of Tripura is agrarian. More than 50 per cent of its population depends on agriculture for livelihood. Contribution of agriculture & allied activities to the Gross State Domestic Product (GSDP) is 23%. The economy of Tripura is characterized by high rate of poverty, low per-capita income (Rs.28806 against country's average of Rs. 33,283) low capital formation, in-adequate infrastructure facilities, geographical isolation and communication bottleneck, inadequate exploitation and use of forest and mineral resources, low progress in industrial field and high un-employment problem. Agriculture growth has remained much lower than the growth rates witnessed in the industrial and services sectors in the State. The average annual growth rate in real terms of Net State Domestic Product (NSDP) at 1999-2000 prices for 2007-08 (P) was 7.16 percent, which shows a down fall from earlier projections.

# 1. Agriculture, Forestry and Fisheries

69. **Agriculture:** Agriculture and allied activities is the mainstay of the people of Tripura and provides employment to about 64% of the population. There is a preponderance of food crop cultivation over cash crop cultivation in Tripura. At present about 62% of the net sown area is under food crop cultivation. Paddy is the principal crop, followed by oilseed, pulses, potato, and sugarcane. Tea and rubber are the important cash crops of the State. Tripura has been declared the second rubber capital of India. The state is the highest producer of true potato seeds in the world. The state is self sufficient in coconut production. It has immense potential for horticulture development. Fruits like pineapple, orange, jackfruit, and banana are traditionally grown in the state. Cashew and lichis are also produced.

70. **Forestry:** Forest is an integral part of the culture and tradition of Tripura. Forestry sector provides important supplementary income and inputs in daily lives of tribal people residing in forested areas. 91.52% of total household depend on fuel wood in Tripura; which stands much higher than national average of 61.50%. Tripura is the second largest producer of rubber in India and rubber produced is of superior quality.

71. **Fisheries**: The state has made remarkable progress in fishery sector with limited resources and now, stands on the leading position in North Eastern Region. Considering the increasing demand for fish in the state, government has been giving emphasis to increase the productivity from the existing water areas. Till 2007-08 Fish Farmers Development Agencies (FFDA) have brought 6920.96 hectares water area under scientific fish culture.

# 2. Industries and Mineral Resources

72. **Industries:** The industrialisation in the State is yet to take off and industry sector is not able to open employment opportunities despite State Government's effort for comprehensive base for industrialization. There are 7 industrial estates, 2 large and medium industrial units, and 2,066 small scale units in the state. Industrial growth has been low mainly due to lack of infrastructure (roads, road transport and power) and being land locked. The handloom industry is an important sector in providing large-scale employment in Tripura. State government is focussing on development of Tea, Natural Gas and IT industries. There is no major industry along the project road except one small pipe and chemicals industry.

73. **Minerals:** The state is endowed with a number of mineral resources. Besides oil and gas, the state has good reserves of clay and silica sand. The total oil and gas wealth of state is 588 thousand tones whereas that of clay and quartz silica sand is 0.3 and 0.2 thousand tonnes respectively.

# 3. Infrastructure Facility

74. **Transport:** Road transport is not only dependable means of transport and lifeline of the state through its hostile-hilly terrain. The National Highway (NH-44) is the only link road with rest of the country which is passing- through neighbouring states of Assam and Meghalaya. Road network of Tripura stands at 16169 km Out of the total road length of 16,169 km, there are 4,534 km of black topped road, 2,990 km brick soled road and remaining 8,645 km roads are earthen

75. Tripura still remained backward in terms of railway connectivity and total railway link is 153 km. In 2008-09, the rail connectivity has been extended to the capital city of Agartala through the metre gauge connecting it to Badarpur and Lamding of Assam by same metre-gauge. The work for further extension of railway line from Agartala to Sabroom.

76. So far as civil aviation is concerned, the people of the state are dependent especially on the flights operating between Agartala-Kolkata and Agartala-Guwahati. Besides, in recent year's air connectivity with other sectors of the country have also been improved from Agartala to Delhi and Chennai. The runway at Agartala Airport has been extended to 7,500 feet. Helicopter service was introduced in October, 2002 to connect some remote areas.

77. **Power:** The State has two sources of generation of electricity namely, hydro and thermal. The State is endowed with natural gas, which enhances potentially for thermal power generation. Out of the two major sources of power generation, thermal power accounts for 94% while remaining 6% is generated from hydel power. Present peak demand of the State is around 400 MW. After commissioning of mega gas power project at paltana and other ongoing hydel and thermal projects, there will be surplus power in the state.

78. **Irrigation:** Tripura has a total cultivable land of 2,80,000 ha and irrigation potential of 1,17,000 ha. Out of the available water resources 79,000 hectares can be brought under assured irrigation through surface water and 38,000 hectares through ground water.

79. **Water Supply and Sanitation:** State and centre has given high priority in improving water supply and sanitation in both rural and urban areas. Presently, in 40 Blocks under 8 District of Tripura, daily drinking water is being supplied through 933 Deep Tube Well Schemes, 837 Small Bore Tube Wells, 8 Surface Water Treatment Plants, 312 Iron Removal Plants, 73 Over Head Tanks and Spot Sources. As on 01.04.2010, 547206 nos individual house hold toilets, 4550 nos school toilets, 5232 nos Balwadi toilets, and 162 nos sanitary complex have been constructed under different sanitation program.

#### D. Social and Cultural Resources

80. **Demography:** As per details from Census 2011, total population of Tripura is 3,671,032 of which male and female are 1,871,867 and 1,799,165 respectively. In 2001, total population was 3,199,203 in which males were 1,642,225 while females were 1,556,978. The total population growth in this decade was 14.75% while in previous% it was 15.74%. The population of Tripura forms 0.30 % of India in 2011. In 2001, the figure was 0.31 percent. Literacy rate in Tripura has seen upward trend and is 87.75% as per 2011 population census. Of that, male literacy stands at 92.18 % while female literacy is at 83.15%. In 2001, literacy rate in Tripura stood at 73.19% of which male and female were 82.42% and 64.33% literate respectively. As per the Census 2011, project districts have following facts **(Table 10)** on demography Vis-a Vis state and the country.

Description	India	Tripura	South District	West Tripura
Population	1,21,01,93,422	3,671,032	875,144	1,724,619
Male	62,37,24,248	1,871,867	447,124	877,930
Female	58,64,69,174	1,799,165	428,020	846,689
Population Growth	17.64	14.75%	14.03%	12.5%
Sex Ratio	940	961	957	964
Density/km2	382	350	286	576
Literacy	74.04%	87.75 %	85.41%	88.91%
Male Literacy	82.14	92.18 %	90.94%	92.91%
Female Literacy	65.46	83.15 %	79.64%	84.76%

 Table 10: Demography of the Project Districts, State and Country

Source: Census of India, 2011

Note: At the time of Census, newly formed project districts (Sepahijala and Gomati) were part of South and West Tripura District

81. **Educational Facilities**: Tripura has made a comprehensive progress in the field of education since launching of first five-year-plan. It can be evident from the Census- 2011 data that overall literacy rate in the State is 87.75 % against the similar proportion for all India 74.04%. For school education facility, there 2378- Junior Basic Schools, 1139-Senior Basic Schools, 459-High Schools and 311-Higher Secondary Schools in the state. For education, the State has one Central University and one private ICFAI-University, 15-General Degree Colleges, 1- Institute of Advanced Studies in Education, 2- Engineering Colleges, 1- Women's Polytechnic, 1- Government Law College, 1- Govt. Music College, and 1- Art & Craft College,

82. **Health Facilities:** There were 19-Hospitals, 11- Rural Hospitals and Community Health Centres, 77- Primary Health Centres, 579- Sub-Centres/Dispensaries, 6- Blood Banks and 7-Blood Storage centres in allopathic branch during 2008-09 through which the State Government has been providing basic health facilities to all section of the society. The State Government Medical College has been started from August 2006, which is the first medical college in the State, and named as Agartala Government Medical College (AGMC). Total no of beds in the hospitals is 2894.

83. **Occupational Pattern:** The occupational structure in the South Tripura District shows that about 12.6% are cultivators, 8-9% is agricultural labourers and 1.61% is dependent on trade and commerce. The non-working population is about 68% which is an indication of the weak economic base and under-development. About 72% of the rural populations are living below poverty line.

84. **Tourism:** Tourism based on wildlife, forest and Hindu / Buddhist religious places have good potential in the state. Presently promotion of tourists has been affected by inadequate infrastructure. The development of tourism related infrastructure facilities are essential and prerequisite for promotion of tourism in the state. Important tourist destinations in the project districts are Bhubaneswari Temple, Tripureswari Temple (Matabari), Trishna Wildlife Sanctuary in Gomati district and 14-Gods Temple, Ujjayanta Palace, Brahmakunda, Kamalasagar and Sepahijala Wildlife Sanctuary in Sepahijala district.

#### IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND ITS MITIGATION MEASURES

85. Road improvement projects are likely to bring several changes in the local environment both beneficial and adverse. This section of IEE identifies nature, extent and magnitude of all such likely changes vis-a-vis project activities for all stage of project cycle i.e. pre-construction, construction and operation. Beneficial impacts are mostly long-term and permanent whereas adverse impacts are localized and temporary in nature and are likely to occur mostly during construction stage.

# A. Beneficial Impacts

86. The immediate benefits of road construction and improvement will come in the form of direct employment opportunities during construction for the roadside communities and specially those who are engaged as wage labourers, petty contractors and suppliers of raw materials.

87. During operation stage, road-side economic activities supporting transport like gasoline stations, automotive repair shops, lodging, and restaurants will increase due to increased number of vehicles. Increase in agro-industrial activities are also expected to take advantage of improved access to urban centres where there are higher demands and better prices for agricultural products. Since the project road provides strategic linkage to international border of Bangladesh, trade between two countries be promoted. Other benefits of road improvement projects are: (i) reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, educational and other infrastructural facilities (iv) enhanced tourism activities in the area and state which in many terms will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

# B. Adverse Impacts

88. Project improvement components are relatively of lesser magnitude involving 3-4m additional formation width for expansion. Reconstruction of inclusion of any major civil structure is also not need. Due to small length and comparatively low embankment height, borrowing of earth is not huge. No new quarry is proposed. All aggregates will be procured from existing licensed quarries. No interface with any sensitive ecological resource is involved. Cutting of trees is limited to narrow strip of 3-4m. Change in landuse is minor since widening will be mostly accommodated within available ROW. No alteration in surface water hydrology is expected. All other impacts are temporary and localised in nature limited to construction period. The most significant impact identified during site visit is water quality deterioration of large number of ponds abutting the project road. Following subsections describes anticipated impacts and its mitigation measures on all aspects of physical, ecological and socio-cultural environment during construction and operation stage of the projects.

# C. Pre-construction Impacts

89. Project road is not located in any eco-sensitive areas. No interface with intermittent forest patches along the project road is envisaged. There is no major bottleneck along the project road requiring realignment/bypasses except at Kakraban market area. Proposed widening will follow the existing alignment. As a result, no acquisition of any agricultural land is required. Impact on private and community structure is also insignificant. Road design has considered all major preconstruction impacts and taken avoidance measures at an early stage of planning.

- (i) **Alignment**: Final alignment has been determined to avoid/minimise land acquisition, impact on structures, archaeological/cultural sites, shifting of existing utilities etc.
- (ii) **Water bodies:** widening on other sides. If technically not feasible toe walls/retaining walls have been proposed. Aggregate will be procured from existing licensed quarries.
- (iii) **Tree cutting:** Proposed to restrict tree cutting to formation width. To the extent possible, road has been aligned on other side of dense vegetation/mature trees.
- (iv) **Construction material sourcing:** Borrow areas have been identified at non agricultural land. Quarrying is not proposed.
- (v) **Dust and air pollution:** Borrow sites, waste disposal sites and asphalt mixing sites have been sited away from habitated areas.
- (vi) Noise Pollution: Time regulation near sensitive receptors and residential areas. No crusher operation near these locations. Noise barriers have been proposed near
- (vii) **Soil erosion, cut, and fill:** The design attempted to equalise cut and fill. Adequate erosion control measures included in design.
- (viii) **Construction camp and waste disposal:** No such facility is sited near any water bodies, forest area and settlements.

# D. Construction Stage Impacts

# 1. Natural Hazard

90. The project area is located in seismic zone V which is very high damage risk zone. This may cause failure of civil structures in the event of earthquake if design consideration related to seismicity is not taken into consideration.

# Mitigation Measures

91. Relevant IS codes shall be adopted while designing the civil structures to sustain the earthquake of highest magnitude in Seismic zone V.

# 2. Climate and Air Quality

92. Negligible impact is anticipated due to relatively small number of cutting of trees, estimated at 1,852. The potential sources of air emission during the construction phase of the project are: (i) dust from earth works (during site preparation), (ii) emissions from the operation of equipment, machines and vehicles for construction, (iii) fugitive emissions during the transport of construction materials, (v) air emissions other than dust arise from combustion of hydrocarbons particularly from the hot mix plants and process of heating bitumen and (vi) traffic congestion in construction areas. Most of the emissions will be in the form of coarse particulate matter which will settle down in close vicinity of construction site.

93. The stone aggregate will be sourced from licensed quarries. No new quarries shall be open for the project. The pollution related aspects to these quarries are independently complied by the quarry owners. The aggregate will be transported in the tarpaulin covered trucks.

# Mitigation Measures

- (i) Vehicles delivering loose and fine materials shall be covered.
- (ii) Loading and unloading of construction materials in covered area or provisions of water fogging around these locations.
- (iii) Storage areas should be located downwind of the habitation area.
- (iv) Water shall be sprayed on earthworks periodically
- (v) Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory.
- (vi) Hot mix plants should be located at least 1.5 km from the nearest habitation, school, hospital, archaeological site, forest, rivers, streams and lakes, 500 m from ponds, and national highway, 250 m from state highway, unless otherwise required by statutory requirements after securing a No-Objection Certificate (NOC) from the SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.
- (vii) Bitumen emulsion and bitumen heaters should be used to extent feasible.
- (viii) Only crushers licensed by PCB shall be used.
- (ix) LPG should be used as fuel source in construction camps instead of wood.
- (x) Regular water sprinkling of unpaved haulage roads3.
- (xi) Mask and other PPE shall be provided to the construction workers
- (xii) Diesel Generating (DG) sets shall be fitted with adequate height as per regulations (Height of stack = height of the building + 0.2  $\sqrt{\text{KVA}}$ . Low sulphur diesel shall be used in DG sets as well as machineries.
- (xiii) Contractor should submit a dust suppression and control programme to the PWD prior to construction.

# 3. Noise

94. Noise level may increase temporarily in the close vicinity of construction activities, maintenance workshops and earth work site. These construction activities are expected to produce noise levels in the range of  $80 - 95 \, dB(A)$  (at a distance of about 5 m from the source). Although this level of noise is higher the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporary. This noise level will attenuate fast with increase in distance from noise source. However, there is a number of noise sensitive locations (Appendix 4) especially schools close to the alignment. Some of them, where noise barriers need to be installed are listed in Table 11. Typical design for noise barrier is provided in Appendix 5.

SI. No.	Name of School/	Chainage (km)	Noise Barrier (m)	Village
1.	NSS Khilpara H. S. School	1.490-1.570	70	Khilpara
2.	Madrasa School	2.850-2.807	50	Khilpara
3.	Phul Sunduri Primary School	5.660-5.700	40	Jhamjuri
4.	Aganwadi Baloari School	19.180-19.200	20	Chandigarh
Total No	oise Barrier (meter)	180		

Table 11: List of Sensitiv	e Receptors F	Requiring Noise	Barriers

## Mitigation Measures

- (i) All equipment shall be timely serviced and properly maintained to minimize its operational noise. Noise level will be one of the considerations in equipment selection which will favour lower sound power levels. Construction equipment and machinery shall be fitted with silencers and maintained properly.
- (ii) Stationary noise making equipments shall be placed along un-inhabited stretches.

<sup>&</sup>lt;sup>3</sup> Water suppression of fugitive dust can reduce emissions from 12% 98%

- (iii) Timing of noisy construction activities shall be regulated near sensitive receptors. Maximum construction activities shall be undertaken during night time and weekends when there are minimal activities by the sensitive receptor, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards.
- (iv) If the above mentioned schemes prove to be inadequate, the provision of temporary noise barrier shall be made near identified sensitive locations or near the noise source during construction.
- (v) Protection devices (ear plugs or ear muffs) shall be provided to the workers operating in the vicinity of high noise generating machines.
- (vi) Noise measurements should be carried out to ensure the effectiveness of mitigation measures.
- (vii) Develop a mechanism to record and respond to complaints on noise

# 4. Impact on Land and Soil

95. **Topography and aesthetics:** Activities like (i) clearing of vegetation (ii) excavation of borrow areas (iii) waste/debris disposal, and (iv) establishment of labour camps may change the topography and appearance of the landscape.

# Mitigation Measures

- (i) Cut materials should be used to widen the road or disposed off in environmentally acceptable manner.
- (ii) Cut slopes should be re-vegetated immediately after widening activities
- (iii) Borrow areas should be rehabilitated and brought back as far as possible to their previous appearance. Some borrows shall be converted into ponds to compensate loss of water bodies. This will also enhance the local aesthetics
- (iv) Cut off material should be used to widen the road or disposed of at proper disposal sites
- (v) Provision and allocation of proper waste disposal bins and sites are required. a supply of cooking gas should be provided by the contractor to eliminate the use of fire wood.

96. Loss of Productive Soil and Change in Land use: Road widening and improvement is limited to available ROW and no encroachment on agricultural land is expected. Hence, agricultural yield of the area is not likely to be affected. Major change in landuse of the area is also unlikely. Following set of mitigative measures are recommended in case there is last minute requirement of agricultural land emerged for some allied activities like borrows areas, construction camp, storage areas etc.

## Mitigation Measures

- (vi) The top soil from the productive land if required shall be preserved and reused for plantation purposes. It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion.
- (vii) It shall be ensured that the land taken on lease for access road, borrow areas, construction camp is restored back to its original land use.

97. **Soil Erosion/Silt Runoff:** Soil erosion may take place near cutting areas, at steep and uncompacted embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect viz. siltation, embankment damage, drainage problem etc. Loss of soil due to run off from earth stock-piles may also lead to siltation.

#### Mitigation Measures

- (i) Bank protection measures shall be taken at erosion prone areas.
- (ii) Provision of side drain to guide the water to natural outfalls.
- (iii) In view of large no. ponds along the alignment, it is proposed to provide toe walls for protection of the embankment passing by the side of such ponds. Stone pitching shall be done wherever necessary.
- (iv) When soil is spread on slopes for permanent disposal, it shall be buttressed at the toe by retaining walls.
- (v) Side slopes of the embankment shall not be steeper than 2H: 1V. Turfing of embankment slopes shall be done along the stretch.
- (vi) Retaining wall on both sides shall be provided. Shrubs shall be planted in loose soil area.
- (vii) IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration.

98. **Borrow Areas and Quarries:** Borrow areas if left un-rehabilitated may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution. Opening of new quarries is not envisaged due to the proposed project. Quarry material will be sourced from existing licensed quarries. The dredging and use of dredged material, if involved, may have its impact in terms of localised sedimentation level increase and dispersion of pollutants present in the dredged material in the river water.

#### Mitigation Measures

- (i) Borrow areas shall not be located near forest areas. The edges of borrow sites shall be no closer than 3 metres from any fence line or boundary. Adequate clearance shall be provided for the construction of catch drains. Borrow sites shall have adequate drainage outlets unless the relevant landowner has agreed that the borrow area is to create a permanent tank or dam. Cut batter slopes shall not be steeper than 3 to 1 and shall be left by the Contractor in a tidy and safe condition to the satisfaction of the Engineer. Written clearance from the land owner/village head shall be obtained before leaving a site
- (ii) Obtain statutory approval from competent authority as detailed in chapter II (recent policy initiatives on mining of minor mineral)
- (iii) Borrow pits shall be selected from barren land/wasteland to the extent possible. Borrow areas should not be located on cultivable lands except in the situations where land owners desires to level the land. The top soil shall be preserved and depth shall be restricted to the desired level.
- (iv) Borrow areas should be excavated as per the intended end use by the owner. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.
- (v) The dredged material from the river bank shall be tested for presence of heavy metals and other pollutants before its reuse.
- (vi) The depths in borrow pits to be regulated so that the sides shall not be steeper than 25%, To the extent possible, borrow areas shall be sited away from habitated areas. Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil.
- (vii) Monitoring of rehabilitation plan of borrow areas.

99. **Compaction and Contamination of Soil**: Soil of the haulage roads and construction camp area may be compacted due to movement of construction vehicles, machineries and equipments, and due to sitting of construction camps and workshops. Soil may get contaminated due to inappropriate disposal of liquid waste, (lubricating oil and fuel spills, waste oil and lubricant and vehicle/equipment washing effluent) and solid waste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment and machinery.

100. Soil may also get contaminated due to inappropriate disposal of domestic solid waste and sewage from construction camps. Sub soil contamination may also be attributed to: scarified bitumen wastes, operation of the emulsion sprayer and laying of hot mix, storage and stock yards of bitumen and emulsion, excess production of hot mix and rejected materials

# Mitigation Measures

- (i) Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils.
- (ii) All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.
- (iii) Movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route.
- (iv) Approach roads shall be designed along the barren and hard soil area to reduce the compaction induced impact on soil.
- (v) The productive land shall be reclaimed after construction activity.
- (vi) Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp.
- (vii) Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. Non biodegradable and non saleable waste shall be disposed off to authorised land fill site. If land fill site not available then burial of the waste in a secured manner shall be ensured.

# 5. Surface Water Resources

101. **Loss of Water Bodies**: There are numerous private ponds along the project road. Some of them are within the right of way very close to the alignment. Earth filling may be required in some cases but limited to a narrow strip of 1-1.5 m. This will cause reduction in volumetric capacity of these ponds. However, overall impact will not be significant since the project area is endowed with abundant surface water resources. Moreover, the usage of these ponds is limited to washing/cattle bathing and fishing. No other aquaculture was observed other than fishing of some indigenous variety mostly for domestic consumption and restricting mosquito breeding.

## Mitigation Measure

- (i) Alignment may be suitably modified to avoid encroachment of water bodies wherever possible
- (ii) Efforts shall be made to increase its volumetric capacity either by increasing depth or area wherever feasible.

(iii) Borrow areas shall be converted into ponds at least at least equivalent to filling.

102. **Siltation and Deterioration in Surface Water Quality**: Siltation and water quality deterioration of River Gomati, the only perennial stream, is not envisaged since no new bridge construction is proposed on it. The temporary pollution of water bodies from spillage of chemicals and oil at construction sites and waste from construction camps may occur. Soil erosion has direct bearing on siltation. The siltation impact and its mitigations have already been addressed above in soil erosion section. Accidental oil and chemicals spills can contaminate the ponds close to alignment.

# Mitigation Measure

- (i) Required mitigation to prevent siltation as suggested in soil erosion section shall be taken into consideration.
- (ii) Construction works near waterways/water bodies shall not be undertaken during the monsoon season
- (iii) Toe walls and stone pitching has been proposed on embankment slopes where ponds are abutting to avoid seepage into sub grade and erosion of road embankment.
- (iv) Construction near ponds will be initiated after fencing with drum sheets/other silt fencing measures.
- (v) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (vi) No construction camp within 500m of any water body
- (vii) Locate all parking, repair and fuel and hazardous material storage area away from any water body. Vehicle parking & maintenance areas shall have waterproof floors from which drainage is collected and treated to legal standards.
- (viii) Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge
- (ix) Collect all waste oil, store in sealed damage-proof containers and dispose it to recyclers.
- (x) All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual cleanup.
- (xi) temporary retention ponds, interception drains, and silt traps are installed to prevent silt laden water from entering adjacent water bodies;
- (xii) The slopes of embankments leading to water bodies should be modified and rechannelised to prevent entry of contaminants.

103. **Alteration of Surface Water Hydrology/Drainage:** Diversion of water channels during construction is not envisaged. Hence, no specific mitigation proposed.

104. **Groundwater:** Water for construction purpose will be sourced through a combination of surface and groundwater. Groundwater will be used for drinking and domestic purpose. Groundwater resources are not scarce in the project area. The area is not classified as critical semi-critical or overexploited by CGWB. However, uncontrolled abstraction can deteriorate the situation. Contamination of groundwater is not envisaged since all construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp.

## Mitigation Measures

- (i) Requisite permission shall be obtained for abstraction of groundwater.
- (ii) The contractor shall make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.

# 6. Impact due to Construction Debris/Waste

105. Debris can be generated by dismantling of pavement, though involved only for few kilometres as realignment is envisaged for major sections. Quarry dust and unused iron bars or damaged support structures constitute significant wastes. Mitigation for solid waste from construction camp has been given in construction camp section.

# Mitigation measures

- (i) The existing bitumen surface can be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, haulage routes etc.
- (ii) All excavated materials from roadway, shoulders, verges, drains, cross drainage and the like will be the property of the EA and will be used for backfilling embankments, filling pits, and landscaping.
- (iii) Unusable debris material should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner.
- (iv) Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.

The locations of dumping sites should be selected with following considerations.

- (v) Unproductive/wastelands shall be selected for dumping sites.
- (vi) Away from residential areas and located at least 1.5 km from habitation and forest areas and 500 m from ponds.
- (vii) Dumping sites do not contaminate any water sources, rivers etc, and
- (viii) Public perception and consent from the village Panchayats about the location of debris disposal site has to be obtained before finalizing the location.
- (ix) Form works will be re-used to the extent possible, more than 20 times as dictated by good practice. All stripped formworks will be examined for any damage and rectified in the workshop for reuse. Rectification includes plugging holes, and straightening bent steel props.

# 7. Ecological Resources

106. **Terrestrial:** There are no national parks, wildlife sanctuaries or any other similar ecosensitive areas in the project area. No Wildlife movement was reported/observed. Project road, intermittently passes along/through reserve forest area in some stretches. However, diversion of forest land is not required. Some trees are likely to be affected. The cutting of trees will have negligible impact on local environment. Moreover, this will be temporary since large number of trees have been planned to be planted on both sides of the road. This will improve the local climatic conditions in long term.

107. **Forest Fires:** Although the forest boundaries are located safely away from required formation width, risk of forest fire cannot be ruled out due to uncontrolled burning of grasses/shrubs for clearance of ROW and fuel accumulation due to accidental spillage.

## Mitigation Measures

- (i) Requisite permission from Forest Department shall be obtained for cutting of roadside trees. Compensatory plantation as per prevailing guidelines of State's forest department on 1:3 basis. Besides, additional plantation shall be done on areas exposed after site clearance. All tree plantations will be carried out in close consultation with forest department.
- (ii) For safe traffic operation, vertical clearance between the crown of the carriageway and lowest part of overhang of the tree available across the roadway shall conform to the standards laid down in IRC: SP: 21-2009. The pit size, fencing, watering, and manuring requirements shall also conform to the above standard. Excess use of pesticides shall be restricted.
- (iii) Immediate removal of fuel spills near forest areas;
- (iv) Clearance of vegetation shall not be done by burning along forested/thickly vegetated areas.
- (v) Planting and management of fire-resistant species adjacent to and within ROW.
- (vi) Provision of fire lines to avoid further spread over of fire.

108. **Aquatic Ecology:** Fishing in the ponds located along the project road was observed. Temporary sedimentation and water quality deterioration is expected from the project during the construction stage. Improvement of existing embankments particularly along the water bodies may increase silt while accidental spill of materials, chemicals, and fuels will deteriorate receiving water quality.

# Mitigation Measures

109. Siltation shall be avoided by measures suggested above in impact on surface water resource section.

110. **Impacts due to Construction Camp and Immigration of Workers:** Poor sitting and improper management of construction camp may lead to several adverse impacts on environment viz. (i) loss of vegetation due to use of wood as fuel source for cooking (ii) deterioration in nearby surface water bodies' quality (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste (iv)Poor sanitation may result to transmission of communicable diseases among the workers and the host communities. This include the possible spread of sexually transmitted disease, diseases from improper handling and supply of foodstuffs, poor water supply, insect-borne diseases, and alcoholic and drug.

## Mitigation measures

- (i) No productive land should be utilised for construction camp. All sites must be graded, ditched and rendered free from depressions to avoid water stagnation. Accommodation and ancillary facilities including recreational facility for workers shall be erected and maintained to standards and scales approved by the resident engineer. All camps should maintain minimum distance of 500 m from habitation and water bodies.
- (ii) All construction camps shall be provided sanitary toilet with provision of septic tanks attached with soak pits. Storm water drains shall be provided for the flow of used water outside the camp. Drains and ditches shall be treated with bleaching powder on a regular basis. Garbage bins must be provided in the camp and regularly emptied and disposed off in a hygienic manner. LPG cylinders shall be provided as fuel source for cooking to avoid any tree cutting.
- (iii) At every workplace, the Contactor will ensure that a readily available first-aid unit. Workplaces away from regular hospitals shall have indoor health units. Suitable

transport shall be provided to approach the nearest hospital. At every workplace an ambulance containing the prescribed equipment and nursing staff shall be provided.

- (iv) The Contractor will ensure the good health and hygiene of all workers to prevent sickness and epidemics. These include the HIV/AIDS prevention program to reduce the risk and transfer of HIV virus. Activities under the program include monthly information, education, and communication campaigns to workers, drivers, delivery crew, and communities on the risk.
- (v) The Contractor will provide adequate and safe water supply for the use of the workers. The Contractor will ensure that all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations. No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community.
- (vi) Migrant workers may be the potential carriers of various diseases. Local community may get exposed to the diseases carried by migrant workers. Regular health checkup and immunization camps shall also be organized for the workers and nearby population.

111. **Safety of Construction Workers and Accident Risk to Local Community:** The following safety aspects viz. (i) safety of construction workers, (ii) safety of road users including pedestrians and cyclists (iii) safety to cattle; (iv) safety of local community (iv) unsafe/ hazardous traffic conditions due to construction vehicle movement need to be considered during design and construction stage and (v) conduct of safety audit.

## Mitigation measures

- (i) During the construction phase, contractors shall be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during (i) road works (ii) handling of large construction equipment and machineries, (iii) handling of chemicals and hazardous materials and inflammable substances (iii) welding (iv) electrical works etc.
- (ii) Contractor shall arrange all PPEs for workers, first aid and fire fighting equipments at construction sites. An emergency plan shall be prepared duly approved by engineer in charge to respond to any instance of safety hazard.
- (iii) To avoid disruption of the existing traffic due to construction activities, comprehensive traffic management plan shall be drawn up by the concessionaire. Traffic in construction zones shall be managed as per the provisions of IRC SP 55.
- (iv) After construction is completed in a particular zone, it shall be opened for normal operation. All diversions/access roads should be closed before start of normal operation.
- (v) Use of retro-reflectorized traffic signs, and cantilever/gantry types overhead signs, thermoplastic road marking paints, delineators, traffic cones, empty bitumen drums, barricades, and flagmen will be used to ensure traffic management and safety. Conduct of regular safety audit on safety measures adopted during construction. The audit will cover manpower and their safety, machinery, temporary works, equipment and vehicles, materials storage and handling, construction procedures, environment, site safety guidelines, and miscellaneous services.

112. **Obstruction and Disruption of Traffic:** Disruption of access to infrastructure or social resource due to construction activity will cause nuisance and to a certain extent additional cost to the public in terms of longer travel period due to diversion or heavier traffic. It will also pose risk of accident to motorist at night if these blockages and disruption are not clearly demarcated.

## Mitigation Measures

- (i) The contractor will submit a Traffic Plan to the Project Engineer at least two weeks before the construction starts that will result to obstruction. This Plan will recommend for approval, the safe and convenient temporary diversion of traffic during construction, design of barricades, delineators, signs, markings, lights, and flagmen, among others.
- (ii) For widening of existing carriageway and part of it will be used for passage of traffic, paved shoulder will be provided on one side of the existing road by the contractor with the following minimum requirements:
- (iii) At least one 3.5 m lane to remain to traffic at all times
- (iv) The surface used by the through traffic will be firm bituminous compacted surface free of defect
- (v) The maximum continuous length over which construction under traffic may take place is limited to 750 meters.
- (vi) Construction activity will be restricted to only one side of the existing road.
- (vii) On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. These paved diversions will comply with standards on junctions and temporary cross drainage.
- (viii) Transportation of quarry material to the construction sites through heavy vehicles shall be done through existing major roads to the extent possible. This will restrict wear and tear to the village/minor roads. Small vehicles/unmotorised vehicle can also be used for its further transportation to the construction sites from temporary storage areas.

113. **Transports and Storage of Materials:** The construction material primarily will consist of aggregate, sand, cement, bitumen, lubricating oil and fuel for vehicle and construction equipments. These will be primarily stored temporarily at construction camps. The oils, fuels and chemicals will be stored on concreted platform with spills collection pits. The cement will be stored under cover. All these temporary storage areas will be located at least 150 M away from the habitat. The likely impacts due to transportation and storage including fugitive emission have already been covered under different section above.

114. **Impact on Land and Private Properties:** The assessment made in resettlement plan shall be referred for exact loss of private properties and measures to compensate such losses. Besides monetary compensation for any loss of private trees, compensatory afforestation and extensive plantation has been incorporated in the EMP to have long-term environmental benefits. Income restoration measures/livelihood options for vulnerable group/resource poor sections and other affected persons as recommended by social development/resettlement expert shall be implemented.

115. **Impact on Common Property Resources:** There are various types of community structures/ facilities/utilities along the proposed alignment. Geometric adjustments have been made to minimize the loss to any such facilities. Any such structures even falling within ROW but out of required formation width shall be saved. Alternate access has to be provided to these structures during construction stage. All community structures likely to be dismantled shall be suitably relocated. For exact extent of impact on these structures and mode of compensation, resettlement/land acquisition plan shall be referred

# E. Operation Stage Impacts

116. **Road Maintenance:** Lack of proper maintenance may deteriorate the road condition over the years resulting into numerous problems such as rise in accidents, disruption of

transportation services, tree survival. PWD/PIU must allocate adequate resources and logistics to ensure that the road is being maintained and intended benefits are generated thereof.

117. **Soil Erosion and its Cumulative Impacts:** The consequences of soil erosions are far wider than repair and maintenance of the road. Along the project road, the inflow of water into ponds during rains causes erosion of the embankment besides seepage of water into embankment and subgrade resulting in softening of the subgrade. This may also increase siltation in water bodies. Project design includes provisions of toe walls/retaining walls for the protection. Regular checks shall be made to ensure its effectiveness.

118. **Air Pollution:** Likely rise in traffic after road improvement may cause air and noise pollution in the vicinity of the project Vehicular emission will be the principle source of pollution during operation stage. The project road is located in thickly vegetated and open agricultural land which will provide adequate dispersion dynamics of gaseous pollutants. Vegetation acts as sink to air pollutants. Further, the improved road condition will facilitate free flow of traffic thereby reducing the emission level significantly.

119. **Noise Pollution**: Noise level is likely to increase due to increased traffic. Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch and speed limitation and honking restrictions may be enforced near sensitive locations. The effectiveness of noise mitigation should be monitored and if need be, solid noise barrier shall be placed.

120. **Water Pollution:** Accidental oil spillage, washing of vehicles, used engine oils can contaminate the nearby water bodies. Expansion joints and drainage spouts are choked due to silt and vegetation growth. In order to prevent water pollution; communities should not allow drivers washing their vehicles near the streams and ponds. Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions will be regularly conducted.

121. **Ribbon Development/Encroachment of ROW:** Increase in economic activities results in ribbon development along highways. This may cause congestion to road users and increase in accident. PWD shall explore options like avenue plantation and/or fencing and initiating regulatory provisions to stop encroachment of ROW.

# V. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

122. Meaningful consultations in consistent to SPS, 2009 was carried out during this IEE preparation. All the five principles of information dissemination, information solicitation, integration, co-ordination and engagement into dialogue were incorporated in the consultation process. A framework of different environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially in the micro level by setting up dialogues with the village people from whom information on site facts and prevailing conditions were collected. The requirement of public consultation during the implementation of the project has been proposed as part of the mitigation plan.

# A. Objectives of the Public Consultations

123. Public consultations were held early and throughout the project development stage to allow the incorporation of relevant views of the stakeholders in the final project design, mitigation measures, implementation issues, and enhance the distribution of benefits. Stakeholder's consultations were held with intent to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design and implementation. Informal meetings, interviews were organized covering the entire project design stage.

124. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project to which their opinions was sought particularly in identifying and mitigating any potential adverse impact.

# B. Project Stakeholders

- (i) Residents, shopkeepers and businesspeople who live and work along the project road specially the project affected persons
- (ii) All type of road users/commuters
- (iii) Executing Agency;
- Other government institutions whose remit includes areas or issues affected by the project (state environment and forest department, irrigation department, Public Health Engineering (PHED) department, fishery department
- (v) Non-government organizations (NGOs) and community-based organizations (CBOs)
- (vi) Other community representatives (prominent citizens, religious leaders, elders, women's groups); and
- (vii) The beneficiary community in general.

## C. Methodology

125. Key issues were identified in initial consultations during reconnaissance site visit with local people and government departments and framework for comprehensive consultations was designed. Detailed consultations based on freezed alignment and project improvement components were held in September-December, 2012. This IEE also includes the key findings of the consultations conducted by the preliminary design team during 2005-06 and by DPMC held during 2010

126. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires to obtain background information and details of general environmental issues that concern people in the project area. The official

consultation with the Stakeholders was carried out at respective offices in state capital and project district headquarters.

# D. Consultation with Government Departments

127. Besides, detailed discussions with officials of state Public Works Department officials (executing agency), all relevant government departments including forest and wildlife, fisheries, pollution control board, economics & statistics, tribal welfare etc. were consulted for collection of available information their views/ comments and suggestions about the project. The list of government officials contacted, along with purpose/objective has been summarised in **Table 12**.

SI.No.	Name of Official	Department	Issue discussed
1	Mr. Manas Mukherjee	Executive Engineer,	Availability of baseline data on environmental quality was discussed.
	Prof. Mihir Deb	Chairman	State of the environment report was obtained. Capacity assessment was
	Dr. M.K. Das	Scientist, (Tripura Pollution Control Board)	done for the likely involvement in the project for monitoring and other environmental management required for the project.
2	Mr. Ashok Kumar	Assistant Chief Conservator of Forest, Agartala	Information obtained about forest cover, Wildlife status of State,, flora
	Mr. C. M Deo Verma Mr. G.R. Paul Mr. Ratan Das	Chief Conservator of Forest DFO, Working Plan Division-I, ADFO, Udaipur	and fauna species. Availability of forest maps of the Area
3	Mr. Swapan Das	Deputy Direct, Directorate of Fisheries, Gomati District	Status of Fisheries activity, fish species Impact on fishes due to road
	Mr. Tikendrajit Jamtaya	District Fishery Officer, Gomati	construction activities. Mitigation options were also discussed.
4	Mr. N Sutradhar Mr. Amlesh Choudhary Mr. Vimal Namsudra Mr. Jitendra Das MR. R. K. Paul	Forest Range Officer (Kakraban) Forester, Kakraban Range Ex Forester Kakraban Range Forest Range Officer (Melaghar) Forester, Melaghar Range	Discussion held about spatial extent of forest areas along the project road, flora and fauna, predominant tree species, presence of any rare or endangered species of flora and wildlife movement
5	Mr. N.C.Debnath,	Senior Conservation Assistant, Archaeological Survey of India, Udaipur	Presence of Archaeological site along the Project road.
6	Mr. M.B.Beraia	Director, AgarGeological Survey of India, Agartala	Discussion about the Rocks and Mineral formation near the Project road
7	Mr. A.K. Chandra	Joint Director, Directorate of Economics & Statistics	Socio-economic conditions of the state
8	Mr. K.C. Das	Dy. Director, Directorate of Social Welfare	Social activities, active NGO's,
9	Drinking water & Sanitation Circle	Mr. Ashim Chakroborty Superintending Engineer Kunjaban, Agartala	Discussion about the water table and water quality along the region and Project road.
10	Mr. L. Darlang	Director, Tribal welfare directorate, Govt. of Tripura, Agartala	Welfare schemes for f tribal communities, Jhum Cultivation, Alternative rehabilitation program with Rubber Plantation

 Table 12: Summary of Consultation Held with Government Departments.

#### Ε. **Consultations with Local people/Beneficiaries**

128. The informal consultation generally started with explaining the subprojects, followed by an explanation to potential impacts. Participant's views were gathered with regard to all aspects of the environment which may have direct or indirect impact on local people. Issues discussed are:

- Awareness and extent of the project and development components; (i)
- (ii) Benefits of the project for the economic and social upliftment of community;
- (iii) Labour availability in the project area or requirement of outside labour involvement;
- (iv) Local disturbances due to project construction work;
- Necessity of tree felling etc. at project sites; (v)
- Impact on water bodies, water logging and drainage problem if any; (vi)
- Drinking water problem; (vii)
- (viii) Health issues
- Flora and fauna of the project area (ix)
- Socio-economic standing of the local people and (X)
- Willingness to contribute/co-operate (xi)

129. Summary of consultations held during different stages with affected persons, local communities, panchayat members, shop owners is given in Table13.

-	Table 13: Summary of Consultation with Local Community					
Date	Venue / Place	Participants				
Consu	Iltations Held during Prelimina	ry Design (October 2005)				
1	Udaipur, Melaghar, Jhamjuri,	Total – 14 participants				
	Kakraban and Melaghar	Local villagers, affected persons, shop owners, farmers,				
Consi	litations Held during Detailed F	ngineering (April-May, 2010)				
4	Shilahati Villaga	Denchavet members (2) and village community (9)				
	Venue: Gram Panchavat	Panchayat members (2) and village community (8).				
2	Jamjuri Village	Panchayat member (1) and village community (23).				
	Venue: Public Library,					
3	Khilpara Village	Panchayat member (1) and village community (18).				
	Venue: Gram Panchayat					
4	Purba Chandigarh	Panchayat members (2), P.W.D. official (1), village				
	Venue: Gram Panchayat	community (8).				
5	Mohanbhog Village	Panchayat members (2), village community (11) P.W.D				
	Venue: Gram Panchayat	official (1)				
6	Kakrabon Village	Panchayat members (6) and village community (19).				
	Venue: Community Hall					
Consu	Iltations Held during IEE Finali	zation (Sep and Dec, 2012)				
1	Kakraban Motor Stand	Shopkeeper (6), Farmer(2) Wage earner (3), Auto Drivers (2)				
2	Kakraban Market Area	Businessmen (10)				
3	Kamarangtali Market	Farmer (2), Businessmen (4), Teacher (1), Student (1)				
4	Mohanbhog Market Area	Panchayat Members (3), Farmers (2) Businessmen (5), Student(1)				

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#### F. **Outcome of Public Consultations**

130. Project received wide acceptance from local people with some apprehensions/concerns. They perceived that the project road improvement will definitely bring out positive socio-economic changes. They also made some demands and suggestions for maximum benefits to the local community and other road users. Results of the public consultations has been summarised in **Table 14**.

P	erceived Benefits		Concerns/	Demands and Suggestions			
			Apprehensions				
•	Reduction in travel	•	physical and	Adequate compensation at market value for			
	time and fuel due		economic	loss of land and other assets			
	to improved road		displacement	• Employment and petty contracts to local			
•	better access to	•	Compensation for	people in construction activities			
	educational,		pvt. and community	• Lines/concrete covered drains in market			
	medical facilities		properties	areas to prevent water particularly at			
	markets,;	•	Impact due to loss of	Kakraban, Jamjhuri and Kamarangatali.			
•	improvement in		trees	• Adequate safety measures especially near			
	road safety;	•	impact on places of	market areas and schools.			
•	more employment		worship	<ul> <li>Street Lighting near built-up areas</li> </ul>			
	opportunities	•	air and noise	Solid waste bins in market areas			
•	growth in import-		pollution during	• Provision of wayside amenities viz bus			
	export business		construction	shelter, urinals etc. near built-up areas.			
•	boost in tourism	•	impact on ponds	• Measures to avoid siltation and water			
	due to easy		close to road	pollution of nearby ponds			
	access to tourist	•	Disturbances in	Alignment: Dood width in Kalyahan markat area			
	spots such as		traffic flow during	Alignment: Road width in Kakraban market area			
	Rudrasagar and		construction.	his very infined. Any widefining will cause significant			
	Matarbari			Shorkooners of Kakrahan market area			
•	improvement in			demanded for a realignment limited to single land			
	quality of life			and open for one way traffic. Existing road			
•	Appreciation in			should be retained and improved and open for			
	land cost			other direction. This will ease the traffic and limit			
				the extent of land acquisition			

Table 14: Outcome of Public Consultations

# G. Future Consultation

131. This process shall be extended during implementation. Appointed supervision consultant and implementing NGO for RP shall develop public consultation and disclosure program which is likely include: (i) public meetings with affected communities to discuss and plan work programmes and allow issues to be raised and addressed once construction has started; and (ii) smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

## H. Disclosure

132. The IEE report will be made available in the office of PWD. The same will be disclosed on its website. The full printed reports will also be available to interested parties on request from office of PWD. The ADB will disclose this IEE on its website prior to Board consideration. During project implementation, annual monitoring reports will be disclosed in both PWD and ADB websites.



## VI. ENVIRONMENTAL MANAGEMENT PLAN, MONTORING PLAN AND GRIEVANCE REDRESSAL MECHANISM

# A. Environment Management Plan

133. Environmental Management Plan (EMP) is intended to set out clearly and unambiguously the likely negative impacts of construction and/or operation of the project, the action that is required to avoid or mitigate each impact and the responsibility for taking each action. Responsibility is made legally binding when actions are subsequently specified in contracts. The EMP (**Appendix 6**) also ensures that the positive impacts are conserved and enhanced. It addition, it provides measures for institutional strengthening and effectiveness assessment through defined monitoring plan, reporting and corrective & preventive action planning. More specifically the objectives of the EMP are:

- (i) To ensure compliance with Asian Development Bank's applicable safeguard policies, and regulatory requirements of Sikkim and the Government of India;
- (ii) To formulate avoidance, mitigation and compensation measures for anticipated adverse environmental impacts during construction and maintenance and ensure that environmentally sound, sustainable and good practices are adopted;
- (iii) To stipulate monitoring and institutional requirements for ensuring safeguard compliance; and
- (iv) The project road should be environmentally sustainable.

# B. Environment Monitoring Program

134. The monitoring and evaluation are critical activities in implementation of the Project. Monitoring involves periodic checking to ascertain whether activities are going according to plan or not. It provides the necessary feedback for project management to ensure project objectives are met and on schedule. The reporting system is based on accountability to ensure that the environmental mitigation measures are implemented. Environmental monitoring program has the underlying objective to ensure that the intended environmental mitigations are realized and these results in desired benefits to the target population causing minimal deterioration to the environmental parameters. Such program targets proper implementation of the EMP. The broad objectives are:

- (i) To evaluate the performance of mitigation measures proposed in the EMP.
- (ii) To evaluate the adequacy of environmental assessment.
- (iii) To suggest ongoing improvements in management plan based on the monitoring and to devise fresh monitoring on the basis of the improved EMP.
- (iv) To enhance environmental quality through proper implementation of suggested mitigation measures.
- (v) To meet the requirements of the existing environmental regulatory framework and community obligations.

## C. Performance Indicators

135. The significant physical, biological and social components affecting the environment at critical locations serve as wider/overall Performance Indicators. However, the following specific environmental parameters can be quantitatively measured and compared over a period of time and are, therefore, selected as specific Performance Indicators (PIs) for monitoring because of their regulatory importance and the availability of standardized procedures and relevant expertise. A comprehensive monitoring plan for all performance indicators has been prepared for all stages appended as **Appendix 7.** This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. Performance indicators requiring quantitative measurements are:

- (i) Air Quality with respect to PM2.5, PM10, CO, NOx and SO2 at selected location.
- (ii) Water Quality with reference to DO, BOD, Oil and grease, COD, Suspended Solids and Turbidity, Alkalinity rivers/streams and water bodies at selected points.
- (iii) Noise levels at sensitive receptors (schools, hospitals, community/religious places).
- (iv) Survival rates of trees planted as compensatory plantation to compensate for lost forestlands and compensatory plantation raised for removal of roadside trees.

136. **Ambient Air Quality (AAQ) Monitoring:** Ambient air quality parameters recommended for monitoring road development projects are PM2.5, PM10, Carbon Monoxide (CO), Oxides of Nitrogen (NOx) and Sulphur Dioxide (SO2). These are to be monitored, right from the commencement of construction activity at selected locations of plants and machinery, crushers on sites, excavation works etc. Data should be generated once in a season excluding monsoon in accordance with the National Ambient Air Quality Standards as per CPCB recent notification of 2009 (Appendix 8).

137. **Water Quality Monitoring:** The physical and chemical parameters recommended for analysis of water quality relevant to road development projects are pH, total solids, total dissolved solids, total suspended solids, oil and grease, COD, Chloride, Lead, Zinc and Cadmium. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are given in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at locations identified along the project road during construction and operation phase. The Indian Standard Specifications – IS10500: 1991 is given in **Appendix 9**. Surface water quality will be monitored as per fresh water classification of CPCB (**Appendix 10**).

138. **Noise Level Monitoring:** The measurements for monitoring noise levels would be carried out at sensitive receptors and construction sites along the project roads. The Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) in 1989 or the standards by State Pollution Control Board if such standards are stringent than those of the CPCB are to be complied. The CPCB standards are given in **Appendix 11**. Sound pressure levels would be monitored on twenty-four hour basis. Noise should be recorded at "A" weighted frequency using a "slow time response mode" of the measuring instrument.

139. **Success of Re-vegetation:** compensatory plantation will be taken up in lieu of tree cutting@1:3 basis. These compensatory plantations will have to be monitored by the implementing agency with the help of the Forest Department. Such monitoring will be conducted through random samples. Such sampling should cover at least 5% of the area planted up. 75% survival rate shall be ensured.

## D. Institutional Arrangement

140. The PWD, through its Project Implementing Unit (PIU), is the Executive Agency of the Project. The Project Director is overall responsible for EMP implementation. The following groups are involved in EMP implementation during construction stage:

- (i) PIU and its environmental unit;
- (ii) Construction Supervision Consultant (SC) i.e. Engineer and his representatives; and

(iii) Contractor.

141. There is a need to establish Environmental and Social Management Unit (EMSU) within the PIU. Since it is not envisage that significant environmental impacts will result from the road upgrading, it is recommended that one of the senior officers of PIU will be designated as Environmental and Social Officer for monitoring implementation of proposed safeguard measure. EMSU will be headed by the Project Director but coordinating and supervising implementation of safeguard measures will be undertaken by the designated Environmental and Social Officer. There is a need for capacity building of environmental unit through various trainings.

142. The Project Director of PIU with the assistance of designated Environmental and Social Officer will be overall responsible for ensuring compliance of safeguard measures and will be reporting to the regulatory bodies and ADB certifying that relevant environmental safeguard measures have been complied with during project implementation. At the field level, the Executive Engineer with his Assistant Engineer/s will supervise implementation of safeguard measures for this subproject and submit monthly reports to PIU.

143. PIU may engage independent agencies for carrying out pollution monitoring activities. The Supervision Consultant (SC) will be interacting with these agencies and facilitate them in carrying out such activities.

144. The SC will liaise with PIU environment unit to ensure that Contractor complies with the requirements of various environmental safeguard measures through supervision, monitoring and reporting. Efforts must be made by SC to ensure that environmental mitigation and good-construction-practices are implemented as integral component of each civil activity. Implementation of environmental safeguard measures needs team effort and as such the Team Leader of SC will delegate the responsibilities to each member of the supervision team with respect to their core responsibilities. The project should have a provision of part time input of Environmental Specialist within SC to supervise implementation of safeguard measures. His role would be more on advisory. He will assist the Team Leader of SC on the following:

- (i) Advise PIU on preparing reports to ADB and other statutory bodies;
- (ii) Preparing procedures for implementing EMP;
- (iii) review Contractor's EMP, traffic management plan and safety plan and recommend for its approval / improvements, to the Team Leader;
- (iv) provide training to PIU, SC and Contractors' staff on implementing EMP;
- (v) advise on obtaining various statutory environmental clearances on time;
- (vi) conduct periodic field visits to examine environmental compliances and suggest corrective actions ; and
- (vii) any other issues as will be required to ensure environmental compliance.

145. Besides, the Team Leader of SC will nominate a senior engineer from the site office responsible for day-to-day supervision of EMP implementation. He will provide guidance to the field staff of SC and Contractor for implementing each of the activities of the EMP. He will be responsible for record keeping, providing instructions through the Engineer for corrective actions, ensuring compliance of various statutory and legislative requirements and assist Engineer for submitting reports to PIU. He will maintain a close co-ordination with the Contractors and PIU for successful implemented, Contractor shall appoint a full time qualified and experienced Environmental and Safety Officer (ESO) from the commencement to completion of the project. The qualification and responsibilities of ESO as stipulated below should be considered. The qualification of ESO will be as given below:

- (i) Diploma or Graduate in Civil Engineering with post graduate specialization in Environmental Engineering or Environmental Science or equivalent;
- (ii) 5 to 10 years of total professional experience; and
- (iii) About 3 to 5 years of experience in similar projects i.e. management of environmental issues in design and construction of road / highway / flyover / bridges

The responsibilities of ESO of Contractor will include the following:

- (i) Directly reporting to the Project Manager of the Contractor;
- (ii) Discussing various environmental issues and environmental mitigation, enhancement and monitoring actions with all concerned directly or indirectly;
- (iii) Preparing Contractor's EMP, traffic management plan and safety plan;
- (iv) Ensuring contractor's compliance with the EMP stipulations and conditions;
- (v) Assisting project manager to ensure environmentally sound and safe construction practices;
- (vi) Assisting project manager to ensure the timely procurement of materials that are included in the BOQ relating to environmental mitigations and enhancement;
- (vii) Conducting periodic environmental and safety training for contractor's engineers, supervisors and workers;
- (viii) Preparing a registers for material sources, labour, pollution monitoring results, public complaint and as may be directed by the Engineer;
- (ix) Assisting the PIU on various environmental monitoring and control activities including pollution monitoring; and
- (x) Submitting monthly reports to SC on status of implementation safeguard measures.

146. As mentioned above, there is a need for capacity building of PIU on various environmental and social aspects of the project through various environmental training. Recently, there has been change of statutory requirements for this similar projects based on new EIA Notification. This has changed the landscape of legal and administrative framework for implementing the projects. Thus, there is a need for the PIU staff to updating the information and keeping abreast with the changing legal and administrative requirement... For successful implementation of EMP, it is essential to orient engineers of PIU, SC and Contractor who would be mobilized for this project. One day environmental orientation workshop will be conducted each at by PIU, once most of the staff has been mobilized. The details of the training program are included in **Table 15**.

Module	Title	Objectives	Duration (Day)	Target Group
1	Environmental Legislations and Bank's Safeguard Policies	<ul> <li>Brush up latest on environmental legislations</li> <li>Brush up safeguard policies</li> </ul>	1	PIU and SC staff
2	Environmental Supervision and Monitoring	<ul> <li>EMP requirements</li> <li>Implementation, Supervision and Monitoring Mechanism</li> <li>Provision made in Contract Documents for Works</li> <li>Provision made in contract Agreement for Supervision Services</li> </ul>		PIU and SC staff
3	Orientation Workshop on EMP Implementation	<ul> <li>EMP requirements</li> <li>Implementation, Supervision and Monitoring Mechanism</li> <li>Roles and Responsibilities of Contractors and SCs</li> </ul>		PIU, Contractors and SCs

Table 15: Details of Environmental Training Program

4	Focused Training on Specific Issue/s (three during course of implementation)	<ul> <li>Analyzing problems, referring stipulations in Contract and EMP and agreed to feasible solution within specified timeframe</li> </ul>	0.5	PIU, Contractors and SCs
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# E. Grievance Redressal Mechanism

147. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the social and environmental performance at the level of the Project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. The project-specific GRM is not intended to bypass the government's own redress process, rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people and is scaled to the risks and impacts of the project.

148. The PIUs will make the public aware of the GRM through public awareness campaigns. The contact phone number of the respective PIUs will serve as a hotline for complaints and will be publicized through the media and placed on notice boards outside their offices and at construction sites. The project information leaflet will include information on the GRM and will be widely disseminated throughout the corridor by the R&R officers in the PIUs with support from the NGO engaged to implement the RP. Grievances can be filed in writing using the Complaint Register and Complaint Forms or by phone with any member of the PIU.

149. **First tier of GRM.** The PIU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The Resettlement Officer in the PIU will be designated as the key officer for grievance redress. Resolution of complaints will be done within seven working (7) days. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

- Initial grievance sheet (including the description of the grievance) with an acknowledgement of receipt given to the complainant when the complaint is registered;
- (ii) Grievance monitoring sheet with actions taken (investigation, corrective measures);
- (iii) Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

150. The updated register of grievances and complaints will be available to the public at the PIU office, construction sites, and other key public offices along the project corridor (offices of the ward members, local Resident Welfare Association offices etc). Should the grievance remain unresolved it will be escalated to the second tier.

151. 1. **Second Tier of GRM.** The Environment Officer in the PIU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the Grievance Redress Committee  $(GRC)^4$ . The GRC will be established before commencement

<sup>&</sup>lt;sup>4</sup> The GRC will consist of the following persons: (i) Project Director; (ii) representative of the affected person(s); (iv) representative of the local Deputy Commissioners office (land). The functions of the local GRC are as follows: (i) resolve problems quickly and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety

of site works. A hearing will be called with the GRC, if necessary, where the affected person can present his/her concern/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

152. The PIU Officers will be responsible for processing and placing all papers before the GRC, maintaining database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

153. **Third tier of GRM.** In the event that a grievance cannot be resolved directly by the PIUs (first tier) or GRC (second tier), the affected person can seek alternative redress in the appropriate court of law. The PIUs or GRC will be kept informed by the district, municipal or national authority.

154. The monitoring reports of the resettlement plan implementation will include the following aspects pertaining to progress on grievances: (i) number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, closed, pending)

155. **Costs:** All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the Project.



Figure 7.1: Grievance Redress Mechanism

as well as social and resettlement related issues such as land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons, categorize and prioritize them and aim to provide solutions within a month; and (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

# F. Environment Management Budget

147. An environmental management budget of INR 32.5 Lakhs has been estimated for implementation of the environmental management plan. This budget also includes cost of environmental monitoring and associated trainings. A detail of environmental management budget is given in **Table 16**.

# G. Generic Guidelines for Implementing EMP

148. A set of generic guidelines have been formulated to avoid potential impacts due to construction and its allied activities. Quarry Area Management has been excluded since quarrying is not involved. Quarry materials will be obtained from licensed quarries. These guidelines have been attached as Appendices with following headings.

Appendix 12- Management of Construction Plants, equipment and vehicles
 Appendix 13- Campsite Management
 Appendix 14- Management of Construction Waste and Debris Disposal
 Appendix 15- Borrow Area Management

 Table 16: Environment Management Budget

SL. NO.	ITEM DESCRIPTION	QUANTITY	UNIT	RATE (Rs.)	AMOUNT (Rs.)	Responsibility	
А	Tree Plantation						
A.1	Compensatory Plantation@1:3 basis for 1,852 <sup>5</sup>	5556	No.	285	1,583,460	PIU through	
A.2	Bamboo tree guard of height 1.2 meters above ground and 0.20 meter below ground for all trees other than bamboo tree.	5556	No.	100	555,600	Forest Department	
В	Environmental Monitoring						
B.1	Ambient air quality monitoring as per Appendix 7	18	No.	4000	72,000	PILLthrough	
B.2	Ambient noise level monitoring as per Appendix 7	14	No.	1500	21,000	Approved	
B.3	Water quality monitoring of surface water as per Appendix 7	14	No.	4000	56,000	Monitoring	
B.4	Water quality monitoring of drinking water	6	No.	4000	24,000	Agency	
С	Provide the Noise barrier at sensitive areas. The design of the noise barrier shall be approved by the engineer in charge, where as a typical drawing of noise barrier is given in <b>Appendix 5</b>	180	Rm	4000	720,000		
D Enhancement of cultural properties as per directed by the engineer including the following items							
D.1	Provision and erection of cement concrete, standard sitting benches including clearing of the area around the benches.	30	No.	1000	30,000	through BOQ	
D.2	Boundary fencing with barbed wire fencing of approved make and specification including provision and errection of struts200Rm.550110,000						
E Environmental Training							
E.1	Training at site as per Appendix E of EMP.	1		75000	75,000	PIU through Supervision Consultant	
	Grand Total = INR 3,247,060 Say 32.5 lakhs						

<sup>&</sup>lt;sup>5</sup> This is the total no. of trees enumerated within ROW (24-26m). Actual number of trees likely to be cut will reduce significantly, since tree cutting will be restricted to formation width of 12-14m. This can be ascertained after joint verification with forest department after finalisation of widening schedule.

#### VII. CONCLUSION AND RECOMMENDATION

149. The proposed TR02: Udaipur-Melaghar road section improvement has been categorized as Category 'B' based on environmental screening and assessment of likely impacts. Initial environmental examination ascertains that it is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed subproject, most of which are localized and temporary in nature and easy to mitigate.

150. Project road is not located in any environmentally sensitive areas. However, it passes along/through some reserve forest areas. No encroachment/diversion of forest land is involved. All widening and improvement will be accommodated within available right-of -way (ROW) varying from 24-26 m. Moreover, formation width is limited to 12-14m.

151. The significant environmental impacts attributable to the upgrading of the road sections pertains to tree cutting, temporary deterioration of environmental attributes/ambients during construction phase from land clearing, silt run off, borrowing of earth, camp operations and community and occupational health and safety. These impacts are easily mitigated by adopting good construction practices and effective implementation of EMP. During operation stage, the main impacts are increase in mobile emissions, noise level, accident risk to motorist, pedestrian and animals. Road safety measures are proposed as per IRC: SP: 44-1996 like road delineators, signage, metal beam crash barriers and guide posts etc. Toe walls and stone pitching has been proposed on embankment slopes where ponds are abutting to avoid seepage into sub grade and erosion of road embankment.

152. In general, the subproject received immense support from local people. The local people appreciated that improved connectivity will bear out several socio-economic positive benefits resulting to improved quality of life

153. The initial environmental examination of the subproject ascertains that the project is unlikely to cause any significant environmental impacts. No additional studies or need of undertaking detailed EIA is envisaged at this stage. The Executing Agency shall ensure that EMP and EMoP are included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. The same shall be revised if necessary during project implementation or if there is any change in the project design and with approval of ADB.

ROADS AND HIGHWAYS

#### **RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST**

#### Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

**Country/Project Title:** 

Udaipur-Melaghar in the State of Tripura (NESRIP-Tranche 2)

#### Sector Division:

South Asia Transport and Communications Division

Screening Questions	Yes	No	Remarks
A. project siting is the project area adjacent to or within any of the following environmentally sensitive areas?			
<ul> <li>Cultural heritage site</li> </ul>		x	No cultural heritage site in located within the road ROW.
<ul> <li>Protected area</li> </ul>		x	No protected area is located within the road ROW
<ul> <li>Wetland</li> </ul>		x	No designated wetland in the project area. However, there are a number of ponds along the project road.
<ul> <li>Mangrove</li> </ul>		х	No mangrove area is located in the project site
<ul> <li>Estuarine</li> </ul>		х	Not applicable
<ul> <li>Buffer zone of protected area</li> </ul>		х	
<ul> <li>Special area for protecting biodiversity</li> </ul>		x	No special biodiversity area is located within the ROW
B. potential environmental impacts will the project cause			
<ul> <li>Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?</li> </ul>	x		The topography of project road is plain and rolling. Project activities are not of large scale and mostly confined to available ROW. Minor impacts of landscape by road embankments, cuts and fills are anticipated. No encroachment of historical places. However, some temples / shrines / exist along the project road may get impacted.

Screening Questions	Yes	No	Remarks
			Opening of new quarries is not proposed. quarry material will be sourced from existing quarries. Borrow areas will be suitably rehabilitated as per irc guidelines.
<ul> <li>Encroachment on precious ecology (e.g. sensitive or protected areas)?</li> </ul>		x	There is no national park, wild life sanctuaries or any other similar eco-sensitive areas in the project area. however, the project passes along/through patches of reserve forest in following stretches: <b>Chandrapur reserve forest</b> • km. 5.300 to km. 6.115 (lhs) • km. 6.400 to km. 6.865 (lhs), • km. 6.560 to km. 6.890 (rhs) and • km. 7.240 to km. 10.200 (intermittently on both sides) <b>East Chandigarh reserve forest</b> • km. 18.800 to km 18.850 (rhs) and • km 19.000 to km 19.100 (rhs) But no encroachment/diversion of forest land is involved since total formation width required is12- 14 m and available ROW is 24-26 m. Forest
<ul> <li>Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?</li> </ul>	x		River Gomti is the only perennial river crossed by the project road. 2-lane bridge in good condition is already constructed and proposed to be retained. No diversion of any waterway involved. Adequate measures like toe/retaining walls have been proposed to avoid/reduce siltation in the
<ul> <li>Deterioration of surface water quality due to silt runoff and sanitary wastes from worker- based camps and chemicals used in construction?</li> </ul>		x	Adequate sanitary facilities and drainage in the workers camps will help to avoid this possibility. as the construction activity in this project will not contain any harmful ingredients, no impact on surface water quality is anticipated. Measures like embankment slope stabilisation, RCC retaining walls are proposed to prevent siltation of ponds located next to the road due to surface runoff.
<ul> <li>Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?</li> </ul>	x		Local air pollution level is likely to be increased for short duration during construction period. appropriate distance from settlement area and wind direction may be taken into account to locate air polluting facility like stone crushing unit etc. use of environment friendly equipments/machineries will help to reduce air pollution
<ul> <li>Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?</li> </ul>		x	Workers may get exposed to dust and noise during construction activities. however the exposure levels are likely to be short and insignificant. workers will be provided requisite PPEs to minimise such exposure and associated harmful occupational health effects. Traffic on roads is expected to be low and as

Screening Questions	Yes	No	Remarks
			such, no occupational health hazard is anticipated during operation phase.
<ul> <li>Noise and vibration due to blasting</li> </ul>			Blasting is not involved.
and other civil works?	x		Ambient noise level is expected to increase in the range of 80-90 db(a) due to various construction activities, maintenance workshops, and earthmoving equipment. although this level of noise exceeds national standards, their occurrence will be intermittent and co-terminus with the project construction.
			All stationary noise making sources equipment like dg set, compressors will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors. noise barriers have been proposed at sensitive locations very close to the alignment.
<ul> <li>dislocation or involuntary resettlement of people</li> </ul>		x	Since widening will be mostly accommodated within available ROW, this impact is expected to be low. Exact number of displaced persons to be confirmed by RP. this is under preparation
<ul> <li>Dislocation and compulsory resettlement of people living in right-of-way?</li> </ul>		x	Minimal. To be confirmed by RP under preparation.
<ul> <li>Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?</li> </ul>		x	To be minimal
<ul> <li>Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?</li> </ul>		x	Deterioration in ambient air quality will be localised and temporarily during construction activity. The project area is largely located in open areas. Plantation along the highway and improved road conditions will improve the air quality of the area.
<ul> <li>Hazardous driving conditions where construction interferes with pre-existing roads?</li> </ul>		x	Suitable traffic management plan will be designed and implement by the contractor to prevent any hazardous driving condition in above situations.
<ul> <li>Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?</li> </ul>		x	Proper provisions for sanitation, health care and solid waste disposal facilities will be available in the contract documents to avoid such possibility. workers will be made aware about communicable diseases
<ul> <li>Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?</li> </ul>		x	No such condition is anticipated, all borrow pit areas will comply with national standards. borrow areas, will be promoted for fish culture and will naturally control mosquitoes. incidence of malaria will be monitored.
<ul> <li>Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?</li> </ul>		x	Adequate safety measures will be adopted to avoid such conditions.

Screening Questions	Yes	No	Remarks
<ul> <li>Increased noise and air pollution resulting from traffic volume?</li> </ul>	x		Increase in noise and air pollution is expected during construction phase. Adequate mitigation measures will be adopted to minimise them. During operation phase, the main source of noise and air will be traffic. Improved road conditions, extensive plantation will help reduce the noise and air impact. Moreover, the alignment mostly passes through open agricultural land which will provide adequate dispersion of gaseous emission. if measures suggested for noise sensitive receptors prove inadequate, solid noise barrier
<ul> <li>Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?</li> </ul>	x		will be placed.This is expected from accidental spillage.Adequate safety provisions have been proposedto avoid such situation.
<ul> <li>Social conflicts if workers from other regions or countries are hired?</li> </ul>		x	Most of the workers will be from local areas and hence such conflict is not anticipated.
<ul> <li>Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?</li> </ul>		x	Workers will be mostly from local villages. Worker from remote places will be provided with adequate facility. The ratio of local and outside workers will be such balanced that there is minimum burden on existing social infrastructures and services.
<ul> <li>Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?</li> </ul>		x	IEE has outlined such anticipated risks and recommended necessary mitigative measures to avoid them.
<ul> <li>Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.</li> </ul>		x	Adequate measures have been adopted to mitigate such risks. Adequate awareness will be created amongst people and workers through information disclosure, safety signage and public consultation about safety aspects.

Based on the above assessment the project is categorized as 'B' as per SPS, 2009

Project does not require Environmental Clearance under the preview of EIA Notification 2006 and its subsequent amendments.

SI. No.	Type of water bodies and CD Structures	Village name	Ch. (km)	
1	Drain (Culvert)	Ramesh Choumohini	0.180-0.200	
2.	Nala (Culvert)	Khilpara	0.785- 0.795	
3.	Canal (Culvert)	Khilpara	3.310 - 3.320	
4.	Nala (Culvert)	Jamjuri	4.030 - 4.040	
5.	Canal (Minor Bridge)	Jamjuri	4.740 - 4.760	
6.	Nala (Culvert)	Palatana	6.400 - 6.420	
7.	Canal (Culvert)	Palatana	7.420- 7.430	
8.	Canal (Culvert)	Palatana	7.20- 7.230	
9.	Canal (Culvert)	Palatana	8.475- 8.485	
10.	River (RCC Bridge)	Kishorganj	12.760 – 12.920	
11.	Nala (Culvert)	Kishorganj	13.760-13.780	
12.	Canal (Culvert)	Kamrangatoli	14.230-14.260	
13.	Small drain (Culvert)	Kamrangatoli	14.575-14.585	
14.	Nala (culvert)	Kamrangatoli	15.225-15.250	
15.	Drain (culvert)	Mohanbhog	16.100-16.120	
16.	Small drain (Culvert)	Mohanbhog	16.190-16.200	
17.	Nala (culvert)	Mohanbhog	16.325-16.3400	
18.	Nala (Culvert)	Mohonbhog	16.880-16.900	
19.	Nala (Culvert)	Kalapania	17.060-17.070	
20.	Nala (Culvert)	Kalapania	17.140-17.150	
21.	Nala (Culvert)	Kalapania	17.180-17.190	
22.	Nala (Culvert)	Kalapania	17.380-17.395	
23	Nala (Culvert)	Kalapania	17.680-17.695	

# LIST OF WATERWAYS AND TYPE OF CROSS-DRAINAGE STRUCTURES

SI. No.	Type of water bodies	Village name	Chainage (Km)	Distance and Direction from the road edge	Availability of water during a year	Competent users	
1.	Pond		0.240	3mt & RHS	Year Long	House holds	
2.	Pond		0.410	2mt & RHS	Year Long	House holds	
3.	Pond	Ramesh Choumohini	0.430	3mt & LHS	Year Long	House holds	
4.	Pond		0.480	8mt & LHS	Year Long	House holds, Fisherman	
5.	Pond		0.475	2mt & RHS	Seasonal	House holds	
6.	Pond		0.530	1mt & RHS	Year Long	House holds	
7.	Pond		0.560	7mt & RHS	Year Long	House holds, Villagers	
8.	Pond		0.620	1mt & RHS	Year Long	House holds	
9.	Small pond		0.630	1mt & LHS	Seasonal	House holds	
10.	Pond		0.750	10mt & LHS	Year Long	House hold	
11.	Small Pond		0.785	15mt & LHS	Seasonal	House holds	
12.	Small pond		0.870	5mt & RHS	Sesaonal	House holds	
13.	Pond		0.990	2mt & LHS	Year Long	Fisherman, villagers	
14	Pond		1.130	5mt & LHS	Year Long	Fisherman, Villagers	
15.	Pond		1.270	20mt & LHS	Year Long	Fisherman, House holds	
16.	Pond		1.290	2mt & RHS	Year Long	Fisherman, Villagers	
17.	Pond	Khilpara	1.610	2mt & LHS	Year Long	Hose holds	
18.	Pond		1.670	2mt & LHS	Seasonal	House holds	
19.	Pond		1.640	2mt & RHS	Seasonal	House holds	
20.	Pond		1.700	2mt & RHS	Seasonal	House holds	
21.	Pond		2.020	3mt & LHS	Seasonal	House holds	
22.	Pond		2.175	4mt & RHS	Year Long	House holds	
23.	Pond		2.130	2mt & LHS	Seasonal	House hold	
24.	Pond		2.500	3mt & RHS	Year Long	Fisherman, Villagers	
25.	Pond		2.450	3mt & RHS	Year Long	Fishermen, House holds	
26.	Pond		2.230	3mt & LHS	Year Long	Fisherman, House holds	
27.	Pond		2.360	3mt & LHS	Seasonal	House holds	
28.	Pond		2.460	2mt & RHS	Seasonal	House holds	
29.	Pond		2.550	2mt & RHS	Year Long	holds	
30.	Pond		2.590	2mt & RHS	Year Long	House holds	
31.	Pond		2.620	2mt & RHS	Year Long	House holds	
32.	Pond	Boinsobirchar	2.680	4mt & RHS	Seasonal	House holds	
33.	Pond		2.780	4mt & LHS	Year Long	Fishermen, Villagers	
34.	Pond		2.940	3mt & RHS	Year Long	House holds	
35.	Pond		2.950	3mt & LHS	Year Long	Fishermen, House holds	
36.	Pond		3.400	2mt & RHS	Year Long	Fisherman House holds	
37.	Pond		3.400	3mt & LHS	Seasonal	House Holds	
38.	Pond		3.800	3mt & RHS	Year Long	Fisher man, House holds	
39.	Pond		3.570	2mt & RHS	Seasonal	House holds	

# LIST OF STAGNANT WATER BODIES/PONDS

SI. No.	Type of water bodies	Village name	Chainage (Km)	Distance and Direction from the road edge	Availability of water during a year	Competent users	
40.	Pond		3.900	7mt & LHS	Year Long	Fishermen, Villagers	
41.	Pond		3.670	3mt & LHS	Seasonal	House holds	
42.	Pond		3.750	2mt RHS	Year Long	House holds	
43.	Pond		3.850	3mt & RHS	Year Long	Villagers, House holds	
44.	Pond		3.880	7mt & LHS	Seasonal	House Holds	
45.	Pond		3.970	10mt & RHS	Seasonal	House holds	
46.	Pond	Jamjuri	4.065	2mt & LHS	Year Long	House Holds	
47.	Pond		4.080	3mt & RHS	Year Long	House Holds	
48.	Pond		4.130	4mt & RHS	Year Long	Villagers	
49.	Pond		4.170	6mt & RHS	Seasonal	House Holds	
50.	Pond		4.410	3mt & RHS	Year Long	Fishermen, Villagers	
51.	Pond	1	4.450	30mt & RHS	Seasonal	House holds	
52.	Pond	Jamjuri	4.760	4mt & RHS	Year Long	Villagers	
53.	Pond		6.300	5mt & RHS	Year Long	Fishermen	
54.	Pond		10.150	40mt & LHS	Seasonal	House Holds	
55.	Pond		10.200	5mt & RHS	Year Long	House holds	
56.	Pond		11.900	15mt & RHS	Year Long	Fishermen	
57.	Pond		12.560	50 mt & LHS	Seasonal	House Holds	
58.	Khowai River	Along the road	12.760- 20.285	Variable and LHS	Year Long	Fisherman, Farmer, Households, Villagers	
59.	Pond	Kishorganj	13.500	40mt & RHS	Year Long	House Holds, Fishermen	
60.	Pond		14.590	2mt & RHS	Seasonal	House Holds	
61.	Pond		14.600	2mt & RHS	Year Long	House Holds	
62.	Pond		14.750	4mt & RHS	Year Long	House Holds	
63.	Pond	Kamrangatoli	14.850	4mt & RHS	Year Long	Fishermen	
64.	Pond		15.030	8mt & RHS	Year Long	House Holds	
65.	Pond		15.120	8mt & RHS	Year Long	House Holds, Fishermen	
66.	Pond		15.415	2mt & LHS	Seasonal	House Holds	
67.	Pond		15.490	3mt & LHS	Seasonal	House Holds	
68.	Pond	Mohanbhog	16.660	5mt & RHS	Year Long	Villagers & Fishermen	
69.	Pond		16.770	5mt & RHS	Year Long	Fishermen	
70.	Pond	Kalapania	17.280	30mt & RHS	Year Long	House Holds/ Fishermen	
71.	Kalapania Wetland	Kalapania	17.400	5-25mt & RHS	Year Long	Fishermen	
72.	Pond		18.080	75mt & RHS	Seasonal	House Holds	
73.	Pond	Chandigarh	18.240	70mt & RHS	Seasonal	House Holds	
74.	Pond		18.780	40mt & RHS	Seasonal	House Holds	
75.	Pond		19.220	70mt & RHS	Seasonal	House Holds	

SI. No.	Name of School/ College/ Hospital	Chainage (km)	Name of the village	
1.	Ramesh School	0.030-0.130	Ramesh Choumohini	
2.	Rabindra Parishad	0.080-0.120	Ramesh Choumohini	
3.	Rashtriya Anath Balak Ashram	0.980-1.055	Khilpara	
4.	Primary Animal Health Center	1.010-1.050	Khilpara	
5.	NSS Khilpara H. S. School	1.490-1.570	Khilpara	
6.	Madrasa School	2.850-2.807	Khilpara	
7.	Jamjuri H.S.School	4.630-4.720	Jamjuri	
8.	Animal Medical Centre	4.450 - 4.480	Jamjuri	
8.	Phul Sunduri Primary School	5.660-5.700	Jamjuri	
9.	Sitlabari Primary School	7.820-7.860	Palatana	
10.	Duchikala H.S.School	9.880- 9.950	Duchikhola	
11.	Kakraban Govt. Hospital	10.440 – 10.540	Kakraban	
11.	New Garden Bahai School	11.390- 11.420	Kakraban	
12.	Kakraban H.S.School	11.980- 12.070	Kakraban	
13.	Kishor Gang H.S.School	13.180- 13.280	Kishorganj	
14.	Kamrangatali School	14.920- 15.000	Kamrangatoli	
15.	Netaji Sishu Niketan Primary School	15.930- 15.960	Kamrangatoli	
16.	Aganwadi Baloari School	19.180-19.200	Chandigarh	

# LIST OF NOISE SENSITIVE RECEPTORS ALONG THE PROJECT ROAD









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# ENVIRONMENTAL MANAGEMENT PLAN

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency				
PRE-	PRE-CONSTRUCTION PHASE								
1	Tree cutting	Cutting of about 1852 nos. trees during site clearance	<ul> <li>Restricting tree cutting within construction limit</li> <li>Avoiding tree cutting at ancillary sites</li> <li>Providing and maintaining compensatory plantation of 5556 trees i.e. three times of cutting</li> <li>All trees to be cleared will numbered clearly marked with paint</li> </ul>	Forest Dept. / PIU	PIU				
2	Removal of utilities	Work site clearance	<ul> <li>Necessary planning and coordination with concerned authority and local body</li> <li>Prior notice to and consultation with concerned authority, local body and public to be affected so as to ensure that work does not get affected and impact on public is minimum</li> <li>All above ground utilities that will be shifted will clearly marked with paint to guide workers</li> </ul>	Concerned utility agencies / PIU	SC/ PIU				
3	Religious places	Work site	• Suitable mitigation measures are incorporated in resettlement plan.	PIU	SC / PIU				
S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency				
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4	Contractor Preparatory Works (Upon issuance of Notice to Proceed)		<ul> <li>The Contractor will complete the following activities no later than 30 days upon issuance of Notice to Proceed</li> <li>1.) Submit appointment letter and resume of the Contractor's Environmental Focal Person (EFP) to SC/PIU</li> <li>2.) EFP will engage CSC-Environment Specialist and to a meeting to discuss in detail the EMP, seek clarification and recommend corresponding revisions if necessary</li> <li>3.) EFC will request CSC-ES copy of monthly monitoring formats and establish deadlines for submission.</li> <li>4.) EFC will submit for CSC-ES approval an action plan to secure all permits and approvals needed to be secured during construction stage which include but not limited to: i) operation of crushers and hot mix plants, ii) transport and storage of hazardous materials (e.g. fuel, lubricants, explosives), iii) waste disposal sites, iv) temporary storage location, iv) water use, and v) emission compliance of all vehicles. Arrangements to link with government health programs on hygiene, sanitation, and prevention of communicable diseases will also be included in the action plan.</li> <li>5) EFC will submit for approval of CSC-ES the construction camp layout before its establishment.</li> </ul>	Contractor	PIU				
CON	STRUCTION PHASE	1			7				
		Construction plants, equipment and vehicles	Refer Appendix 12 and Appendix 13	Contractor	SC/PIU				
		Temporary diversion	<ul> <li>Maintaining diversion and detour for road traffic in good shape and traffic regulated.</li> <li>Regular sprinkling of water, as necessary.</li> </ul>	Contractor	SC/PIU				
1	Air Pollution	Dust during earth works or from spoil dumps	<ul> <li>Maintaining adequate moisture at surface of any earthwork layer completed or non-completed unless and until base course is applied, to avoid dust emission.</li> <li>Stockpiling spoil at designated areas and at least 5 m away from traffic lane.</li> <li>Refer Appendix 14</li> </ul>	Contractor	SC/PIU				

S.No.	Environmental Location/sources		Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency
		Borrow pits and haul road	Refer Appendix 15	Contractor	SC/PIU
		Storage of construction materials	Sprinkling of water as necessary.	Contractor	SC/PIU
		Construction of Bridges or Culverts - Earthwork and marginal spillage of construction materials causing temporary turbidity and suspended solids	<ul> <li>Constructing and maintaining diversion channel, sedimentation basin, dykes, etc. as may be required to temporarily channel water flow of streams / river</li> <li>Storage of construction material and excavated soil above high flood level</li> </ul>	Contractor	SC/PIU
2	Water Pollution	Construction vehicles	<ul> <li>Strictly avoiding cleaning / washing of construction vehicle in any water body</li> </ul>	Contractor	SC/PIU
2		Soil erosion from construction site	<ul> <li>Proper planning of site clearing and grubbing so as not to keep the cleared site before working for long duration.</li> <li>Providing temporary side drains, catch water bank or drains, sedimentation basin, as necessary to avoid or minimize erosion and prevent sedimentation to receiving water bodies</li> </ul>	Contractor	SC/PIU
		Seepage from Construction Debris	Refer Appendix 14		
		Construction camp and workers' camp	Refer Appendix 13	Contractor	SC/PIU
3	Ground water Pollution	Wastewater logging	<ul> <li>All wastewater will be diverted to a ditch that will be managed for the period of construction and after construction such ditches will be filled and restored to original condition.</li> </ul>	Contractor	SC/PIU
		Borrow pit excavation	<ul> <li>Excavation of borrow pit should not touch the aquifer</li> </ul>	Contractor	SC/PIU

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency
		Human wastes and wastewater at construction camp	<ul> <li>Providing septic tanks for treating sewage from toilets before discharging through soak pits</li> <li>Locating soak pits at least 50m from any ground water sources</li> <li>Decanting and or controlled disposal of oil and grease as collected at collection tanks of maintenance yard and chemical storage areas</li> <li>Refer 13</li> </ul>	Contractor	SC/PIU

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency
4	Noise Pollution and Vibration	Vehicles and Construction machinery	<ul> <li>Site Controls: Stationary equipment will be placed along un-inhabited stretches as per distance requirements computed above as far as practicable to minimize objectionable noise impacts.</li> <li>Scheduling of Project Activities: Operations will be scheduled to coincide with period when people would least likely to be affected. Construction activities will be avoided between 9 P.M. and 6 A.M. near residential areas.</li> <li>Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines.</li> <li>Construction equipment and machinery should be fitted with silencers and maintained properly.</li> <li>Source-control through proper maintenance of all equipment.</li> <li>Use of properly designed engine enclosures and intake silencers.</li> <li>Noise measurements should be carried out along the road to ensure the effectiveness of mitigation measures.</li> <li>Vehicles and equipment used should confirm to the prescribed noise pollution norms.</li> <li>Constructing noise barriers as proposed for schools and hospitals (at chainage km 2.650, km 9.575, km 32.500 of AS-02, and km 6.350 and km 16.650 of AS-03) prior to taking up road construction activities at those sections.</li> <li>Movements of heavy construction vehicles and equipment near public properties will be restricted.</li> <li>Comply with siting criteria for stone crushers, Hot Mix Plant/s (HMP) and concrete batching plant/s (CBP), and installations and maintenance of pollution control devices as mentioned in Appendix 12</li> </ul>	Contractor	SC/PIU

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency
5	Land Pollution	Spillage from plant and equipment at construction camp	<ul> <li>Providing impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform</li> <li>Collection oil and lubes drips in container during repairing construction equipment vehicles</li> <li>Providing impervious platform and collection tank for spillage of liquid fuel and lubes at storage area</li> <li>Providing bulk bituminous storage tank instead of drums for storage of bitumen and bitumen emulsion</li> <li>Providing impervious base at bitumen and emulsion storage area and regular clearing of any bitumen spillage for controlled disposal</li> <li>Reusing bitumen spillage</li> <li>Disposing non-usable bitumen spills in a deep trench providing clay lining at the bottom and filled with soil at the top (for at least 0.5 m)</li> <li>Refer Appendix 12 and 13-B</li> </ul>	Contractor	SC/PIU
		Domestic solid waste and liquid waste generated at camp	<ul> <li>Collecting kitchen waste at separate bins and disposing of in a pit at designated area/s</li> <li>Collecting plastics in separate bins and disposing in deep trench at designated area/s covering with soil</li> <li>Collecting cottons, clothes etc. at separate bins and burning in a pit (with sand bed)</li> </ul>	Contractor	SC/PIU
		Borrow pits	<ul> <li>Controlled operation and redevelopment of borrow pits to avoid water logging and land contamination</li> </ul>	Contractor	SC/PIU
6	Loss of topsoil	All construction sites	<ul> <li>The topsoil from all areas of cutting and all areas to be permanently covered shall be stripped to a specified depth of 150 mm and stored in stockpiles. At least 10% of the temporarily acquired area shall be earmarked for storing topsoil.</li> <li>The stockpile shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile be restricted to 2m. To retain soil and to allow percolation of</li> </ul>	Contractor	SC/PIU

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency
			<ul> <li>water, the edges of the pile shall be protected by silt fencing.</li> <li>Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or tarpaulin.</li> <li>It shall be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles.</li> <li>Such stockpiled topsoil will be returned to cover the disturbed area and cut slopes. Residual topsoil will be distributed on adjoining/proximate barren/rocky areas as identified by the SC in a layer of thickness of 75mm – 150mm. Top soil shall also be utilized for redevelopment of borrow areas, landscaping along slopes, medians and incidental spaces.</li> </ul>		
7	Compaction of soil	All construction sites	<ul> <li>Construction vehicle, machinery and equipment shall move or be stationed in the designated area (RoW or Col, as applicable) only. While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, topsoil from agricultural land will be preserved as mentioned above.</li> </ul>	Contractor	SC/PIU
		Site clearance	Restricting tree cutting within corridor of impact	Contractor	SC/PIU
8	Ecology	Ancillary sites	<ul> <li>Minimizing tree cutting and vegetation clearance during site selection</li> <li>Preservation of trees within ancillary sites and avoiding impact on forest resources by providing buffer area from boundary of PF, RF, national park and wildlife sanctuary of 1km for locating construction plants, construction camp and 500 m for borrow areas</li> <li>Preservation of trees of ecological, socio-cultural importance</li> <li>Providing cooking at camp for discouraging and prohibiting use of fire-wood i.e. cutting of trees by the workers.</li> </ul>	Contractor	SC/PIU

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring		
					Agency		
9	Occupational health and safety of workers	Construction camp	<ul> <li>Water supply, sanitation, drainage and medical health facilities at campsite</li> <li>Providing and using PPEs</li> <li>Using working reverse horn for all construction equipment and vehicles</li> <li>Providing earth link circuit breaker (ELCB) for all electrical connections</li> <li>Maintaining first aid at construction sites</li> <li>Maintaining emergency response system</li> <li>Refer Appendix 13</li> </ul>	Contractor	SC/PIU		
10	Accidents and 10 safety		<ul> <li>Providing and maintaining traffic management comprising diversion; warning, guiding and regulatory signage; channelisers and delineators; lighting, flagmen; dust control system etc. as specified in the contract.</li> <li>Providing adequate light at construction zone if working during night time is permitted by the Engineer</li> <li>Conducting induction and periodic training for all workers and supervisors</li> </ul>			Contractor	SC/PIU
		Construction camp	<ul> <li>Conducting periodic mock drilling on critical accident prone activities</li> <li>Conducting periodic training for all personnel working at plant site</li> </ul>	Contractor	SC/PIU		
OPE	RATION PHASE	-			-		
1	Air Pollution	Vehicular gaseous emission	<ul> <li>Periodicals monitoring of air pollutants and if values exceed the standard limits, suitable mitigation measures to be taken.</li> </ul>	PIU	SPCB and Traffic Police		
2	Noise Pollution	Vehicular	<ul> <li>Periodical monitoring of noise level will be carried out. If values exceed the standard limits, suitable measures will be taken.</li> <li>Providing and maintaining signage on noise regulation at silence zones</li> </ul>	PIU	SPCB		
3	Road Safety	Traffic and Vehicles	Maintenance of standard Highway Safety Signage and Traffic Management.	PIU	PIU and Traffic Police		

S.No.	Environmental Issue	Location/sources	Mitigation Measures	Implementing Agency	Supervising & Monitoring Agency
		Lighting	Maintenance of road / flyover lighting.	PIU	PIU/Traffic police
4	Tree plantation	-	Roadside tree plantation three times of cutting	Forest Dept. / PIU	PIU
5	Contamination of Soil and Water Resources from Spills due to traffic & Accidents	Vehicular Traffic	<ul> <li>Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals.</li> <li>Spill of oil, fuel and automobile servicing units without adequate preventive systems in place to be discouraged.</li> </ul>	PIU	PIU
6	Soil Erosion and Sedimentation		<ul> <li>Maintaining the slope protection measures provided at stretches of high embankment and protection measures for bed scouring at cross drainage locations as per maintenance manual to be prepared before operation</li> </ul>	PIU	PIU
7	Maintenance of drainage system	-	<ul> <li>The drains will be periodically cleared to maintain storm water flow.</li> <li>Road drains will be cleared of debris before onset of every monsoon.</li> </ul>	PIU	PIU

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# ENVIRONMENTAL MONITORING PLAN

		MONITORING							RESPONSIBILITY	
Component	Project Stage	Parameters	Measurement Method	Standards	Location	Frequency	Duration	Implementation	Supervision	
Air	Construction Stage	PM 2.5 PM 10 SO <sub>2</sub> NO <sub>x</sub> CO	Methods of Measurement as prescribed in National Ambient Air Quality Standard (Appendix 8)	National Ambient Quality Standards (Appendix 8)	Hot mix plant /Batching plant Jamjuri Market, Khilpara Market, Dudhpuspa Magpuskarmi , Khilpara Village, Dudhpuspaini Village, Purba, Paltana Village, Sur Sundari Siksha Kendra, Paltana Primary Village 1 location	HMP - annual Once in the community areas during active construction	Continuous 24 hourly twice a week for Continuous	Contractor through approved monitoring agency PIU through	SC, PIU PIU	
	Stage	above		above	throughout the stretch during operation	year other than monsoon season	24 hourly twice a week (Tota	approved monitoring agency		

	_	MONITORING						RESPONSIBILITY	
Component	Project Stage	Parameters	Measurement Method	Standards	Location	Frequency	Duration	Implementation	Supervision
	Construction stage (surface water)	turbidity, DO, BOD, COD, TDS, TSS, Oil & Grease	Grab sample collected from source and analyzed as per IS : 2488 (Part 1- 5) methods for sampling and testing of Industrial effluents	Water quality standards by CPCB (Appendix 10)	Discharge point of camp and at Gomti River	Once in a Quarter for 18 months in camp and annual in Gomti River	-	Contractor through approved monitoring agency	SC, PIU
Water Quality	Construction stage (ground water)	All parameters of drinking water		IS: 10500, 1991 ( <b>Appendix 9</b> )	1 location at Camp site	Mothly	-	Contractor through approved monitoring agency	SC, PIU
	Operation Stage (surface water)	pH, temperature, turbidity, DO, BOD, COD, TDS, TSS, Oil & Grease and Pb	Grab sample collected from source and analyzed as per IS : 2488 (Part 1-5) methods for sampling and testing of Industrial effluents	Water quality standards by CPCB	1 location trough out the corridor will be monitored till end of construction period	half yearly for one year	-	PIU through approved monitoring agency	PIU

				MONITOR	RING			RESPONSIBIL	RESPONSIBILITY	
Component	Project Stage	Parameters	Measurement Method	Standards	Location	Frequency	Duration	Implementation	Supervision	
Noise levels	Construction stage	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 10-15 m from edge of pavement	Noise standards by CPCB ( Appendix 11)	Jamjuri Market, Khilpara Market, Dudhpuspa Magpuskarm i, Khilpara Village, Dudhpuspain i Village, Purba, Paltana, Paltana Village, Sur Sundari Siksha Kendra, Paltana Primary Village	Quarterly in construction camp Once in each village during peak construction	Readings to be taken at 15 seconds interval for 15 minutes every hour and then Leq should be estimated.	Contractor through approved monitoring agency	SC, PIU	
	Operation Stage	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 10-15 m from edge of pavement	Noise standards by CPCB ( <b>Appendix 11</b> )	1 location throughout the stretch during operation	Half-yearly for one year	Continuous 24 hours/ or for 1 full working day	PIU through approved monitoring agency	PIU	
Tree plantation	Operation stage	Rate of Survival	Physical verification	Ensuring at least 75% survival	Area of plantation along the road will be specified by PIU	For three years	-	Forest Dept.	PIU	

Pollutant	Concentration in ambient Air								
	Average	Industrial, Residential and other rural area	Ecologically Sensitive Area (Notified by Central Government)	Methods of Measurement					
SO <sub>2</sub> ug/m <sup>3</sup>	Annual* 24 hours**	50 80	20 80	<ul> <li>Improved West and Geake</li> <li>Ultraviolet Fluorescence</li> </ul>					
NO <sub>x</sub> ug/m <sup>3</sup>	Annual*	40	30 80	- Modified Jacob and Hochheiser					
PM <sub>10</sub> ug/m <sup>3</sup>	Annual*	60 100	60	- Gravimetric - TEOM - Beta Attenuation					
PM <sub>2.5</sub> ug/m <sup>3</sup>	Annual* 24 hours**	40	40	- Gravimetric - TEOM - Beta Attenuation					
Ozone (O <sub>3</sub> ) ug/m <sup>3</sup>	8 Hours** 1 Hour**	100 180	100 180	<ul> <li>UV Photometric</li> <li>Chemiluminescence</li> <li>Chemical Method</li> </ul>					
Lead ug/m <sup>3</sup>	Annual* 24 hours**	0.50 1.0	0.50 1.0	<ul> <li>AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper</li> <li>ED-XRF using Teflon filter</li> </ul>					
CO ug/m <sup>3</sup>	8 Hours** 1 Hour**	2000 4000	2000 4000	- Non Dispersive Infra Red Spectroscopy					
NH <sub>3</sub> ug/m <sup>3</sup>	Annual* 24 hours**	100 400	100 400	<ul> <li>Chemiluminescence</li> <li>Indophenol blue method</li> </ul>					
Benzene $(C_6H_6)$ ug/m <sup>3</sup>	Annual*	05	05	<ul> <li>Gas Chromatography based</li> <li>Continuous Analyzer</li> <li>Adsorption followed by GC Analysis</li> </ul>					
Benzo Pyrene- Particulate Phase only ug/m <sup>3</sup>	Annual*	01	01	<ul> <li>Solvent extraction followed by HPLC/GC analysis</li> </ul>					
Arsenic ng/m <sup>3</sup>	Annual*	06	06	<ul> <li>AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper</li> </ul>					
Nickel ng/m <sup>3</sup>	Annual*	20	20	<ul> <li>AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper</li> </ul>					

# **National Ambient Air Quality Standards**

Source: Gazette of India, Part II-Section -3-Subsection (i)

\* Annual Arithmetic Mean of minimum 1<u>04</u> measurements in a year taken twice a week 24-hourly at uniform interval.

\*\* 24-hourly / 8-hourly values or 0.1 hourly monitored values shall be complied with 98% of the time in the year. However, 2% of the time, it may exceed but not on two consecutive days.

SI. No.	Parameter and Unit	Desirable Limit	Permissible Limit in Absence of Alternate Source
1.	Colour (Hazen units)	5	25
2.	Odour	Unobjectionable	-
3.	Taste	Agreeable	-
4.	Turbidity (NTU)	5	10
5.	рН	5-8.5	No relaxation
6.	Total Coliforms (MPN/100 mL)	nil	-
7.	Pathogenic Organisms or Virus	nil	-
8.	TDS (mg/L)	500	2000
9.	Mineral Oil (mg/L)	0.01	0.03
10.	Free Residual Chlorine (mg/L)	0.2	-
11.	Cyanide (mg/L as CN)	0.05	No relaxation
12.	Phenol (mg/L C <sub>6</sub> H <sub>5</sub> OH)	0.001	0.002
13.	Total Hardness (mg/L as CaCO <sub>3</sub> )	300	600
14.	Total Alkalinity (mg/L as CaCO <sub>3</sub> )	200	600
15.	Chloride (mg/L as Cl)	250	1000
16.	Sulphate (mg/L as SO <sub>4</sub> )	200	400
17.	Nitrate (mg/L as NO <sub>3</sub> )	45	100
18.	Fluoride (mg/L as F)	1	1.5
19.	Calcium (mg/L as Ca)	75	200
20.	Magnesium (mg/L as Mg)	30	100
21.	Copper (mg/L as Cu)	0.05	1.5
22.	Iron (mg/L as Fe)	0.3	1
23.	Manganese (mg/L as Mn)	0.1	0.3
24.	Zinc (mg/L as Zn)	5	15
25.	Boron (mg/L as B)	1	5
26.	Aluminium (mg/L as AL)	0.03	0.2
27.	Arsenic (mg/L as As)	0.05	No relaxation
28.	Mercury (mg/L as Hg)	0.001	No relaxation
29.	Lead (mg/L as Pb)	0.05	No relaxation
30.	Cadmium (mg/L as Cd)	0.01	No relaxation
31.	Chromium (VI) (mg/L as Cr)	0.05	No relaxation
32.	Selenium (mg/L as Se)	0.01	No relaxation
33.	Anionic Detergents (mg/L MBAS)	0.2	1
34.	PAH (mg/L)	nil	-
35.	Pesticides (µg/L)	Absent	0.001
36.	Alpha Emitters (10 <sup>-6</sup> μc/mL)	nil	0.0001
37.	Beta Emitters (10 <sup>-6</sup> µc/mL)	nil	0.001

# Drinking Water Quality Standards (as per IS: 10500-1991)

Parameters	BOD mg/l	рН	<b>D.O. in</b> mg/l	Oil & Grease mg/l
CPCB standard <b>Class A</b> (drinking water without conventional treatment but after disinfections)	≤ 2.0	6.5 - 8.5	≥ 6.0	
CPCB standard <b>Class B</b> (for outdoor bathing)	≤ 3.0	6.5 - 8.5	5.0	
CPCB standard <b>Class C</b> (drinking water after conventional treatment and disinfections)	≤ 2.0	6 – 9	≥ 4.0	
CPCB standard <b>Class D</b> (for propagation of wild life, fisheries)		6.5 - 8.5	≥ 4.0	≤ 0.1
CPCB standard Class E (for irrigation)		6.0-8.5		

# Water Quality Criteria and Standards for Freshwater Classification (CPCB, 1979)

' --' Indicates not applicable/relevant

Area Code	Category of Zones	Limits of Leq in dB(A)	
		Day time*	Night time*
A	Industrial	75	70
В	Commercial	65	55
С	Residential	55	45
D	Silence Zone **	50	40

# **National Ambient Noise Standards**

Gazette Notification dated 26th December 1989. It is based on the weighted equivalent noise level (Leq).

\* Day time is from 6 am to 9 pm whereas night time is from 9 pm to 6 am

\*\* Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicles horns, loud speakers and bursting of cracking are banned in these zones

These noise standards have been given the status of statutory norms vide Noise Pollution (Regulation and Control) Rules, 2000. However, these rules have changed the periods for 'Day Time' and 'Night Time' to 6 a.m. to 10 p.m. and 10 p.m. to 6 am respectively.

# MANAGEMENT OF CONSTRUCTION PLANTS, EQUIPMENT AND VEHICLES PLANT MANAGEMENT

# Purpose

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

#### Site selection criteria

# Following criteria are to be met wherever possible for crusher and HMP:

- 1.5 km away from settlement, school, hospital on downwind directions
- 1.5 km from any archaeological site
- 1.5 km from ecologically sensitive areas i.e. forest, national park, sanctuary etc.
- 1.5 km from rivers, streams and lakes
- 500 m from ponds
- 250 m from State and National Highway boundary
- away from agricultural land
- preference to barren land

Concrete batching plant should be located at least 200 m from the settlement, preferably on leeward side, whenever possible.

The format for submission of details to the Engineer during finalisation of plant site is given as follows (**Site identification for Plants**).

#### **Statutory Requirements**

- Obtaining Consent-for-Establishment (CFE) under Air and Water Acts from the State Pollution Control Board (SPCB) before start of installation
- Obtaining Consent-for-Operation (CFO) under Air and Water Acts from the State Pollution Control Board (SPCB) before start of commissioning and trial run
- Complying with the terms and conditions laid down in the CFE and CFO, which generally include providing metallic road inside plant campus for movement of vehicles, 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 μg/m<sup>3</sup> or as shall be prescribed by SPCB.
- 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 1 m from the enclosure surface shall not exceed 75 dB (A).

# Pollution control measures

- Dust control measures in stone crusher plant i.e. water sprinkling at primary crusher and secondary crusher, conveyor & return belts, covered conveyor system, chute at outfall of aggregates, cyclone separator, wind braking wall etc.
- For HMP, ensure adequate stack height as stipulated in CFE, 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 CFE.

- 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 ground 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
- Pollution control measures for Diesel Generator (DG) set i.e. stack height, acoustic enclosure etc.
- Greenbelt along the periphery of plant site.

# SITE IDENTIFICATION FOR PLANTS

Date:

#### Construction Stage Report: One Time

#### Installed Capacity:

#### Location of Plant (Ch. & offset):

SI. No.	Item / Requirement	Details as per Actual
1	Predominant wind direction	
2	Size and area of the proposed plant site (m xm & Sq.m)	
3	Present land use (barren or fallow land having no prominent vegetation should be preferred)	
4	No dwelling units within 1.5km from the plant boundary in downwind direction	
5	Distance of nearest boundary of State Highways and National Highways (should be at least 250 m from the plant boundary)	
6	Sensitive areas such as religious places, schools/educational institutions, reserved / protected forest, sanctuary etc. within 1.5 km (should be nil)	
7	River/Stream/Lake within 1.5 km and ponds within 500 m	
8	No other trees of girth>0.3m present and will be affected (no tree should be affected)	
9	Width of Haul road (m)	
10	Total Length of Haul Road (km)	
11	Length of non-metal Haul Road (km) (should be as minimum as possible)	

# Documents to be attached:

- I. Site plan showing wind direction, haul road and other environmental features.
- II. Certified that the furnished information is correct and all relevant information as required is attached.

Contractor:

# CAMPSITE MANAGEMENT

#### Purpose

Campsite of a contractor represents the single potentially most polluting location during implementation of any road project. Air pollution may be caused by emissions from Crushers, Hot-Mix, and Concrete Batching Plants. Water pollution may be caused by discharge of sediment, oil & grease, and organics laden run-off from these plants and their ancillary facilities as well as workshops, residential quarters for the labor. Land may be polluted due to indiscriminate disposal of domestic waste or (accidental) release of hazardous solids from storage areas.

While the installation and operation of Crushers and Hot-Mix Plants are regulated by the respective Pollution Control Boards, the other sources described above usually do not appear to be causes of significant concern. Items to be considered for labor camps are mentioned briefly in Clause 105.2 (as part of 105: Scope of Work) of the Ministry of Road Transport and Highways (MoRTH) publication: Specifications for Road and Bridge Works. Some specific requirements for labor accommodation and facilities are to be met by the Contractor in line with Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. Currently, there is no one-point guidance regarding the environmental management aspects of the Contractor's campsite. This guideline on Campsites is designed to fill this gap.

# Scope

This guideline covers the Contractors' camp sites – whether used by in-house crew or by any sub-contractors' crew. It covers siting, operation, maintenance, repair and dismantling procedures for facilities for labor employed on project (and ancillary) activities as well as equipment and vehicles. *It does not include siting, operation, maintenance, repair and dismantling of major plants – Hot-mix Plant, Concrete Batching Plant, Crusher or Wet Mix Macadam Plant.* 

I. Siting, Establishing, Operation and Closure of Construction Camp

# 8. Potential Environmental Impacts

Construction camps require large areas for siting facilities like major plants, storage areas for material, residential accommodation for construction labor and supervisors, and offices. Removal of topsoil and vegetation from the land to be utilized for camps is the first direct impact of any such establishment. In addition, local drainage may be impaired if proper drainage is not effected by grading. Other impacts may include damage to ecologically important flora and fauna, if campsites are located close to such areas. Water pollution because of discharge of sediment, fuel and chemicals is also a possibility. Pollution of land due to indiscriminate disposal of construction wastes including scarified pavement, concrete and even substantial quantities of domestic wastes from residential areas can also be potentially disastrous, especially if the site is reverted to its original use after the project (mostly agriculture).

#### **Mitigation Measures**

#### 9. Siting of Construction Camps

The following guidelines will assist the Contractor to avoid any environmental issues while siting construction camps:

• Maintain a distance of at least 1.5 km from boundaries of designated Reserved Forests, Sanctuary or National Park area for locating any temporary or permanent camps.

- Maintain 1.5 km from river, stream and lake and 500m from ponds
- Maintain 250 m from the boundary of state and national highways
- Locate facilities in areas not affected by flooding and clear of any natural or storm water courses.
- Locate campsites in the (most prevalent) downwind direction of nearest village(s). The boundary of the campsite should be at least 1.5 km from the nearest habitation so that the incoming labor does not stress the existing local civic facilities.
- The ground should have gentle slope to allow free drainage of the site.
- Recorded consultations should be held with residents of the nearest settlement and/or their representatives to understand and incorporate where possible, what they would like to see within their locality.

# 10. Establishment, Operation, and Closure of Camps

- The facilities within the camp site should be laid out so that the separation distances suggested in other guidelines are maintained. A notional lay-out of the facilities except the major plants is included in this guideline.
- Topsoil from the area of the plant shall be stored separately for the duration of the operation of the camp and protected from being washed away, unless agreed otherwise in writing with the owner. If stored, it will be returned on to its original location at the time of closure of the site.
- The Contractor shall prepare, make widely available (especially to staff responsible for water and material management), and implement a Storm water Management Plan (SWMP) for (all) the site(s) following approval of the same by the Engineer.
- The Contractor shall prepare an Emergency and Spill Response Plan as per the requirements of <u>Appendix 1 to Clause 501</u> of Specifications for Road and Bridge Works to cover the spillage of bitumen and/or chemicals like retarders, curing compounds, etc.
- The Contractor shall prepare a Waste Management Plan describing the types and quantities that are likely to be generated from within the camp site, with the period and duration during the construction schedule; methods to be adopted to minimize these; methods of removal, treatment and (on-site or off-site) disposal for each type; as well as location of final disposal site, if any.
- The Contractor shall provide safe ingress and egress for vehicles from the site and public roads and shall not impact existing through traffic.
- Water tankers with sprayers must be available at the camp site at all times to prevent dust generation.
- In case of stockpiles of stored material rising higher than wind-breaking perimeter fencing provided, sprinklers shall be available to prevent dusting from the piles during windy days.
- On completion of works, the Contractor shall restore the site to the condition it was in before the establishment of the campsite, unless agreed otherwise in writing with the owner(s) of the site(s). If such a written agreement has been made, the Contractor shall hand over the site to the owner(s) in accordance with such an agreement.

# Equipment and Vehicle-related issues

#### Potential Environmental Impacts

The maintenance and repair of equipment and vehicles in Contractor's camp are activities that can have significant adverse impacts if not carried out properly. The concern mainly arises from discharge of wash water contaminated with oil and grease, whether from washing of vehicles or degreasing of equipment and vehicle parts. Vehicle washing, especially dirt from tires, also gives rise to sediment-laden run-off. No such discharges should be directly allowed into surface water bodies since they can be harmful to aquatic species.

# Mitigation Measures

# 1. <u>Vehicles</u>

- All vehicles used by the Contractor must have copies of currently valid Pollution Under Control Certificates displayed as per the requirement of the Motor Vehicles Department for the duration of the Contract.
- All vehicles and equipment will be fitted with silencers and/or mufflers which will be serviced regularly to maintain them in good working condition and conforming to the standard of 75dB (A) at 1m from surface of enclosure.

# 2. Workshop and Maintenance areas

- These areas must have impervious flooring to prevent seepage of any leaked oil & grease into the ground. The area should be covered with a roof to prevent the entry of rainwater.
- The flooring shall be sloped to from both directions to one corner where an oiland-grease trap with sufficient capacity should be installed. All discharges from the workshop area must pass through the trap to remove the floating oil and grease before entering the drainage system of the site. The trap should be designed to provide a hydraulic residence time of about 20 minutes for the peak hourly discharge anticipated from the area (as per following figure).
- Alternatively, degreasing can also be carried out using mechanical spray type degreaser, with complete recycle using an enclosure with nozzles and two sieves, coarse above and fine below, may be used as shown in the adjacent photograph. This arrangement will require some initial investment and running cost for the pump, but the payback period, in terms of the use of diesel, under Indian conditions, has been reported to be less than 1 year.



Figure: Workshop Area Pollution Control

 All the waste oil collected, from skimming of the oil trap as well as from the drip pans, or the mechanical degreaser shall be stored in accordance with the Environment Protection (Storage and Disposal of Hazardous Wastes) Rules, 1989. For this purpose, metallic drums should be used. These should be stored separately in sheds, preferably bunded. The advantage of this arrangement is that it allows for accurate accounting in case the waste material is sold to oil waste recyclers or other users like brick-kiln owners who can burn such inferior fuel. • A separate vehicle washing ramp shall be constructed adjacent to the workshop for washing vehicles, including truck mounted concrete mixers, if any, after each day's construction is over, or as required. This ramp should have an impervious bottom and it should be sloped so that it drains into a separate chamber to remove the sediment from the wash water before discharge. The chamber should allow for a hydraulic residence time of about 10 minutes for discharge associated with the washing of each truck.

#### Following figure shows an outline sketch for a sedimentation chamber.



Figure: Sedimentation Chamber for vehicle washing ramp discharge

#### **Facilities for Labour**

#### **Potential Environmental Impacts**

The sudden arrival and relatively longer duration of stay of construction crew can cause substantial strain on the existing infrastructure facilities like water supply, sanitation and medical care, especially in rural areas. Pollution from domestic wastes can affect local sources of water supply and may harm the crew themselves as well as local residents. Improper sanitation and inadequate health care also potential bottlenecks that the Contractor can eliminate with relatively little effort.

#### **Mitigation Measures**

It should be emphasized that the Indian Law requires that the Contractor provide several facilities to for the workers as per Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. Some of the provisions described herein are more stringent to act as benchmark for improved environmental performance of road projects:

- The contractor shall provide free-of-charge temporary accommodation to all the labour employed for the project. The accommodation includes separate cooking place, bathing, washing and lavatory facilities. At least, one toilet will be provided for every 35 people and one urinal will be provided for every 20 persons. More toilets and/or urinals may have to be provided if the Engineer decides that these numbers are insufficient. In case female labourers are employed, separate toilet and urinals will be provided in locations clearly marked "Ladies Toilets" in a language understood by most labourers.
- The contractor shall ensure the supply of wholesome water for all the labour, including those employed by any other agency working for the contractor. These locations will be marked "Drinking Water" in the language most commonly understood among the labour. In hot season, the contractor shall make efforts to ensure supply of cool water. No water point shall be located within 15 m of any washing place, urinal, or latrine.
- The contractor shall ensure that adequate cooking fuel, preferably kerosene or LPG, is available on-site. The contractor will ensure that wood/ coal are not used as fuel on the site. Workers need to be made aware of this restriction. In cases where more than 250 labours are employed, canteen facility should be provided by the Contractor.
- A crèche must be provided in each campsite where more than 50 female labourers are employed, whether directly or indirectly, for the project or its ancillary activities.
- Contractor must provide adequate facilities for first-aid treatment at the campsite. A doctor / ambulance should be available on call for the duration of project implementation.
- The contractor shall obtain the approval of the Engineer for these facilities within 30 days of mobilization.









# Layout of a Construction camp

# MANAGEMENT OF CONSTRUCTION WASTE DEBRIS DISPOSAL

#### Purpose

- To maximize re-use of material generated during construction and
- To avoid environmental hazards due to improper disposal of construction waste material.

# Procedure

# The following procedures should be followed for upkeep of storage and disposal sites;

- Contractor shall maintain register for keeping records on kilometer-wise quantities of material generated during grubbing, stripping, excavation and scarifying;
- Contractor shall re-use construction material to the extent possible based on engineering
  properties. Possible re-use areas are fill sections, embankment slope, village approach
  roads etc. Debris without bitumen could be used for backfilling of quarry / borrow areas
  as recommended by the Engineer. At locations identified for dumping of residual
  bituminous wastes, the dumping shall be carried out over a 60mm thick layer of rammed
  clay so as to eliminate the possibility of the leaching of the wastes into the ground water.
  The contractor shall ensure that the filled area is covered with a layer of preserved
  topsoil layer of preserved topsoil.
- Contractor shall estimate the chainage-wise quantities of various waste material to be disposed of;
- Contractor shall restrict waste disposal strictly at approved site/s only;
- Contractor shall prepare a plan including detailed lay out plan and cross-section for disposal of debris and bitumen waste and get approval of the same by the Engineer;
- Bentonite slurry or similar debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area;
- Contractor and Engineer shall ensure that disposal areas are properly treated as per agreed plan;
- Contractor and Engineer's representatives shall undertake joint weekly inspection to ensure compliance of various environmental requirements.
- Engineer's representatives shall issue non-compliance if disposal site is not managed as per agreed plan;
- All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the SC.

# Site Inspection

Weekly joint site inspection shall be undertaken for all the storage areas. The details of attributes, which are to be inspected, are given as follows. The Contractor shall ensure compliance of the requirements.

Attributes	Requirements
Construction material generation and re-use	<ul> <li>Segregating debris and bitumen during generation;</li> <li>Segregating re-usable portion of debris and bitumen and storing preferably near areas of re-use; and</li> <li>Temporary storage of waste material at sites as directed by the Engineer.</li> </ul>
Waste disposal	<ul> <li>Disposal of waste material at approved disposal site within a week of generation;</li> <li>Disposal site should be properly demarcated;</li> <li>Proper leveling / grading at disposal site/s;</li> <li>Recommended / agreed safeguard measures to avoid ground water contamination by leachate from disposal of scarified material are to be implemented;</li> <li>Recommended / agreed safeguard measures to avoid soil erosion are to be implemented;</li> <li>Recommended / agreed plan for surface treatment of waste disposal site/s are to be implement.</li> </ul>

# Details to be inspected for Monitoring Construction Material Reuse & Disposal

# **BORROW AREA MANAGEMENT**

# Purpose

Borrow areas are generally required to provide material for road construction sites, can have significant adverse environmental effects, especially on ecologically sensitive areas. Borrow areas 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 social impacts of borrow areas.

# Scope

# These guidelines for borrow areas cover:

- statutory approvals
- environmental and social impacts of borrow areas
- selection of borrow areas
- operation of borrow areas
- rehabilitation of borrow areas

# 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 borrow areas are:

- 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
- natural beauty of the landscape being affected by excavations and the removal of vegetation

- natural drainage systems in the area being affected by excavations
- agriculture land and productive soils being lost, especially in paddy field areas

Borrow areas are not generally specified in Contract documents but rather it is generally the responsibility of Contractors to identify borrow areas and obtain the necessary consent from land owner and approval from SC.

In IRC: 10 and Clause 305.2.2.2 of MoRTH Specification, exclusive guideline has been given for borrow areas located alongside the road and only some of the requirements have been indicated for borrow areas located outside the road land. Following guideline is proposed to supplement the existing stipulation in IRC: 10 and Clause 305.2.2.2 of MoRTH Specification for Roads and Bridge Works:

# Location

- Identify areas having present land use as barren land, riverside land. Otherwise, unirrigated agriculture land or land without vegetation and tree cover;
- Prefer borrow areas on bed of irrigation water storage tank;
- Prefer areas of highland with respect to surroundings;
- Avoid locating borrow area close to any road (maintain atleast 30 m distance from ROW and 10 m from toe of embankment, whichever is higher);
- Should be at least 1.5 km away from inhabited areas;
- Maintain a distance of about 1.5km from ecologically sensitive area i.e. Reserve Forest, Protected Forest, Sanctuary, wetland etc.;
- Maintain a distance of about 1.5 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;
- Depth of excavation should be decided based on natural ground level of the land and the surroundings, and rehabilitation plan. In case higher depth of excavation is agreed with backfilling by unsuitable excavated soil (from roadway), then filling should be adequately compacted except topsoil which is to be spread on topmost layer (for at least 20cm thick).

# Operation

- Controlled operation as per agreed / approved plan;
- Preservation of topsoil at designated areas e.g. corners of the area etc.;
- Maintain necessary buffer zone in all directions and go for vertical cut within this area. Final cut slope should be maintained within the buffer zone;
- Step-wise excavation if borrow area is located on inclined area having more than 2% slope;
- Restricting excavation up to 2m for each stages of operation if allowed depth is more;
- Avoid cutting of any tree of girth size > 30cm<sup>6</sup>. if any tree cutting is inevitable, prior permission (written) from the competent authority should be taken and compensatory plantation has to be raised.

# Rehabilitation

- Prior approval of Rehabilitation Plan considering terrain, land use and local need;
- Restricting operation as agreed by landowner and approved by the Engineer;

<sup>&</sup>lt;sup>6</sup> Plant having girth size more than 30cm is considered as tree.

- Rehabilitation within agreed timeframe and before taking over;
- Integrate debris disposal and borrow area redevelopment.

#### Management Procedure

The important aspects of this procedure are:

- The first and foremost thing is to have tentative estimate of borrow material requirement chainage-wise. For this, BoQ quantity for earth work, which is given as total quantity for the entire package/milestone, has to be distributed chainage-wise. The requirement of borrow material chainage-wise then has to be estimated based on the suitability of roadway excavation material for reuse and BoQ.
- Contractor to site borrow areas fulfilling environmental requirements and obtaining one time approval of the Engineer both on quality as well as environmental consideration thereby integrating environmental safeguard measures into day-to-day activities;
- Contractor to submit environmental information in prescribed format for obtaining Engineer's approval, as given in the following format (Borrow Area Identification). The format has been so designed that it stipulates the requirements as well as what is actual for each borrow areas and could be easily understood by any person, whoever in-charge of identifying borrow areas;
- Contractor to submit Borrow Area Layout Plan as attachment to the format showing the land use of the proposed and surrounding area along with the presence of other environmental features such as water bodies, forests, settlement, temple and any sensitive receptor i.e. health and educational institution, roads etc. within a radius of 1.5km area from the boundary of the borrow area;
- Contractor to prepare and submit Block Contour Map of each borrow area (especially which are located close to road and on undulating terrain) for deciding on operation and redevelopment plan;
- Contractor to prepare Operation Plan and submit as attachment to the format including cross sections on both directions (x,y) mentioning natural ground level, depth of topsoil (if any), total depth of excavation, cut side slope and bed slope;
- Contractor to prepare Redevelopment Plan and submit as attachment to the format include cross sections on both directions (x,y) mentioning natural ground level, excavated profile, finished profile after redevelopment etc.;
- Contractor to maintain Borrow Material Register;
- Periodic joint inspections of each borrow area until rehabilitation is complete as agreed and approved.
- The checklist for periodic inspection is given in this appendix.

#### **BORROW AREAS IDENTIFICATION**

Construction Stage Report: One Time Location of Borrow Area (Ch. & Offset): No.: Date: Revenue Survey

SI. No.	Item / Requirement	Details as per Actual (to be filled by Contractor & checked by Engineer)
1	Date of Borrow Area planned to be operational	
2	Current Land use (preference to barren land, riverside land, otherwise, un-irrigated agriculture land or land without tree cover)	
3	Size (Sg.m) and area (m x m) of Borrow Area	

SI.	Item / Requirement	Details as per Actual
NO.		Contractor & checked
4	Proposed maximum depth of pit in m (IRC 10 & Clause 305.2.2 of MoRTH Spec.)	
5	Details of riverside borrow area (inner edge should not be less than 10m from the toe of the bank and bottom of pit should not cut the imaginary line of 1:4 from embankment top)	
6	Borrow area in cultivable land (should be avoided or restricted to total depth of 45cm including preservation of 15cm topsoil)	
7	Quantity Available (Cum)	
8	Quantity of top soil to be removed (Sq.m & depth in cm)	
9	Details of preservation (storage) and management (re-use / re-laid) of top soil	
10	Width of Haul road (m)	
11	Total Length of Haul Road (km)	
12	Length of Non-metal Haul Road (should be as minimum as possible)	
13	No of settlements within 200 m of Non-metal Haul Road (should be as minimum as possible)	
14	Distance from settlement (should be minimum 1500 m)	
15	Should be away from water bodies. Give details of water bodies within 250 m.	
16	Details of water sources for dust suppression	
17	Quantity of water required for dust suppression i.e. sprinkling at borrow area and on haul road (Cum)	
18	Availability of water required for dust suppression (Cum)	
19	Details of ecologically sensitive area i.e. RF, PF, Sanctuary etc. within 1500m (should be nil)	
20	Details of school, hospital and any archaeological sites within 1500m (should be nil)	
21	Distance from nearby road embankment, fence line / boundary (should be minimum 30m from ROW and 10m from toe of embankment, whichever is higher)	
22	No of Trees with girth more than 0.3 m (No tree should be affected)	

# Documents to be attached:

- 1) Site plan and layout plan of borrow area;
- 2) Proposed borrow area operation and redevelopment plan;
- 3) Written consent from competent authority for use of water for dust suppression
- 4) Written consent of landowner on agreed operation and redevelopment plan

Certified that the furnished information is correct and all relevant information as required is attached

Contractor's Representative:

# **CHECKLIST FOR MONITORING BORROW AREA OPERATION & MANAGEMENT**

Attributes	Requirements	
Access road	✓ Only approved access road shall be used	
Top soil preservation	<ul> <li>Top soil, if any, shall be stripped and stored at corners of the area before start of excavation for material collection;</li> </ul>	
	$\checkmark$ Top soil should be re-used / re-laid as per agreed plan	
Depth of excavation	✓ For cultivable (agriculture) land, total depth of excavation should be limited to 45 cm including top 15 cm for top soil preservation;	
	✓ For riverside borrow area, the depth of excavation shall be so regulated that the inner edge of any borrow pit should not be less than 10m from the toe of the bank and bottom of pit should not cut the imaginary line of 1:4 from embankment top;	
	✓ If borrow area is located within 1500 m of towns or villages, they should not exceed 30 cm in depth and should be properly drained;	
	<ul> <li>✓ Borrow areas close to ROW should be rectangular in shape with one side parallel to center line of the road and depth should be so regulated that it should not cut an imaginary line having slope of 1 in 4 projected from the edge of the final section of the embankment.</li> </ul>	
Damage to surrounding land	<ul> <li>Movement of man &amp; machinery should be regulated to avoid damage to surrounding land.</li> </ul>	
Drainage control	age control <ul> <li>The surface drainage in and around the area should be merged surrounding drainage;</li> </ul>	
	✓ No water stagnation shall occur.	
Dust suppression	✓ Water should be sprayed on <i>kutcha</i> (earthen) haul road twice in a day or as may be required to avoid dust generation during transportation of material;	
	✓ Depending on moisture content, 0.5 to 1.5% water may be added to excavated soil before loading during dry weather to avoid fugitive dust emission.	
Covering material transport vehicle	✓ Material transport vehicle shall be provided with tarpaulin cover	
Personal Protective Equipment	✓ Workers should be provided with helmet, gumboot and air mask and their use should be strictly enforced.	
Redevelopment	✓ The area should be redeveloped within agreed timeframe on completion of material collection as per agreed rehabilitation plan.	

**Recent Policy Regarding Borrow Areas:** Ministry of Environment & Forest (MoEF) vide O.M. No. L-11011/47/2011-IA.II(M) dated 18th May, 2012 in view of the Order of Hon'ble Supreme Court dated 27.2.2012 in I.A. no. 12-13 of 2011 in SLP (C) no. 19628-19629 of 2009 in the matter of : Deepak Kumar etc. Vs State of Haryana and others has informed that it has been decided in the MoEF that: (i) All mining projects of minor minerals including their renewal, irrespective of the size of the lease would henceforth require prior environment clearance. (ii) Mining projects with lease area up to less than 50 ha including projects of minor mineral with lease area less than 5 ha would be treated as category "B" as defined in the EIA Notification, 2006 and will be considered by the respective State/ UT Level Environment Impact Assessment Authority (SEIAAs). (iii) All the respective SEIAAs in

dealing with the applications regarding environment clearance should be disposed within ten days from the date of receipt of the applications in accordance with law. All State Governments should take action as per the decision of the MoEF