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## ABBREVIATIONS

ASI	Archaeological Survey of India
BOD	Biological Oxygen Demand
Cl	Chloride
CO	Carbon monoxide
COD	Chemical Oxygen Demand
CoI	Corridor of Impact
CPCB	Central Pollution Control Board
EP	Entitled Persons
ERMP	Environmental and Resettlement Management Plan
ESMP	Environmental and Social Management Plan
GoI	Government of India
GoTN	Government of Tamil Nadu
HC	Hydrocarbons
HD	Highways Department
ILO	International Labour Organisation
INR	Indian Rupees
IRC	Indian Roads Congress
IS	Indian Standards

LA	Land Acquisition
MoEF	Ministry of Environment and Forests
MoRTH	Ministry of Road Transport and Highways
NGO	Non Governmental Organisation
NH	National Highway
No <sub>x</sub>	Oxides of Nitrogen
PIU	Project Implementation Unit
R&R	Resettlement and Rehabilitation
RAP	Resettlement Action Plan
RoW	Right of Way
RPM	Respirable Particulate matter
SO <sub>2</sub>	Sulphur Dioxide
SOS	Strategic Options Study
SPCB	State Pollution Control Board
SPM	Suspended particulate matter
TDS	Total Dissolved Solids
TNRSP	Tamil Nadu Road Sector Project
WB	World Bank

## ENVIRONMENTAL AND RESETTLEMENT MANAGEMENT PLAN FOR MAINTENANCE ROADS

### 1.1 INTRODUCTION

The Tamil Nadu Road Sector Project (TNRSP) is an endeavour of the Highways Department (HD), Government of Tamil Nadu, to carry out upgradation of 732.2 km and maintenance of another 2600 km of state roads with World Bank (WB) loan assistance.

The project preparation for the TNRSP began with the Strategic Options Study (SOS) in 1995. Project Co-ordinating Consultants led by M/s. Kinhill Pty. Ltd. (now part of Haliburton group), Australia were procured in 1997 to prepare and assist the PIU in the design and construction stages of the project. Feasibility Studies, including engineering analysis and design, social and environmental screening and economic evaluation were carried out. Based on the findings of these studies, corridors identified for maintenance works are listed in **Table-1**.

**Table 1: List of Maintenance Corridors**

Name of the Maintenance Corridor	Length (Km)	Name of the Maintenance Corridor	Length (Km)	Name of the Maintenance Corridor	Length (Km)	Name of the Maintenance Corridor	Length (Km)
Kosasthalayar Puthur	18.2	DindigulNatham Karaikudi	13.16	Kolhills Ghat Road	10.5	Chennai Trichy Dindigul	2.6
Thirumazhisai Sathyavedu	22.7	Palani Dharmapuram(E)	8	Tiruchengode Pallipayalam	6.2	Thuraiyur Perambalur	3
Vealchery Bypass	1.9	Dindigul Karur	26.4	Edapadi Magudanchavadi	7.2	Musiri Pulivilam	12
Taramani Link Road	3.63	Karur Velliyanai Dindigul	5	Pandamangalam Velur	2.4	Thanjavur Sayalkudi	66.39
Maramalong Bridge Irumbuliyur	6	Palayam Thevaram	1.8	Rasipuram Treichengode	5	Pattukottai Muthupet	8.2
Mount Madipakkam Road	8.6	Bodi Thevaram Road	19.6	Trichengode Paramathy	9.8	Peraurani Sethubavachatran	4
Bukkathurai Uthiramerur	12.6	Andipatty Varusa Nadu Road	29.2	Old NH 7	9.9	Thanjavur Vallam	2
Cuddalore Chittor	31.2	Ramanathapuram Nainarkol Melur	36.8	Erode Karur	18.7	Thittai Melatoor	9.7
Pallikonda Palamaneri	17.8	Ramanathapuram Melur	10.2	Manapalai Kulithalai	30	Grand Annicut Cauveripattinam	11
Katpadi Venkatagirkottah	1	Dindigul Tirupathur	39.48	Karur Vanagal	6	Tharagambady Myladuthurai	18.4
Wallajah Sholingur	19	Thanjavur Patukottai	11.2	Aravakurichy Pungambady	4.6	Myladuthurai Pattavarhti	13
Ambur Sathgur	20	Kammanagudi BR Kundrakud	7.2	Vaiyampatti Mylampatti	10	Thiruthurai Poondi Vedharanyam	23.6
Chittor Thiruthani	5.4	Parthibanur Arrupukottai	29.17	Paramathy Noyyal Road	10.4	Mettur Palakkanathu	17
Municipal Bypass	2	Sivilliputhur Parthibanur	72.8	Sattur Sivakasi Srivilliputhur	12	Ooty M Palayam Erode	63.4
Arcot Tindivanam	11.6	Arupukkottai Valnokkam	71.67	Rajapalayam Keelarajakularaman	16.8	Erode Perundururai	16.8
Cuddalore Vchalam Salem	46.2	Mudukulathur Kamuthi	18.4	Alagapuri Virudhunagar	20	Palladam Dharamapuram	12.4
Kallakurchi Sankarapuram Tiruvanamalai	40.502	Kamuthi Sayalakkudi	26.6	Watrap Maharalpuram Alagapuri	17.4	Pollachi Dharapuram Karur	7
Villupuram Mambalampattu Tirukovillur	13.4	Salem Thirupathur	9.6	Paruvakudy Vilathikulam Vembar	41	Podanur Junction Road	2.6
Mailam Pandy Road	10.7	Musiri Thuraiyur Attur	23.6	Tiruchandur Shencottah	33	Pollachi Valparai	47.4
Kallakurchi Koothakudy	24.8	Attur Veeraganur	7	Srivaikuntam Pudukottai	32.2	Tirupur Vijaya Mangalam	5.8
Vellimedpettai Mailam	21.6	Salem Vaniyambadi	37.4	Tirunelveli Shencottah Quilon	66.4	Dharmapuram Tiruppur	25.4
Pandy Krishnagiri	17.9	Krishnagiri Ranipet	1.25	Rajapalayam Tirunelveli	71.61	Udumalpet Tiruppur	38.2

Name of the Maintenance Corridor	Length (Km)	Name of the Maintenance Corridor	Length (Km)	Name of the Maintenance Corridor	Length (Km)	Name of the Maintenance Corridor	Length (Km)
Cuddalore Tirukollur Anaicut	27.7	Denkanicottah Kahamangalam	3.8	Paruvakudi Ettayapuram	39.2	Nagapattinam Gudalor Mysore	22.8
Trichy Chidambaram Road	30.6	Dharmapuri Hoggenakkal	4.4	Old Courtalam Falls Road	2.4	Calicut Vythiri Gudalor	22.8
Vridhachalam Tholudur	16	Dharmapuri Morappur	3.4	Pavoorchatram Vellakal Surundai	8.8	Coonoor Kattabettu	13.8
Thiruvanthipuram Arni	21.2	Dharmapuri Papparpatti	3.2	Athivuthu Surandai	12	Coonoor Kundah	23.4
Kannamangalam Arni	17.2	Sholagiri Berigal	1.4	Ambasamudram Papanasam	4.6	Redhills Thiruvallur	7.4
Acharapakkam Vandavasi	3	Krishnagiri Royacotta	5.9	Aralvaimuzhi Rajakkamangalam Colachel	5	Nagari Pallipet	5.6
Vandavasi Polur Road	13	Cauveripattanam Kakkangal	9	Parasery Colachel	14.8	Thanjavur Pattukottai	13.89
Perambalur Manamadurai	120.13	Hosour Denkanicotta	6	Marathandom Pechiparai	9	Dharmapuri Morappur	2
Vikravandi Kumbakonam	13.2	Trichy Namakkal	42.8	Kottar Dharmapuram	4	Aravoimozhi Rajakkamangalam Colachel	4
Vikravandi Kumbakonam Thanjavur	23.4	Namakkal Mohanur	3.6	Trichy Pudukottai	24.52	Kumbakonam Adirampattinam	17.95
Perambalur Attur	26.2	Omalur Sankari	17.8	Aranthangi Kattumvadi	25.8	Musuri Tpet Murugur	19.6
Thirumangalam Usilampatti	26	Rasipuram Attur	10.6	Thanjavur Mannargudy	16.4	Peravurani Sethubhava Chattaram	5.2
Dindigul Karaikudi	4	Nainamalai Sedamangalam	8.6	Thanjavur Vaduvor Mannagurdy	9.5	Kumbakonam Karaikal	3.2
Alampatti Sedhapatti	5.8	Tiruchengode Ariyanur	11.64	Kumbakonam Adirampattinam	23.85	TOTAL LENGTH IN KM	2621
Pudupathy Mangalveru	8	Komrapalayam Edapadi	13.6	Poonphottam Nachiyarkoil	20.8		
Kallikudi Kallupatti	4.6	Velur Mohanur	11.7	Nagore Vettar	8		

Location map of the above project roads are enclosed as **Map 1.1**.

# Map 1.1      Location of Maintenance Corridors

## 1.2 MAINTENANCE WORKS

No widening of the existing roads or any other construction works are envisaged under maintenance component. These would mainly consist of pavement improvement. Depending upon the condition of existing road the following types of treatment for improving the pavement are suggested:

- Patch plus 60mm overlay @ 5.5 IRI and subsequent 40mm overlay @ 4.5 IRI
- Patch plus 80mm overlay @ 5.5 IRI and subsequent 25mm overlay @ 4.5 IRI
- Patch plus 100mm overlay @ 5.5 IRI and subsequent 25mm overlay @ 4.5 IRI
- Rehabilitation of pavement plus 40mm overlay @ 4.5 IRI
- Rehabilitation of pavement plus 25mm overlay @ 4.5 IRI
- Patch plus rehabilitation of pavement plus 40mm overlay @ 4.5 IRI

HD is the executing agency for this project and will be responsible for the overall preparation, implementation and operation of the project. Construction work will be supervised by the Divisional offices of the HD and shall be carried out by contractors selected under national competitive bidding framework.

### 1.2.1 SCREENING METHODOLOGY AND CORRIDOR SELECTION

The screening analysis was done by taking the following factors:

- Land acquisition
- Clearing of squatters and encroachers
- Relocation of Common property resources
- Encroachment on to Environmental Resources:
  - Reserved forests
  - Wildlife Sanctuaries, National Parks, bird sanctuaries and biosphere reserves
  - Water bodies and other environmentally sensitive areas
  - Landslides

In case of higher magnitude the corridors are excluded from maintenance component. The screening guidelines will be used in case of magnitude of impacts could not be readily perceived, the corridors should be recommended for further analysis as per the impact magnitudes given in the **Table-1** of **Appendix I(A)**. **Figure 1.1** shows the methodology adopted for selection of maintenance corridors. Corridors likely to have adverse environmental impacts will be excluded from consideration, screened as per the exclusion criteria mentioned in **Appendix –I(B)**. The Engineer of design consultants for maintenance corridors shall carry out the screening exercise. Corridors obtained after exclusion and screening and are likely to have minor impacts have to be subjected to further analysis as per **Appendix – I(A)** by the HD. Corridors for which impacts could not be readily quantified, but could be taken up with mitigation measures, approximate costs of mitigation shall be worked out and priority of corridors have to be decided by the HD. Final corridors so obtained shall be selected for maintenance.

## Figure 1.1: Insert Flow Chart

## **1.3 ENVIRONMENTAL IMPACTS OF MAINTENANCE**

### **1.3.1 IMPACT ON PHYSICAL RESOURCES**

Though no significant earthwork is expected due to the proposed maintenance activities, there would be a requirement of borrow materials for the project. The collection of material required from borrow pits and quarry sites shall be as per IRC guidelines. Yields from the existing borrow pits and quarries are sufficient to meet the requirement for construction of the road. Therefore no adverse impacts on physical resources due to the maintenance works are anticipated.

### **1.3.2 IMPACT ON FLORA**

As maintenance of the corridors does not include any land take no adverse impact on the roadside plantation or the flora outside the Corridor of Impact is anticipated. The only impact likely is clearing of vegetation and ground cover within the existing formation, which may need to be removed at certain locations. No direct adverse impact on flora is expected.

### **1.3.3 IMPACT ON FAUNA**

The corridors included in maintenance are all existing alignments. None of the maintenance routes pass through wildlife sanctuaries or national parks except Mundanthurai Wild life Sanctuary. However, there is one location where spotted deer crossing is marked in a Reserve Forest (Km 73.8-75.8 Salem - Vaniyambadi road). During the operation period, the impacts arise mainly from the increased accessibility of the area, which can lead to increased human influence. Adequate safety measures have been worked out for the minimisation of adverse impacts during construction.

### **1.3.4 IMPACT ON GROUND WATER RESOURCES**

The proposed works in case affects ground water resources as hand pumps, well etc. the resources lost would be relocated through consultation with local people.

### **1.3.5 IMPACT ON HUMAN USE VALUES**

As the pavement will be re-laid only within available clear space and no land take is involved, no severe impacts on the roadside structures are envisaged. At some place few encroachments are (both commercial and residential) marked within the RoW. These are at Km 12.2,12.4,12.6,21.2,22.6,23.6,25.4,28.2 & 28.4 of Dindigul Karur corridor. 84 number of encroached structures are existing at Km (26.0-26.8), 328 (Encroachments at Km 31.0-34.0) & 68 (Encroachments at Km 38.0-43.6) at Erode Karur corridor. During construction, care shall be taken not to affect any structure and maintenance will be carried out within the available RoW.

## **1.4 SOCIAL IMPACTS OF MAINTENANCE**

No activity, which might end up disturbing the existing socio-economic setting of the areas, is expected to occur outside the clear space already available along the existing pavements. In particular, the following are expected not to occur either during pre-construction or construction periods.

### **1.4.1 LAND ACQUISITION**

Since the construction activity is expected to occur only within the available clear space and existing formation width, there will be no land acquisition. Normally, there will not be even temporary land acquisition and the traffic will move within the constrained sections when hard shoulders are being constructed.

### **1.4.2 BUILDINGS**

No private buildings will be affected though they may lie in the RoW. Hard shoulders will be provided without affecting any private or public buildings.

### **1.4.3 UTILITIES**

None of the roadside utilities, including but not limited to electricity lines, overhead telephone lines or underground water pipelines, will be affected. The project will ensure that the downstream users are not deprived of the utility due to construction activities.



#### **1.4.4 VERIFICATION OF IMPACTS**

During implementation of RAP the implementing NGOs will carry out a joint verification with HD for the affected properties and finally provide with exact number of properties, both land and structures to be impacted by the project. These numbers of affected properties will be certified and accordingly compensation and assistances to the Entitled Persons (EP).

#### **1.4.5 REQUIREMENT OF UNDERTAKING BY THE CONSTRUCTION CONTRACTOR**

All compensation and assistances will be disbursed to EPs prior to their shifting for taking possession of land for the construction activities. In this context the construction contractor should verify that he has received the roads without any encumbrances and thereto provide with an undertaking to avoid any delays in construction after handing over the lands.

### **1.5 ENVIRONMENTAL MANAGEMENT MEASURES PROPOSED**

Maintenance component of the TNRSR is expected to be far less intrusive in terms of environmental and social impacts. In order to mitigate any inconsequential impacts of the proposed improvements, elaborate arrangements have been made as part of the Environmental and Social Management Plan (ERMP). These include, provision for the verification of the conditions along each route, with specific reference to roadside trees and properties by the contractor and the approval of the HD before construction begins on any stretch. In case of the any properties likely to be impacted, all the provisions of the R&R policy for the TNRSR (see **Appendix II** for salient features of the policy) shall be applicable. Construction can begin only after disbursement of the entitlements for the persons / properties being impacted. Mitigation measures for environmental impacts anticipated during the construction phase have also been detailed along with the responsibilities for implementation and supervision.

A description of the management measures during the various stages of the project is provided in the following sections.

#### **1.5.1 PRE-CONSTRUCTION STAGE**

During the pre-construction stage, the management measures required will include:

- 1) Clearance of the formation width required for construction. If impacts on structures are unavoidable, preparation of RAP as per R&R Policy for the project shall be considered mandatory
- 2) Relocation of utilities. If unavoidable, are to be relocated as per utility relocation plan that would be prepared by the HD, and

#### **1.5.2 CONSTRUCTION STAGE**

Construction activity to be monitored such that environment is not impacted beyond permissible limits. Various avoidance and management measures for the anticipated impacts and provisions for environmental management are worked out. In addition, in the event of adverse impacts occurring during the construction stage, the impacts have to be mitigated through the measures specified in the following sections. Implementation of each of these provisions is mandatory. All the measures suggested are applicable for all contract packages. The Environmental Specialist of PIU shall monitor implementation of the measures suggested. All the necessary co-ordination and communication to the contractor by the Environmental Specialist will be directed through the Divisional Engineers of respective districts.

#### **1.5.3 OPERATION STAGE**

The operation stage will essentially entail monitoring activity along the corridor, especially on the sensitive locations identified in terms of social (educational institutes, hospitals etc.) and environmental (forest area) point of view. The measures adopted and/or to be adopted during different stages of the project have been detailed in **Table-2**. These measures are mandatory and shall be applicable to all maintenance routes.

**Table 2 Environmental & Resettlement Management Plan**

Sl. No	Activities	Management Measure	Location	Reference
<b>1.0</b>	<b>PRE-CONSTRUCTION</b>			
<b>1.1</b>	<b>Pre-Construction activities by HD</b>			
1.1.1	R&R	In case of any acquisition of property becoming absolutely necessary both within and outside the RoW, a full socio-economic survey of the affected population will be carried out and a Resettlement and Rehabilitation Action plan shall be prepared as per the R&R policy and LA Act, 1894 and Highway Act, 2002 for this project.	Corridor of Impact.	LA Act 1894, LA (Amendment) Act 1984, LA (Tamil Nadu Amendment) Act 1996, Highway Act, 2002 & <b>Appendix – II</b>
1.1.2	Tree Cutting	Trees will generally not be removed from the Corridor of Impact unless they are a safety hazard. Removal of trees shall be done by the HD with prior intimation to the forest department and permit for transport of timber shall be obtained. Disposal of cut trees is to be done immediately to ensure that the traffic movement is not disrupted.	Corridor of Impact.	Design
1.1.3	Utility Relocation and common property resources	In case of utilities and common property resources being impacted due to the project, they will be relocated with prior approval of the concerned agencies before construction starts, on any sub-section of the project road. The relocation site identification will be in accordance with the choice of the community.	Corridor of Impact.	Design
1.1.4	Relocation of Cultural Property	In likelihood of impact on cultural properties within the CoI, they will be relocated at suitable locations, as desired by the community before construction starts. Local Community meetings, will be held to discuss relocation aspects, siting of structures etc.	Corridor of Impact.	Design
<b>1.2</b>	<b>Pre-construction activities by Contractor</b>			
1.2.1	Field Verification	Field verification of ERMP	All Corridors	ERMP
1.2.2	Procurement of Machinery			
1.2.2.1	Crushers	Specifications of the aggregate crushing plant if procured should strictly conform to the GoI noise standards and relevant dust emission control legislations. (The GoI National Ambient Air Quality Standards are presented in <b>Table-4</b> and Standard Noise Levels in <b>Table-6</b> of Section 1.8).	All Aggregate Crushing Plants.	MoRTH: 111.1, GoI Air and Noise Standards, OSHA Standards
1.2.2.2	Hot-mix plants & Batching Plants	Specifications hot mix plants and batching plants to be procured will comply with the requirements of the relevant current emission control legislation	All Hot-mix and Batching Plants	MoRTH: 111.5

Sl. No	Activities	Management Measure	Location	Reference
1.2.2.3	Other Construction Vehicles, Equipment and Machinery	The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. All vehicles, equipment and machinery to be procured for construction will conform to the relevant Bureau of Indian Standard (BIS) norms. Noise limits for construction equipment, (measured at one metre from the edge of the equipment in free field) to be procured as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB(A) <sup>1</sup> , as specified in the Environment (Protection) Rules, 1986.		Contract, Environment Protection Act, 1986 & MoRTH: 111.1
1.2.3	Identification & Selection of Material Sources			
1.2.3.1	Borrow Areas	Arrangement for locating the source of supply of material for embankment will be the sole responsibility of the contractor. No borrow area will be opened without permission of the Engineer. Siting of borrow areas if required to be opened shall be as per the Guidelines presented in <b>Appendix III (A)</b> of ERMP. The contractor will not use any of the locations described here for borrowing (within/near Reserve Forest/ Wild life Sanctuary/Ecologically sensitive areas).	At all borrow area locations suggested for the project.	MoRTH: 305.2.2.2 <b>Appendix III(A)</b>
1.2.3.2	Quarries	The Contractor will obtain materials from existing licensed quarries approved by HD, GoTN. The Engineer will ensure that the selected quarries have approval under Tamil Nadu Minor Mineral Concession Rules, 1959 [Corrected upto 31.3.2001].	All quarries recommended to be used in the project	MoRTH: 111.3
1.2.3.3	Water	The Contractor will be responsible for arranging adequate supply of water for the entire construction period. The contractor will source the requirement of water from surface water bodies. Only at locations where surface water sources are not available, the contractor can contemplate extraction of ground water. Consent from the Engineer for extraction of ground water is a pre-requisite. The contractor will need to comply with the requirements of the state Ground water department and seek their written approval.	All water bodies recommended to be used in the project	Contract requirement
1.2.3.4	Sand	Sand will be extracted from riverbeds at locations where approvals for the extraction of sand have been obtained under Tamil Nadu Minor Mineral Concession Rules, 1959 [Corrected upto 31.3.2001].	Locations approved by the Engineer, HD	
1.2.4	Identification of Disposal sites	Location of disposal sites shall be finalized based on the guidelines given in <b>Appendix - IV</b> and the Engineer shall certify that (a) These are not located within designated forest areas and other ecosensitive	All along the corridors	Contractor

<sup>1</sup> Standards prescribed as per the schedule VI by Rule 2(d) of the Environment Protection Second Amendment Rules, 1986.

Sl. No	Activities	Management Measure	Location	Reference
		areas (b) The disposal does not impact natural drainage courses (c) No endangered/rare flora is impacted by such disposal.		
1.2.5	Labour Requirements for the Project	The contractor will use unskilled labour drawn from local communities to avoid any additional stress on the existing facilities (medical services, power, water supply, etc.). No child labour will be employed. All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to.	All along the project corridor at construction sites	Contract
<b>1.3</b>	<b>Pre-Construction activities on Site</b>			
1.3.1	Construction Camp Locations - Selection, Design & Layout	<p>Construction labourers' camps if setup, will be located at least 200m away from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The information on ecosensitive areas with respect to their distances from maintenance roads is given in <b>Appendix V</b>.</p> <p>Construction camps will not be proposed :</p> <p>(i) Within 2000m of locations (Reserve Forest /Ecologically sensitive areas). (ii) Within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>The layout of construction camps will be as per the conceptual design presented in <b>Drawing-11</b></p> <p>The waste disposal and sewage system for the camp will be properly designed, built and operated so that no odour is generated.</p> <p>Unless otherwise arranged by the local sanitary authority, arrangements shall be made for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by Engineer.</p>	All Construction Worker's Camps including areas in immediate vicinity.	<b>Drawing 11</b>
1.3.2	Hot Mix Plants & Batching Plant Location	Hot mix plants and batching plants will be located sufficiently away from habitation, agricultural operations or industrial establishments. Such plants will be located at least 1000m away from the nearest habitation, preferably in the downwind direction. The details of ecosensitive areas are presented in <b>Appendix - V</b> .	<b>Appendix- V</b>	Contract
1.3.3	Planning Traffic Diversions & Detours	Detailed Traffic Control Plans will be prepared for single lane roads and hill roads. They shall be submitted to the Engineer (HD) for approval, 5 days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.		MoRTH: 112.1

Sl. No	Activities	Management Measure	Location	Reference
		<p>Engineer will need to assess the environmental impacts associated as the loss of vegetation, productive lands and the arrangement for temporary diversion of the land prior to the finalisation of diversions and detours. Temporary diversions will be constructed with the approval of the Engineer.</p> <p>Special consideration will be given to the preparation of the traffic control plan for safety of pedestrians and workers at night.</p> <p>The Contractor will ensure that the running surface is always maintained in running condition, particularly during the monsoon so that no disruption to the traffic flow occurs</p> <p>The temporary traffic detours will be kept free of dust by frequent application of water, if necessary.</p>		<p>MoRTH: 112.4</p> <p>MoRTH: 112.2</p> <p>MoRTH: 112.5</p>
1.3.4	Mitigation Measures to Prevent Animal Crossings(if found necessary)			
1.3.4.1	Provision of Water Source within the Forest	Water shall be supplied from a nearby perennial water source within the forest into ponds of size 1m x 10m x 0.3m with cement concrete sealing (to prevent percolation losses)	along Dharmapuram Tiruppur, Nilgiris, Tirunelveli Shencottah Quilon, Old Courtalam Falls Road, Ooty M Palayam Erode, Ooty Kothagiri Erode, Calicut Vythiri Gudalor, Coonoor Kattabettu and Coonoor Kundah	
1.3.4.2	Plantation of fruit bearing trees	Plantation of fruit bearing trees is to be taken up for providing food to the animals. The selection of the species to be planted is to be finalized during the implementation in consultation with the local forest officials as per the need.	Stretches along Dharmapuram Tiruppur, Nilgiris, Tirunelveli Shencottah Quilon, Old Courtalam Falls Road, Ooty M Palayam Erode, Ooty Kothagiri Erode, Calicut Vythiri	

Sl. No	Activities	Management Measure	Location	Reference
			Gudalor, Coonoor Kattabettu and Coonoor Kundah	
<b>2.0</b>	<b>CONSTRUCTION</b>			
2.1	Site Clearance			
2.1.1	Clearing and Grubbing	Ground cover or shrubs will only be felled or removed that impinge directly on the permanent works or necessary temporary works with prior approval from the Engineer.	Corridor of Impact	Design
2.1.2	Debris Disposal	All debris that is generated during the construction shall be disposed only at the designated dumping locations.	Dump site locations	<b>Appendix – IV</b>
2.1.3	Preservation of Top soil	The topsoil from areas to be permanently covered and borrow areas, will be stripped to a specified depth of 150mm and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. 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 will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles.  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 Engineer in a layer of thickness of 75mm - 150mm. Top soil will also be utilized for redevelopment of borrow areas, landscaping along slopes etc,	Throughout Project Corridor, where productive land is acquired.	MoRTH: 301.3.2 & MoRTH: 305.3.3  MoRTH: 301.7 & MoRTH: 305.3.9
2.2	Procurement of Construction Materials			
2.2.1	Transporting Construction Materials	All vehicles delivering materials to the site will be covered to avoid spillage of materials. All existing highways and roads used by vehicles of the contractor, or any of his sub-contractor or suppliers of materials or plant and similarly roads which are part of the works will be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres	All along the Project corridor and all haul roads	MoRTH: 111.9
2.2.2	Quarries	All vehicles delivering materials to the site will be covered to avoid spillage of materials. The quarry operations will be undertaken within the rules and regulations in force.	All along the project corridor and all haul roads	Tamil Nadu Minor Mineral Concession Rules, 1959 [Corrected upto 31.3.2001].
2.2.3	Borrow Areas	Borrow pits will not be dug continuously in a stretch. The location, shape and size of the designated borrow areas will be as approved by the Engineer and in accordance to the IRC recommended practice for borrow pits for road embankments. The Contractor will facilitate inspection of all borrow areas by the	All along the project corridor, all access roads, sites temporarily acquired	MoRTH: 305.2.2.2 IRC 10 1961

Sl. No	Activities	Management Measure	Location	Reference
		PIU, and satisfy the Engineer of the environmental compliance. Any non-compliance will be made good by the Contractor at his own cost. The borrowing will not be carried out in cultivable lands, unless and until, it will be agreed upon by the Engineer that there is no suitable uncultivable land in the vicinity for borrowing, or there are private land owners willing to allow borrowing on their fields. Borrowing shall be carried out at designated areas in accordance with the IRC guidelines 10: 1961	& all borrow areas	
2.2.4	Water Extraction	Procurement of water is to be carried out as per Section 1.2.2.3. Along surface water bodies selected particular areas will be earmarked for water extraction. The contractor will minimise wastage of water in the construction process.	All water bodies recommended to be used in the project	Section 1.2.2.3
2.3	Stock Piling of Construction Materials	Stock piling of topsoil as per Section 2.1.3. The stock piles will be located at least 100 m from water courses.		Section 4.1.4
2.4	Material Handling at Site	All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stone-breakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any herbicide or other toxic chemical will be strictly in accordance with the manufacturer's instructions. The Engineer will be given at least 6 working days notice of the proposed use of any herbicide or toxic chemical. A register of all herbicides and other toxic chemicals delivered to the site will be kept and maintained up to date by the Contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product. The project comply with the Manufacture, Storage and Use of Hazardous Chemical Rules, 1989.	All construction sites	MoRTH: 111.6 MSIHC Rules, 1989
2.5	Safety Measures During Construction	The Contractor is required to comply with all the precautions as required for the safety of the workmen as per the International Labour Organisation (ILO) Convention No. 62 as far as those are applicable to this contract. The contractor will supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff. The contractor has to comply with all regulation regarding working platforms, excavations, trenches and safe means of entry and egress.  No man below the age of 18 years and no woman will be employed on the work of painting with products containing lead in any form. No paint containing lead or lead products will be used except in the form of paste or readymade paint. Face masks will be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.	All construction sites	International Labour Organisation (ILO) Convention No. 62 Section 2.6

Sl. No	Activities	Management Measure	Location	Reference
2.6	Earthworks			
2.6.1	Earthcut	The work will consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution, through use of mulches, grasses, slope drains and other devices. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.	All along the project corridor	MoRTH 301.3.3
2.6.1.1	Stripping, stocking and preservation of top soil	Stock piling of top soil as per Sec 2.1.3	All along the project corridor	Sec 2.3.2
2.6.1.2	Dust	All earthwork will be protected in a manner acceptable to the Engineer to minimise generation of dust.	All along the project corridor	MoRTH 111.8
2.6.1.3	Erosion  Contamination of soil  Compaction	<p>While planning or executing excavations the Contractor will take all adequate precautions against soil erosion and contamination as per MoRTH 306 and take appropriate drainage measures to keep the site free of water as per MoRTH 311.</p> <p>Turfing on critical road embankment slopes with grass sods, shall be in accordance with the recommended practice for treatment of embankment slopes for erosion control. The work will be taken up as soon as possible provided the season is favourable for the establishment of sods. Other measures of slope stabilization will include mulching, netting and seeding of batters and drains immediately on completion of earthworks.</p> <p>Vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptor (6 Nos.) will be provided for vehicle parking, wash down and refueling areas within the construction camps. Fuel storage will be in proper bunded areas. All spills and collected petroleum products will be disposed off in accordance with MoEF and SPCB guidelines.</p> <p>The design of Oil interceptor will be as per the conceptual design presented in <b>Drawing-12</b></p> <p>Fuel storage and refilling areas will be located at least 300m from all cross drainage structures and important water bodies or as directed by the Engineer. In all fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the topsoil will be stripped, stockpiled and returned after cessation of such storage and refueling activities as per Section 4.1.4.</p>	All along the project corridor	<p>MoRTH 306 &amp; MoRTH 311</p> <p>MoRTH 307 &amp; MoRTH 308</p> <p>MoRTH 307 &amp; MoRTH 311</p> <p><b>Drawing-1.2</b></p> <p>Section 2.3.2</p>



Sl. No	Activities	Management Measure	Location	Reference
		To minimise soil compaction construction vehicle, machinery and equipment will move or be stationed in the designated area (RoW or Col, haul roads as applicable) only. The haul roads for construction materials should be routed to avoid agricultural areas		
2.6.1.4	Silting, Contamination of Water bodies	Silt fencing will be provided at the base of stock piles near water bodies abutting the road close to construction sites. Silt fencing of geo textile (MIRAFI 140N or equivalent). The design of silt fencing will be as per the conceptual design presented in <b>Drawing-13</b> Construction materials containing fine particles will be stored in an enclosure such that sediment-laden water does not drain into nearby watercourses. All discharge standards promulgated under Environmental Protection Act, 1986, will be adhered to. All waste generated from the site will be disposed off as acceptable to the Engineer.	Water bodies close to the project corridor	Environmental Protection Act, 1986  <b>Drawing-13</b>
2.6.1.5	Earth fill	Embankment and other fill areas, unless other wise permitted by the Engineer, be constructed evenly over their full width and the contractor will control, and direct movement of construction vehicles and machinery over them	Along earthfill areas	MoRTH 305.3.5.3
2.6.1.6	Slope protection	Embankments and other areas of unsupported fill will not be constructed with steeper side slopes, or to greater widths than those shown in design drawings.		
2.6.1.7	Compaction of soil	Construction vehicle, machinery and equipment shall move or be stationed in the designated area (RoW or Col, as applicable) only. While operating on agricultural lands for any construction activities, topsoil will be preserved in stockpiles.	All along the corridor	Annexure 'A' to MoRTH 501
2.6.1.8	Soil Erosion	On road embankment slopes, slopes of all cut, fill etc., shrubs and grass will be planted. On sections with high filling and deep cutting the side slopes will be graded and covered with bushes and grass, etc., adopting suitable bioengineering techniques. The suitability to be decided by the Engineer at site. Along sections abutting water bodies stone pitching needs to be carried out for slopes between 1 vertical: 4 horizontal to 1 vertical to 2 horizontal. At the outfall of each culvert, erosion prevention measure, such as the following, will be undertaken, as provided in the design: 1. Grass scales 2. Rock riprap 3. Rock mattresses 4. Cut off wall 5. Downstream silt screens/walls The work shall consist of measures as per design, or as directed by the Engineer to	All along the corridor  Stretches along Dharmapuram Tiruppur Nilgiris, Tirunelveli Shencottah Quilon, Old Courtalam Falls Road, Ooty M Palayam Erode, Ooty Kothagiri Erode, Calicut Vythiri Gudalor, Coonoor Kattabettu and Coonoor Kundah	HD

Sl. No	Activities	Management Measure	Location	Reference
		control soil erosion, sedimentation and water pollution, through use of berms, dikes, sediment basins, fiber mats, mulches, grasses, slope drains and other devices. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.		
2.7	Surfacing	The contractor will take all necessary means to ensure that works and all associated operations are carried out in conformity with <i>Annexure A</i> to MoRTH 501.  All workers employed on mixing asphaltic material etc., will be provided with protective footwear as specified in Section 2.4.	All along the project corridor	<i>Annexure A</i> to MoRTH 501
2.7.1	Operating Hot Mix Plants and Crushers	Monitoring of the pollutants will be carried out by the agency identified for Environmental Monitoring as detailed in the Environmental Monitoring Plan for the project. All vehicles and equipment used in construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Noise limits for construction equipment used in this project (measured at one metre from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB(A), as specified in the Environment (Protection) Rules, 1986  Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant will be removed from site.  The suspended particulate matter contribution value at a distance of 40m from a controlled isolated as well as from a unit located in a cluster should be less than 500µg/m <sup>3</sup> .Dust screening vegetation will be planted on the edge of the RoW for all existing roadside crushers	All Hot-mix and Crusher Plants	Environment (Protection) Rules, 1986  Monitoring Plan
2.7.2	Bridge Works & Culverts	While working across or close to the Rivers, the Contractor will not prevent the flow of water. If for any bridgework, etc., closure of flow is required, the Contractor will seek approval of the Engineer. The Engineer will have the right to ask the Contractor to serve notice on the downstream users of water sufficiently in advance. Construction over and close to the non-perennial streams will be undertaken in the dry session.  Construction work expected to disrupt users and impacting community water bodies will be taken up after serving notice on the local community.  Dry stone pitching for apron and revetment will be provided for bridges and cross drainage structures.	At locations where bridge works and culverts are proposed.	MoRTH 2500
2.7.3	Environmental	Monitoring of environmental attributes such as air, noise, water and soil quality will	As per Monitoring	Environmental

Sl. No	Activities	Management Measure	Location	Reference
	Monitoring	be carried out by the agency identified for Environmental Monitoring as detailed in the Environmental Monitoring Plan for the project. Monitoring of soil quality will also be carried out in event of accidents / spillage during bulk transport of hazardous material.	Plan	Monitoring Plan
2.7.4	Tree Plantation	Trees felled will be replaced as per the compensatory afforestation criteria in accordance with the Forest (Conservation) Act, 1980. Four trees will be planted for every tree lost, along the project corridors.	Entire Project Corridor, as per the tree plantation strategy	Forest (Conservation) Act, 1980
2.7.5	Chance found Archaeological property	<p>All fossils, coins, articles of value of antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government, and shall be dealt with as per provisions of the relevant legislation.</p> <p>The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped 100m all directions from the site of discovery.</p> <p>The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.</p>		
2.7.6	Damage or Loss of Chance-found Important Flora & Fauna	During construction, at any point of time, if a rare/ threatened/endangered flora species is found, it shall be conserved in a suitable manner. The Engineer, on specific advice from the HD shall approve detailed conservation processes, plans and designs as well as associated modification in the project design.	Stretches along Dharmapuram Tiruppur, Nilgiris, Tirunelveli Shencottah Quilon, Old Courtalam Falls Road, Ooty M Palayam Erode, Ooty Kothagiri Erode, Calicut Vythiri Gudalor, Coonoor Kattabettu and Coonoor Kundah	
3	Contractor Demobilization			
3.1	Clearing of Construction of	Contractor to prepare site restoration plans for approval of PIU and to implement these plans fully prior to demobilization. On completion of the works, all temporary	All Construction Workers' Camps	

Sl. No	Activities	Management Measure	Location	Reference
	Camps & Restoration	structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.		
3.2	Redevelopment of Borrow Areas	Borrow pits will be re-developed at such borrow locations, spoils will be dumped with an overlay of stockpiled topsoil, in accordance with compliance requirements with respect to MoEF/SPCB guidelines. Redevelopment of borrow areas will be taken up in accordance with the plans approved by the environmental specialist.	At all borrow area locations suggested for the project.	<b>Appendix –III(B)</b>







## 1.6 REPORTING SYSTEM

Reporting system provides the necessary feedback for project management to ensure quality of the works and that the program is on schedule. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the Environmental & Social Management Plan get implemented in the project.

The reporting system (see **Table-3**) will operate linearly with the contractor reporting to the Divisional Officer, who in turn shall report to the head office of HD. All reporting by the contractor and Divisional Officer shall be on a quarterly basis. The HD shall be responsible for preparing targets for each of the identified ERMP activities. All subsequent reporting by the contractor shall be monitored as per these targets set by the HD before the contractors move on to the site. The reporting by the Contractor will be a monthly report like report of progress on construction and will form the basis for monitoring by the HD, either by its own Environmental Engineer/s or the Environmental Specialist hired by them. The monitoring and the subsequent reporting would include:

- Monitoring of facilities at construction camps
- Monitoring of air, noise, soil and water parameters
- Monitoring of bio-engineering measures suggested

**Table 3 Desired Monitoring and Reporting Process and Responsibilities**

Format No.	Item	Timing	Local HD		HD Head Office		World Bank (WB)
			Supervision	Reporting to HD Head Office	Oversee/ Field Compliance Monitoring	Report to WB	Desired Supervision
<b>CONTRACTOR MOBILISATION AND SITE CLEARANCE</b>							
M1	Reporting by contractor to HD for debris disposal locations	Before start of construction	As required	As required		Quarterly	Half yearly
<b>CONSTRUCTION PHASE</b>							
C1	Monitoring of construction site and construction camp	Before start of work		Quarterly		Quarterly	Half yearly
C2	Target sheet for Pollution Monitoring		As required	After Monitoring		After Monitoring	Half yearly
C3	Top Soil	Construction Stage	Continuous	Quarterly	Quarterly	Quarterly	Half yearly

The reporting formats are annexed to this plan as **Appendix VI**.

## 1.7 INSTITUTIONAL ARRANGEMENTS & TRAINING

The Superintending Engineer (Highways) of the HD is the Engineer, who will co-ordinate implementation of the maintenance component. Divisional Engineers of respective districts will be implementing authorities at the district level. Environmental specialist of the PIU shall co-ordinate with the contractor for implementation of the ERMP. Reporting shall be undertaken by the contractor under the supervision of the Environmental Specialist of the PIU and shall be reported to be PIU as well as the World Bank.

### 1.7.1 TRAINING

The members of the Environmental Cell<sup>2</sup> will be trained in environmental protection both in theoretical and practical aspects. It is expected that the Environmental specialist hired for the Environmental Cell will act as the key person for this. While theoretical aspects will form the bedrock of the training programme, it will be the practical site visits and /or hands-on training at project site itself, which will be of direct use to the project. However, the HD is committed to

<sup>2</sup>The Environmental Cell in PIU is common both to upgradation and maintenance corridors.



developing the environmental capacity in-house and, therefore, all proposals for the training of its officials will have to consider this objective also.

All the PIU staff, AE's ADE & Divisional Engineer of respective districts shall be attending the training session of upgradation component, specific issues identified along maintenance corridors especially along Hill roads & roads passing through or near sanctuaries/reserve forests shall be discussed in these session. However, maintenance component if requires in depth exposure to specific issues along the corridors, more session can be formulated for training of PIU staff & orientation of the maintenance contractor budgetary provision are made for four additional training sessions including field visits. The detailed training programme is presented in **Appendix-VII**.

## **1.8 ENVIRONMENTAL MONITORING PLAN**

Monitoring programme is prepared to ensure that the envisaged purpose of the project is achieved and resulted in desired benefits to the target population. To ensure the effective implementation of the ERMP, it is essential that an effective monitoring programme be designed and carried out. The environmental monitoring programme provides such information on which management decision may be taken during construction and operational phases. It provides basis for evaluating the efficiency of mitigation and enhancement measures and suggests further actions that need to be taken to achieve the desired effect.

The monitoring includes:

- Visual observations;
- Selection of environmental parameters at specific locations;
- Sampling and regular testing of these parameters.

### **1.8.1 OBJECTIVES**

The objectives of the environmental monitoring programme are:

- Evaluation of the efficiency of mitigation and enhancement measures;
- Updating of the actions and impacts of baseline data;
- Adoption of additional mitigation measures if the present measures are insufficient;
- Generating the data, which may be incorporated in environmental management plan in future projects.

### **1.8.2 METHODOLOGY**

Monitoring methodology covers the following key aspects:

- Components to be monitored;
- Parameters for monitoring of the above components;
- Monitoring frequency;
- Monitoring standards;
- Responsibilities for monitoring;
- Direct responsibility,
- Overall responsibility;
- Monitoring costs.

Environmental monitoring of the parameters involved and the threshold limits specified are discussed below.

### **1.8.3 AMBIENT AIR QUALITY (AAQ) MONITORING**

Ambient air quality parameters recommended for road transportation developments are Respirable Particulate Matter (RPM), Suspended Particulate Matter (SPM), Carbon Monoxide (CO), Oxides of Nitrogen (NO<sub>x</sub>), Hydro-Carbons (HC), Sulphur Dioxide (SO<sub>2</sub>) and Lead (Pb). These are to be monitored at designated locations starting from the commencement of construction activity. Data should be generated over three days at all identified locations in

accordance to the National Ambient Air Quality Standards (Table-4). The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

**Table 4: National Ambient Air Quality Standards**

Pollutants	Time Weighted	Sensitive Area	Industrial Area	Residential Rural & other Area	Method of measurement
Sulphur Dioxide (SO <sub>2</sub> )	Annual*	15 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	Improved West and Gaeke method
	24 hours**	30 µg/m <sup>3</sup>	120 µg/m <sup>3</sup>	90 µg/m <sup>3</sup>	Ultraviolet fluorescence
Oxides of Nitrogen (NO <sub>x</sub> )	Annual*	15 µg/m <sup>3</sup>	80 µg/m <sup>3</sup>	65 µg/m <sup>3</sup>	Jacob and Hochheiser modified (Na-Arsenite method)
	24 hours**	30 µg/m <sup>3</sup>	120 µg/m <sup>3</sup>	91 µg/m <sup>3</sup>	Gas phase Chemiluminescence
Carbon Monoxide (CO)	8 hours**	1000 µg/m <sup>3</sup>	5000 µg/m <sup>3</sup>	2000 µg/m <sup>3</sup>	Non dispersive infrared spectroscopy
	1 hour	2000 µg/m <sup>3</sup>	1000 µg/m <sup>3</sup>	4000 µg/m <sup>3</sup>	
Lead (Pb)	Annual*	0.50 µg/m <sup>3</sup>	1.0 µg/m <sup>3</sup>	0.75 µg/m <sup>3</sup>	AAS Method 24 hours after sampling using EPM 20000 or equivalent filter paper
	24 hours**	0.75 µg/m <sup>3</sup>	1.5 µg/m <sup>3</sup>	1.00 µg/m <sup>3</sup>	
Respirable Particulate Matter (RPM) - Size less than 10µm	Annual*	50 µg/m <sup>3</sup>	120 µg/m <sup>3</sup>	60 µg/m <sup>3</sup>	
	24 hours**	75 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>	100 µg/m <sup>3</sup>	
Suspended Particulate Matter (SPM)	Annual*	70 µg/m <sup>3</sup>	360 µg/m <sup>3</sup>	140 µg/m <sup>3</sup>	Average flow rate not less than 1.1 cum / minute
	24 hours**	100 µg/m <sup>3</sup>	500 µg/m <sup>3</sup>	200 µg/m <sup>3</sup>	

Source Anon 1996-97, National Ambient Air Quality Monitoring Series NAQMS/a/1996-97, Central Pollution Control Board, Delhi.

\*Average Arithmetic mean of minimum 104 measurement in a year taken for a week 24 hourly at uniform interval.

\*\*24 hourly/8 hourly values should meet 98 percent of the time in a year

#### 1.8.4 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 detailed in the Environmental Monitoring Plan. Water should be abstracted with prior permission from the concerned engineer. The monitoring of the water quality is to be carried out at all identified locations in accordance to the Indian Standard Drinking Water Specification – IS 10500: 1991 (stated in Table-5)

**Table 5: Indian Standard Drinking Water Specification-IS 10500:1991**

Sl. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
<b>Essential Characteristics</b>						
1	Colour; Hazen units, Max.	5	Above 5, consumer acceptance decreases	25	3025 (Part 4) 1983	Extended to 25 only if toxic substances are not suspected, in absence of alternate sources
2	Odour	Unobjectionable	-	-	3025 (Parts 5):1984	a) Test cold and when heated b) Test at several dilutions
3	Taste	Agreeable	-	-	3025 (Part 7 and 8) 1984	Test to be conducted only after safety has been established
4	Turbidity NTU, Max.	5	Above 5, consumer acceptance decreases	10	3025 (Part 10) 1984	-

Sl. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
5	Ph Value	6.5 to 8.5	Beyond this range, the water will affect the mucous membrane and/or water supply system	No relaxation	3025 (Part 11) 1984	-
6	Total hardness (as CaCO <sub>3</sub> ) MG/1, <i>Max</i>	300	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21) 1983	-
7	Iron (as Fe) mg/1, <i>Max</i>	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	1	32 of 3025 : 1964	-
8	Chlorides (as Cl) mg/1, <i>Max</i>	250	Beyond this limit, taste, corrosion and palatability are affected	1000	3025 (Part 32) 1988	-
9	Residual, free chlorine, mg/1, <i>Min</i>	0.2	-	-	3025 (Part 26) 1986	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be <i>Min</i> 0.5 mg/1
<b>Desirable Characteristics</b>						
1	Dissolved solids mg/1, <i>Max</i>	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	3025 (Part 16) 1984	-
2	Calcium (as Ca) mg/1, <i>Max</i>	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40) 1991	-
3	Magnesium (as Mg), mg/1, <i>Max</i>	30	Encrustation to water supply structure and adverse effects on domestic use	100	16, 33, 34 of IS 3025: 1964	-
4	Copper (as Cu) mg/1, <i>Max</i>	0.05	Astringent taste, discoloration and corrosion of pipes, fitting and utensils will be caused beyond this	1.5	36 of 3025: 1964	-
5	Manganese (as Mn) mg/1, <i>Max</i>	0.1	Beyond this limit taste/appearance are affected, has adverse effects on domestic uses and water supply structures	0.3	35 of 3025: 1964	-
6	Sulphate (as 200 SO <sub>4</sub> ) mg/1, <i>Max</i>	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	3025 (Part 24) 1986	May be extended up to 400 provided (as Mg) does not exceed 30
7	Nitrate (as NO <sub>3</sub> ) mg/1, <i>Max</i>	45	Beyond this, may cause methaemoglobinemia	100	3025 (Part 34) 1988	-
8	Fluoride (as F) mg/1, <i>Max</i>	1	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	23 of 3025: 1964	-
9	Phenolic compounds (As C <sub>6</sub> H <sub>5</sub> OH) mg/1, <i>Max</i>	0.001	Beyond this, it may cause objectionable taste and odour	0.002	54 of 3025: 1964	-
10	Mercury (as Hg) mg/1, <i>Max</i>	0.001	Beyond this, the water becomes toxic	No relaxation	(see Note) Mercury ion analyser	To be tested when pollution is suspected
11	Cadmium (as Cd), mg/1, <i>Max</i>	0.01	Beyond this, the water becomes toxic	No relaxation	(See note)	To be tested when pollution is suspected
12	Selenium (as Se), mg/1, <i>Max</i>	0.01	Beyond this, the water becomes toxic	No relaxation	28 of 3025: 1964	To be tested when pollution is suspected
13	Arsenic (As As) mg/1, <i>max</i>	0.05	Beyond this, the water becomes toxic	No relaxation	3025 (Part 37) 1988	To be tested when pollution is suspected

Sl. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect Outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref. To IS)	Remarks
14	Cyanide (As CN), mg/1, <i>Max</i>	0.05	Beyond this limit, the water becomes toxic	No relaxation	3025 (Part 27) 1986	To be tested when pollution is suspected
15	Lead (as Pb), mg/1, <i>Max</i>	0.05	Beyond this limit, the water becomes toxic	No relaxation	(see note)	To be tested when pollution is suspected
16	Zinc (As Zn), Mg/1, <i>Max</i>	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	39 of 3025: 1964	To be tested when pollution is suspected
17	Anionic detergents (As MBAS) mg/1, <i>Max</i>	0.2	Beyond this limit it can cause a light froth in water	1	Methylene-blue extraction method	To be tested when pollution is suspected
18	Chromium (As Cr <sup>6+</sup> ) mg/1, <i>Max</i>	0.05	May be carcinogenic above this limit	No relaxation	38 of 3025: 1964	To be tested when pollution is suspected
19	Poly nuclear aromatic hydrocarbons (as PAH) g/1, <i>Max</i>	-	May be carcinogenic above this limit	-	-	-
20	Mineral oil mg/1, <i>Max</i>	0.01	Beyond this limit undesirable taste and odour after chlorination take place	0.03	Gas Chromatographic method	-
21	Pesticides mg/1, <i>Max</i>	Absent	Toxic	0.001	-	-
22	Radioactive materials:				58 of 3025:01964	-
23	a) Alpha emitters Bq/1, <i>Max</i>	-	-	0.1	-	-
24	Beta emitters pci/1, <i>Max</i>	-	-	1	-	-
25	Aluminium (as Al), mg/1, <i>Max</i>	200	Beyond this limit taste becomes unpleasant	600	13 of 3025:1964	-
26	Aluminium (as Al), mg/1, <i>Max</i>	0.03	Cumulative effect is reported to cause dementia	0.2	31 of 3025: 1964	-
27	Boron, mg/1, <i>Max</i>	1	-	5	29 of 3025: 1964	-

Source: Indian Standard Drinking Water Specification-IS10500: 1991

### 1.8.5 NOISE LEVELS MONITORING

The measurements for monitoring noise levels would be carried out at all designated locations in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) in 1989 Sound pressure levels would be monitored on twenty-four hour basis. Noise should be recorded at an "A" weighted frequency using a "slow time response mode" of the measuring instrument. Noise pollution parameters will be monitored and recorded by the contractor, which shall be ensured by the engineer. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan (Table-6).

**Table 6 Noise Level Standards (CPCB)**

Landuse	Noise level for Day Time Leq dB(A)	Noise level for Night Time dB(A)
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence zone	50	40

**Note: Day time - 6.00 am - 10.00 pm (16 hours) Night time - 10.00 pm - 6.00 am (8 hrs)**

It is the responsibility of the contractor to maintain the equipments and to monitor the emissions and noise levels within the permissible limits, which shall be ensured by the engineer.

## **19 MONITORING PLAN**

The monitoring plan along with the environmental parameters and the time frame is presented in the, environmental monitoring plan. The monitoring plan for various performance indicators of the project in the construction stages is summarised in the **Table-7**.



**Table 7: Environmental Monitoring Plan**

Env. Component	Project Stage	MONITORING						Institutional responsibility		
		Parameters	Special Guidance	Standards	Location	Frequency	Duration	Implementation	Supervision	
Air	Construction stage	SPM, RSPM, SO <sub>2</sub> , NO <sub>x</sub> , CO, HC	High volume sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	Hot mix plant/Batching plant	Once every season for one year	Continuous 24 hours/ or for 1 full working day	Contractor through approved monitoring agency	Engineer, HD	
		SPM, RSPM	High Volume Sampler to be located 40 m from the earthworks site downwind direction. Use method specified by CPCB for analysis	Air (Prevention and Control of Pollution) Rules, CPCB, 1994	Stretch of the road where construction is in progress site	Once every season for one year	Continuous 24 hours/ or for 1 full working day	Contractor through approved monitoring agency	Engineer, HD	
Water Quality	Construction stage	pH, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Water quality standards by CPCB	2 locations along each corridor will be monitored till end of construction period	Once every season for one year	-	Contractor through approved monitoring agency	Engineer, HD	
Noise levels	Construction stage	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement	Noise standards by CPCB	As directed by the Engineer (At maximum 5 locations)	Thrice a year for one year during the construction period.	Readings to be taken at 15 seconds interval for 15 minutes every hour and then averaged.	Contractor through approved monitoring agency	Engineer, HD	
Soil Erosion	Construction stage	Turbidity in Storm water  Silt load in ponds, water courses	-	As specified by the engineer HD / Water quality standards	As identified by the HD staff supervising construction along each route	Pre-monsoon and post-monsoon seasons for one year	-	Contractor	HD	
Construction Sites and Construction Camps	Construction Stage	Monitoring of: 1. Storage Area 2. Drainage Arrangements 3. Sanitation in Construction Camps	The parameters mentioned are further elaborated in the reporting format C1. These are to be checked for adequacy.	To the satisfaction of the HD and the standards given in the reporting form.	At Storage area and construction camps	Quarterly in the construction stage.		Contractor	HD	
Bioengineering measures	Operation Stage	Vegetation cover (sq.m)	As per the guidance of Geotechnical personnel of Engineer and as per site requirements						Contractor	HD

## 1.10 ENVIRONMENTAL MANAGEMENT – BUDGET

The environmental budget for the various environmental management measures proposed in the ERMP is detailed in **Volume: Cost Estimate for Environmental Management** for perusal of the PIU and World Bank. Budgetary provisions are presented in the **Table 8**. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which has been accounted for in the Engineering Costs.

**Table 8 & Environmental Budget<sup>3</sup> for Maintenance Corridors**

COMPONENT	STAGE	ITEM	Unit	QUANTITY
<b>(A) Mitigation / Enhancement</b>				
Air	Construction	Dust Management with sprinkling of water, covers for vehicles transporting construction material	Km	Covered in Engineering Costs
Soil	Construction	Turfing/Pitching	sq. m.	Covered in Engineering costs
	Operation	Redevelopment of Borrow areas	sq. m.	Covered in Engineering costs
<b>(B) Monitoring</b>				
Air	Construction	Monitoring near all hot mix plant locations approved by the Engineer	No. of Samples	15 locations x 3 seasons x 1 year
		Monitoring at construction sites in tandem with construction	No. of Samples	149 corridors x 3 seasons x 1 year
Water Quality	Construction	At locations specified in the monitoring plan	No. of Samples	149 corridors x 2 seasons x 1 year
Noise	Construction	At equipment yards as directed by the Engineer	No. of Samples	149 corridors x 3 seasons x 1 year
Enhancement Within Forests	Construction	Water Source within the forest area by creating pond of size 1m x 10m x 0.3m with Cement concrete sealing	No.	8 forest areas
	Construction	Plantation of fruit bearing trees	L.S.	8 forest areas
Bio Engineering Measures	Construction	Monitoring survival	L.S.	Covered in Engineering Costs
	Operation	Monitoring effectiveness	L.S.	
<b>(C) Training &amp; Mobilisation</b>				
Training	Construction and Operation	As per modules developed for TNRSF and issues arising during construction	No. of Sessions	4 Sessions

<sup>3</sup>The estimation of budget is only provisions not based on exact estimates.





## APPENDIX – I (A) PRIORITISATION OF CORRIDORS FOR MAINTENANCE

Corridors that have been marked for further analysis to enable selection of the corridors for maintenance should be subjected to analysis using the Table-1 below. Finalisation of the corridor selection shall be based on the cost of mitigation measures that would be incurred for mitigation/avoidance of the impacts perceived. If mitigation costs for the corridor exceeds the environmental budget for the corridor, it can be excluded from selection.

**Table – 1. Anticipated Impacts along Maintenance corridors and Selection Priority**

Sl. No	Environmental Component	Impact Magnitude			Selection Priority			Mitigation/avoidance Measure
		Description	L	M	H	L	M	
1.0	LA and R&R							
1.1	Land Acquisition	Land acquisition due to geometric corrections is anticipated. Temporary land acquisition due to setting up of construction camps also exists.			•	•		Compensation to the affected persons for land acquisition should be through private negotiations. Provisions of R&R policy will apply.
1.2	Squatters and Encroachers	Clearing of roadsides for laying of shoulders to maintain the proposed sections involves clearing of squatters and encroachers.			•	•		Impacts on affected persons have to be adequately compensated as per the R&R policy of GoTN.
1.3	Relocation of cultural properties	Cultural properties existing on the edge of the existing carriageway will be impacted due to non-availability of sufficient clear width. There is risk of pedestrian conflict and also accidental collision of vehicular traffic with the structure.			•	•		relocation at a suitable site in consultation with the local people. The structure constructed at relocation site should be equal to or greater than the size of the original structure.
1.4	Utility relocation	Utilities present along the corridor with in the envisaged CoI have to be removed. Utilities generally include, Water taps, water pipelines, electricity lines, telephone lines etc.		•			•	All the utilities that are being impacted have to be relocated before start of the construction activity. The relocation has to be taken up in consultation with the local users. The utility relocated should be operational before construction to avoid hardships to the users.
2.0	Biodiversity/Reserved forest/Wild life sanctuaries/National Parks							
2.1	Fauna	Increase of traffic along forests with animal crossings will lead to habitat disintegration and involve animal hits.			•	•		Speed regulation along the forest areas has to be strictly implemented. Provision of perennial water sources within the forest areas has to be taken up to prevent wild life crossings especially along links presented in <b>Appendix V</b>
2.2	Flora	Presence of endangered flora along corridors passing through biodiversity rich areas will have irreversible impacts.			•	•		Fencing (with locally available material) of such locations has to be taken up to clearly define construction work area. No illegitimate dumping has to take place in the region. No setting of construction camps and hot mix plants has to be taken up, especially along links presented in <b>Appendix V</b>
4.0	Water Bodies							
4.1	Water Quality	Construction close to water bodies would lead to siltation due to flow of runoff from construction sites and result in impacts on water quality.		•			•	Silt fencing at stockpiles/temporary storage of dumps has to be provided. No runoff from construction sites should be allowed into the water bodies.
4.2	Impact on water bodies	Geometric corrections are not anticipated as part of the maintenance corridors. If corrections are made it			•	•		If water bodies are impacted, lost storage capacity has to be replaced at the same location or elsewhere in consultation with

Sl. No	Environmental Component	Impact Magnitude			Selection Priority			Mitigation/avoidance Measure	
		Description	L	M	H	L	M		H
		might lead to impacts on storage capacity of water bodies due to partial/total filling.							the local people. In case of total loss of water body, an equivalent area of the water body has to be dug at appropriate location. Local people have to be consulted in finalizing the location.
50	Bridge works and culverts	Working close to rivers for maintenance works would interrupt flow of water into the rivers and streams. This would deprive the usage of downstream users. Further, it would lead to direct flow of construction material into the watercourses.		•			•		The contractor should ensure that if waterflow is interrupted for long time, the down stream users are to be provided with an alternative source. If necessary the watercourse has to be diverted from the construction site to rejoin the original course downstream.
60	Road side trees	Roadside trees which will present a safety hazard for traffic movement and pavement shall need to be removed		•				•	Compensatory planting of 4 trees per tree cut has to be taken up. Survival of the planted saplings has to be ensured and monitored till they can survive independent of maintenance, which is usually 3 years.
70	Debris Disposal	Debris generated from clearing, grubbing, scarifying and laying the road is capable of generating silt. Scarified/wasted bitumen will be hazardous in nature.				•	•		Dumping sites are to be identified prior to start of construction. The dumping sites should be having capacity equal to or greater than the volume of debris generated.
80	Borrowing	Borrow material extracted for grade corrections will have impacts on the topsoil due to the extraction as well as its transport.		•				•	Borrow material should be extracted from licensed borrow areas as per TN Minor Mineral Rules. The topsoil of 15cm depth has to be stockpiled before excavation. Topsoil along haul roads has to be stripped and stored as stockpiles.
90	Quarrying and crushing	Quarry material extraction and crushing operation generates dust and leaves permanent scars on the topography	•					•	Quarry material has to be extracted from licensed quarries only. Crushers utilized for the project should comply with the pollution control regulations of CPCB
100	Water	Water extraction for construction purposes will have impacts on ground water, and disruption to other users.				•		•	Water extraction should be sourced from surface water bodies, identified by the contractor and approved by the TNPWD. Quantity of extraction and timing of extraction should be regulated to avoid disruption to other users.
110	Hot mix plants	Emissions from hot mix plants raise the ambient pollutant concentrations.	•					•	The hot mix plants should be located atleast 1000m away from habitations.
120	Archeological Properties	Working in areas rich in archeological properties may have chances of finding properties of higher archeological value.		•				•	In case of chance find, the construction work has to be halted and archeological department has to be informed. Only on clearance of the archeological department, the work has to be commenced.

**APPENDIX I (B): SCREENING GUIDELINES FOR ENVIRONMENTAL AND SOCIAL ISSUES ALONG MAINTENANCE CORRIDOR**

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As part of the TNRSP, about 2600 km of roads are proposed for maintenance component. This component involves resurfacing of the blacktop in most cases. Maintenance in some stretches involves sub-base treatment and grade corrections. Certain impacts are critical and mitigation would be expensive to be covered under maintenance component and they have been identified as exclusion criteria. These include:

Land acquisition

Clearing of squatters and encroachers

Relocation of Common property resources

Encroachment on to Environmental Resources:

- ♣ Reserved forests
- ♣ Wildlife Sanctuaries, National Parks, bird sanctuaries and biosphere reserves
- ♣ Water bodies and other environmentally sensitive areas
- ♣ Landslides

If the above impacts are of perceptibly higher magnitude, the respective corridors should be excluded under maintenance. In case of magnitude of impacts could not be readily perceived, the corridors should be recommended for further analysis as per the impact magnitudes given in the Table-1 of *Appendix VI(B)* and priority should be worked out based on the quantum of impacts analysed.

**APPENDIX II: SOCIAL IMPACTS AND RESETTLEMENT: PRINCIPLES AND  
POLICY FRAMEWORKS**

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**TAMIL NADU ROAD SECTOR PROJECT**

# **SOCIAL IMPACTS AND RESETTLEMENT: PRINCIPLES AND POLICY FRAMEWORK**

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**JUNE 1998**

(This is a copy of the document ‘Resettlement and Rehabilitation Draft Policy Document’ approved by the Government of Tamil Nadu on 10 August 1998 under G.O. Ms. No. 193)

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## **APPENDIX II: SOCIAL IMPACTS AND RESETTLEMENT: PRINCIPLES AND POLICY FRAMEWORKS**

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### **1 INTRODUCTION AND OBJECTIVES**

#### **1.1 BACKGROUND**

The Government of Tamil Nadu is preparing the Tamil Nadu Road Sector Project with assistance from the World Bank. The aim of the project is to improve the performance of the State's road transport network by improving road conditions and capacity, and to improve the State's capacity to plan, develop and maintain the Tamil Nadu road networks.

A selection of approximately 1,500 km. of road will be included for rehabilitation under the project. These roads will be improved with raising of formation of levels, pavement strengthening, and widening and realignment where necessary. A number of bypasses may also be built.

This policy document describes the principles and approach to be followed in minimizing and mitigating negative social and economic impacts caused by the project. A detailed and time-bound Resettlement Action Plan will be prepared based on this policy document. The Action Plan will contain a census and baseline socio-economic survey of the potentially affected population, as well as the institutional and organizational mechanisms required to undertake the resettlement programme.

#### **1.2 INDIAN AND WORLD BANK REQUIREMENTS REGARDING DISPLACEMENT**

Government of India laws and guidelines require that assets lost through the exercise of Eminent Domain be compensated at market value, and that displaced people be assisted in reestablishing their homes and livelihoods. Similar principles apply in all World Bank financed projects. The Bank's policy is described in Operational Directive 4.30 on Involuntary Resettlement. This policy document states that involuntary resettlement is an integral part of project design, and should be dealt with from the earliest stages of project preparation.

Both Indian and World Bank guidelines related to resettlement aim at achieving the following overall goals:

- Involuntary resettlement shall be avoided or minimized where feasible, exploring all viable alternative project designs.
- Where displacement is unavoidable, people losing assets, livelihood or other resources shall be assisted in improving or at a minimum regaining their former status of living at no cost to themselves.

#### **1.3 THE NEED FOR RESETTLEMENT IN THE PROJECT**

Most of the infrastructure work planned for the Road Sector Project will take place within the established Right of Way (RoW), and major land acquisition is not foreseen. However, initial studies show that the RoW is not free from encumbrances. The public land is encroached upon by people cultivating land within the RoW. It is likely that numbers of these squatters and encroachers will have to be displaced as part of the project. While these squatters and encroachers are generally not entitled to legal compensation for land they have occupied, the project will give targeted support to ensure that people are able to maintain shelter and livelihood, and be compensated for non-land assets lost as a result of the project<sup>1</sup>.

Limited land acquisition is expected in cases where curve straightening or bypasses make it necessary to change the existing road alignment and acquire new land.

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<sup>1</sup> World Bank policy does not require legal compensation for land encroached or squatted upon. In India, however, it is customary to grant legal title to squatters and encroachers who have been in occupation for a certain period. The exact nature of this support varies from state to state. A draft national policy on resettlement currently under consideration by the Central Government proposes granting title to all who have been in occupation five years or more.

## 2 IMPACTS AND ENTITLEMENTS

### 2.1 TYPES OF IMPACT TO BE ADDRESSED

This policy addressed development-induced impacts caused by the project, and is not limited to physical relocation. Initial studies and experience elsewhere indicate that there are three broad categories of social and economic impacts, which require mitigation in this project.

- Loss of assets, including land and house
- Loss of livelihood or income opportunities
- Collective impacts on groups, such as loss of common property resources

The first two categories represent direct project impacts on an identified population. The affected people will be surveyed and registered, and project monitoring and evaluation will compare long term impact against baseline socio-economic data. The third category represents an indirect impact, where group members need not be individually registered. Gains and losses of a group-oriented nature are not quantifiable in terms of impact on the individual. Mitigation and support mechanisms will be collectively oriented, and the monitoring of these development efforts will be the impact and benefits for the groups involved.

### 2.2 SUMMARY ENTITLEMENT MATRIX

A summary entitlement matrix for the project is provided in the table below:

<b>Tamil Nadu Road Sector Project</b>				
<b>SOCIAL IMPACTS AND RESETTLEMENT: SUMMARY ENTITLEMENT MATRIX</b>				
<b>Impacts and assistance criteria</b>	<b>Land Acquisition</b>		<b>Inside Right of Way</b>	
	<b>Vulnerable</b>	<b>Non-Vulnerable</b>	<b>Vulnerable</b>	<b>Non-Vulnerable</b>
Corridor of Impact: Loss of land and other assets				
Support given to families and households				
1. Consultation, counseling regarding alternatives, and assistance in identifying new sites and opportunities	}	}	}	}
2. Compensation for land at replacement cost, free of fees or other charges	}	}		
3. Advance notice to harvest non-perennial crops, or compensation for lost standing crop	}	}	}	}
4. Compensation for perennial crops and trees, calculating as annual net product value multiplied by number of years required for new crop to start producing	}	}		
5. Replacement or compensation for structures and other non-land assets	}	}	}	}
6. Rights to salvage materials from existing structures, trees, and other assets	}	}	}	}
7. Assistance in accessing housing schemes, or other support to assist poor and vulnerable in reestablishing their homes	}		}	
8. Option of housing in resettlement sites in cases of cluster relocation	}	}	}	}
9. Shifting assistance and transition stipends	}	}	}	}



<b>Corridor of Impact: Lost or diminished livelihood</b>				
<b>Support given to adult individuals</b>				
10. Rehabilitation and assistance for lost or diminished livelihood	}	}	}	}
11. Additional support mechanisms for vulnerable groups in reestablishing livelihood	}		}	
12. Employment opportunities in connection with project	}		}	
13. Any other impacts not yet identified, whether loss of assets or livelihood	Unforeseen impacts shall be documented and mitigated based on the principles agreed upon in this policy framework			
<i>Indirect, group oriented impacts in the vicinity of the road corridor</i>				
Group oriented support will be given to mitigate negative impacts and enhance development opportunities				

These categories and support mechanisms are described in more details in the following sections.

### **2.3 SUPPORT PRINCIPLES FOR DIFFERENT CATEGORIES OF IMPACTS**

#### **LOSS OF ASSETS**

The project may cause people to lose productive land or houseplots, structures, wells, trees or other assets. The project will therefore compensate and replace lost assets at their replacement cost, defined as the amount required for the affected person to replace the lost assets through purchase in the open market. The entitlement unit for such assistance is the household or family.

To the extent possible the Project will aim at obtaining land through negotiating purchase prices with the sellers, acting as a buyer in the open market. Only if mutual agreement can not be reached about a purchase price, will the Land Acquisition Act and the Government's right of Eminent Domain be invoked.

Existing records of land transaction and other official documents pertaining to the value of various assets are generally not reliable as indicators of real value. The Indian Land Acquisition Act stipulates that additional compensation known as solatium is to be paid on top of the registered value of land and other assets, in recognition of the involuntary nature of the acquisition. However, it may still be insufficient to reach real replacement cost, or it may overvalue assets unnecessarily. The project will therefore objectively establish the real replacement cost of assets to be required. This will be done through conducting a Land Market Value Survey, and through compiling and comparing other available sources of information.

Experience shows that cash compensation carries a high risk and is normally inadequate in helping poor and vulnerable groups reestablish their lost assets, particularly in the case of productive land. Wealthier or more resourceful people, on the other hand, may prefer compensation which in their case does not entail a risk. The project will therefore provide the option of compensation in kind as well as other support mechanisms to those deemed as vulnerable or at risk. Replacement land of equal or better productive value will be offered as an option to those losing substantial amounts of land (i.e., 25% of their holdings or more), or where loss of land threatens the economic viability of the household.

The costs of compensation for land and other assets acquired for civil works or other purposes are to be borne by the State Government, in accordance with the procedures set out in the Indian Land Acquisition Act. The World Bank has not financed such costs in any of its projects, and is unable to do so in this project.

However, any additional costs related to resettlement, capacity building, and other activities required to implement the Resettlement Action Plan, may be covered under the loan. This may in certain cases include additional support mechanisms other than legal compensation for land, to ensure that affected people benefit from the project and do not suffer any net losses.

**Loss of house and shelter**

People losing their home represent a particular challenge in the resettlement programme. Every effort will be made by the project to ensure that new housing is available before people are required to relocate.

The project involves linear resettlement, where narrow strips of land are affected along the road corridor. Large population clusters are therefore not likely to be affected by the project. The preferred approach is to assist people to move back and away from the Corridor of Impact, without having to move far away and disrupting local networks and support mechanisms.

If it is found that clusters of people have to be relocated, the project will provide new housing in a resettlement site approved by the affected people, with adequate infrastructure and utilities. This will be provided as an option, although people may still choose self-relocation if they wish. In that case, compensation and other support should be provided to them, and the project should assist and facilitate their resettlement process.

If resettlement sites are developed as part of the project, the local ‘host population’ will also be consulted about their views and needs, and be given appropriate support to reduce any negative impact caused by an influx of new people.

**Loss of livelihood or income opportunities**

In some cases, the displacement caused by the project may lead to loss of livelihood or income opportunities, either temporarily or permanently. In such cases, assistance will be given to the affected population to reestablish their livelihood and income, and to compensate for temporary losses. The unit of entitlement eligible for support in such cases will be the adult individual, both men and women. All adult members of households affected in this way will be eligible for support.

In the case of road projects, a common loss is the displacement of a business structure such as a small roadside shop. The project will assist such business in relocating, and continuing their preferred occupation without loss of customer base.

If the project impact leads to people being unable to continue with their previous occupation, the project will provide support and assistance through alternative employment strategies. Where possible, project affected people will be given employment in opportunities created by the project, such as work with construction or maintenance. Longer-term earning opportunities will be provided through strategies such as vocational training, employment counseling, inclusion in income generating schemes, and access to credit.

**Group-based development opportunities**

In addition to the direct losses of assets or livelihood, the project is likely to have more indirect impacts on the population living in the vicinity of the road corridor. While many of these impacts are positive, some are negative and should be mitigated. These may include impacts on traffic safety, access to water and sanitation, access to common property resources, and impacts on non-motorized transport such as pedestrians, bullock carts, etc. increased long-distance traffic has been shown to lead to increase in AIDS and other Sexually Transmitted Diseases. Community-owned assets such as schools and temples may also be affected by the project.

Through designs, provision of infrastructure, and other support mechanisms, the project will replace lost assets and minimize any negative impact on groups, particularly groups which are considered vulnerable. Even where there is no discernible negative impact, the project will seek to benefit the local population, for example by providing bus stops where none existed previously.

If the project affects tribal groups living in the vicinity of the road corridor, special attention will be paid to develop support mechanisms which are culturally appropriate to the affected tribal groups. In such cases,

Government of India and World Bank policies related to tribal groups and Indigenous Peoples will be followed.

## **2.4 TARGETED SUPPORT TO VULNERABLE GROUPS**

For the purposes of this project, different criteria and categories of vulnerability have been defined. As a margin of safety, people earning up to a certain percentage level above the officially recognized poverty line within the State will be considered at risk in this context, and included among the vulnerable groups eligible for targeted support. Increasing the margin and eligibility criteria in this manner is done in recognition of the difference between existing development programmes for the poor, where the poverty level may serve as cut-off point for eligibility, and this type of project, where the impacts from the project itself may lead people to suffer a reduction in living standards. Thus, a safety margin is provided, to ensure that adequate support to all people deemed as potentially vulnerable or at risk.

Through census surveys and other studies, the project will determine who among the affected population may be considered as vulnerable or at risk, or who are likely to be excluded from the normal benefits of growth and development. Vulnerable groups may include but not be limited to:

- Poor or landless people
- Scheduled tribes and castes
- Women-headed households
- Children and the elderly
- Disabled people

Different impacts will affect these groups differently, depending on the reason for their vulnerability under the project. Children may be particularly at risk in terms of traffic safety, for example while poor people may be at risk of losing economic viability if they lose agricultural land.

For the purposes of this project, those considered as poor will be members of any household earning up to twenty-five percent more than the official state poverty level in Tamil Nadu. Since the project may cause temporary or permanent loss of income, even those earning slightly more than the poverty level are at risk; thus the vulnerability criterion is set to poverty level plus 25 percent.

Vulnerable groups will receive targeted support and special attention from the project, and be provided with more options and support mechanism than those not considered vulnerable. The issue of options is discussed in the next section.

## **2.5 OPTIONS AND CHOICES**

The project will provide options and choices among different entitlements to the affected population. As part of the consultation and participation mechanisms, people will be informed and consulted about the project and its impacts, and their entitlements and options.

Affected population will be counseled so they are able to make informed choices among the options provided. The project will therefore undertake a risk benefit analysis of each of the options and support mechanisms, and explain benefits and potential risks to the affected population. This will be done particularly in the case of the vulnerable individuals and groups, who will be encouraged to choose options which entail the lowest risk.

By allowing people to choose among different options, the project will seek to make people active participants in the development process, and to achieve greater acceptance of the resettlement and rehabilitation efforts.

### **3 RESETTLEMENT PLANNING APPROACH**

#### **3.1 CORRIDOR OF IMPACT**

Displacement under the project will be limited to the corridor required for the road and its safety zone. This corridor is referred to as the Corridor of Impact. Within this corridor, there should be no structures or other hindrances.

The advantage to this approach is that such a corridor is easier to maintain free of encumbrances than the full Right of Way. Since the density of structures and other encroachments is not very high close to the road, the need for resettlement is reduced to less than a quarter of what would be required if the entire RoW were to be cleared – with corresponding savings in cost and efforts.<sup>2</sup>

The project will ensure that those outside the Corridor of Impact but inside the Right of Way are not displaced during the lifetime of the project. If they are made to move during the lifetime of the project or within three years after the completion of the project, they will be considered eligible for the support mechanisms available to people affected by the project.

It is recognized that this approach offers only a temporary solution, and does not adequately address the longer-term needs of maintaining the Right of Way clear, or of providing the squatters and encroachers with the security of tenure needed to improve their lives. The project will therefore investigate and attempt to achieve more permanent solutions, such as facilitating access to credit or other ways for squatters and encroachers to obtain security of tenure.

#### **3.2 PHASED APPROACH**

By limiting displacement and the need for resettlement to the Corridor of Impact, exact identification of affected population is not possible until engineering designs have been completed. A shift in alignment of a meter may mean the difference between whether a person is considered affected or not.

The World Bank and the Government of Tamil Nadu have agreed that during the appraisal process, final designs will be prepared for approximately forty percent of the roads to be improved. This means that for those roads, exact numbers, identities and socio-economic characteristics of the project affected population will be made available and included in the Resettlement Action Plan. Estimates based on preliminary designs and initial studies will be made for the remainder of the project. During the project implementation phase, additional studies will be undertaken to update the Action Plans in coordination with designs. Principles for socio-economic studies are described in the next section.

#### **3.3 SOCIAL ASSESSMENT, CENSUS SURVEY**

##### **SOCIAL ASSESSMENT**

A social assessment will be undertaken for the project, in order to support participation and make explicit the social factors affecting the development impacts and results. This social assessment will identify stakeholders and key social issues, and formulate a participation and consultation strategy. It will specifically address the issue of how vulnerable and excluded groups may benefit from the project.

##### **CENSUS AND BASELINE SOCIO-ECONOMIC SURVEYS**

A full census will be undertaken to register and document the status of the potentially affected population within the project impact area, their assets, and sources of livelihood. This census will cover 100% of the affected population within the likely Corridor of Impact and a reasonable distance beyond, to ensure that

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<sup>2</sup>An exception to limiting project displacement and resettlement benefits to a Corridor of Impact is in the cases where a shift of alignment will require land acquisition. In such cases, a full Right of Way will be established, and compensation at replacement cost paid to the landowners.

people and assets have been registered in case of a later shift in road alignment. Legal boundaries including the Right of Way will be verified and certified.

Following final designs, those within the Corridor of Impact will be considered eligible for support under the project. This is likely to be a substantially lower number than those initially covered in the census.

The date of census will be the cut-off date for entitlements under the project, to determine who may be entitled to support. People moving into the project area after this census date will not be entitled to support. It is therefore important to undertake this census at the earliest possible date, to avoid an influx of new people seeking benefits under the project. In the cases where Land Acquisition will be required, the date of the first notification under law will be considered the cut-off date.

A limited sample of the potentially affected population will be studied in more detail to provide the baseline information against which project impacts will be measured and evaluated. This sample will be representative of the different impact categories identified.

### **3.4 COORDINATION BETWEEN CIVIL WORKS AND RESETTLEMENT**

#### **SCREENING AND PLANNING**

Every effort will be made to reduce potential negative impacts of the project, both in terms of environment and social issues. The project will therefore carefully coordinate the design process with the finds from screening and studies related to socio-economic impacts and the environment, in order to minimize impacts and maximize benefits.

When choosing among different design options, such as whether to construct a bypass or improve the road through a built-up area, environmental and social indicators will be factored into the decision along with technical and economical considerations.

#### **IMPLEMENTATION**

During project implementation, the resettlement programme will be coordinated with the completion of designs and the likely timing of civil works. The project will provide adequate notification, counseling and assistance to affected people so that they are able to move or give up their assets without undue hardship before civil works are to start.

In the case of Land Acquisition, the Indian Land Acquisition Act constrains rules for the time required from when people are first notified about the State's intent to acquire the land, to the time people are required to vacate their holdings. The normal procedures for Land Acquisition will be followed in this project. Although the Land Acquisition Act has a provision for emergency acquisition requiring shorter time, this clause will not be invoked unless it is documented that an emergency exists and that it is not possible to follow the normal procedure for Land Acquisition.

The project will ensure that civil works are not started on any road segment before compensation and assistance to the affected population have been provided in accordance with this policy framework.

### **3.5 CONSULTATION AND PARTICIPATION PROCESS**

Experience indicates that involuntary resettlement generally gives rise to severe problems for the affected population. These problems may be reduced if, as part of a resettlement programme, people are properly consulted about the project, their situation and preferences, and allowed to make meaningful choices. This serves to reduce the insecurity and opposition to the project which otherwise are likely to occur.

The project will therefore ensure that the affected population and other stakeholders are informed, consulted in a meaningful way, and allowed to participate actively in the development process. This will be done throughout the project, both during preparing, implementation, and monitoring of project results and impact.

The consultation will be conducted in a way which is appropriate for cultural, gender-based, and other differences among the stakeholders. Where different groups or individuals have different views or opinions, particular emphasis will be put on the views and needs of the more vulnerable groups.

### **3.6 INSTITUTIONAL ARRANGEMENTS**

The Resettlement Action Plan will contain detailed information about institutional and organizational mechanisms required to implement the plan. A Project Implementation Unit (PIU) will have responsibility for coordinating resettlement along with other project components, and will be staffed with people with experience in resettlement and social development.

This project implementation will require coordination among different agencies, working in different districts and jurisdictions. This presents particular challenges, and may pose a risk of delays in implementation of the resettlement programme. An assessment will therefore be made of institutional capacity and risks. This assessment will be described in the Resettlement Action Plan, accompanied by a strategy for developing the required capacity and minimize implementation risks. This will include analysis of training needs and a plan for training of personnel at different levels. Such capacity building will be coordinated with the overall project implementation schedule, to ensure that skilled staff are available to implement the Resettlement Action Plan without causing delays to civil works.

Since much of the work related to resettlement involves social development and community participation, the project will work with agencies experienced in this type of work, such as NGOs.

Consideration will also be given to coordinating with other development programmes, such as vulnerable groups' housing schemes or rural development NGOs, in order to provide the project affected population with access to services and programmes already in place.

While consultancy services will be used in preparing and implementing this project, an important objective is to develop local capacity to plan and implement resettlement programmes. The project will therefore document how capacity building at different levels is achieved, and how this project contributes to improved sector-level or State-level policies and practices related to resettlement in the State.

### **3.7 COSTS AND BUDGETS**

The Resettlement Action Plan will contain a consolidated overview of estimated costs. This will consist of an item-wise budget estimate for resettlement implementation, including administrative expense, monitoring and evaluation, and contingencies. The cost of resettlement will be included in the overall costs of the project.

Compensation amounts and other support mechanisms will be adjusted based on inflation factors. The budget will incorporate provisions for this, and the Resettlement Action Plan will describe how such adjustments and updates to the budget are to be made.

Experience from similar projects show that resettlement costs in road projects are low compared with overall project costs. Delays or inadequacies in implementing the resettlement programme may however lead to costly delays in overall project implementation, since progress in civil works depends on satisfactory completion of the resettlement programme.

The State of Tamil Nadu will pay for costs related to Land Acquisition and compensation for transfer of title to property from private individuals to the State. Other support mechanisms, such as training, capacity building, income generating schemes etc., can be covered through the funds provided through the expected World Bank loan.

### **3.8 GRIEVANCE REDRESS**

It is expected that through a participatory process and good compensation and support mechanisms, acceptance of the project will be enhanced and complaints reduced. There may nevertheless be individuals or groups who feel that they are not given adequate support, or that their needs are not properly addressed.

The project will therefore establish a Grievance Redress process with local committees which will hear complaints and facilitate solutions. This Grievance Redress process will be used to settle disputes through mediation, and to reduce unnecessary litigation.

The Resettlement Action Plan will describe the step-by-step process for registering and addressing grievances, and provide details regarding registering complaints, response times, communication modes, and mechanisms for approaching civil courts if these provisions fail.

In addition to local Government officials and representatives of the project, each Grievance Redress Committee will have representation from the local affected population and collaborating agencies.

### **3.9 MONITORING AND EVALUATION**

The Resettlement Action Plan will contain indicators and benchmarks for achievement of the objectives under the resettlement programme. These indicators and benchmarks will be of three kinds:

- Proposed indicators, indicating project inputs, expenditures, staff deployment, etc.,
- Output indicators, indicating results in terms of numbers of affected people compensated and resettled, training held, credit disbursed, etc.,
- Impact indicators, related to the longer-term effect of the project on people's lives.

The benchmarks and indicators will be limited in number, and combine quantitative and qualitative types of data.

The first two types of indicators, related to process and immediate outputs and results, will be monitored internally by the project. This information will serve to inform project management about progress and results, and to adjust the work programme where necessary if delays or problems arise. The results of this monitoring will be summarized in reports which will be submitted to the World Bank on a regular basis.

Provision will be made for participatory monitoring involving the project affected people and beneficiaries of the resettlement programme in assessing results and impacts.

The project will also contract with an external agency such as an academic institute, which will undertake independent evaluations at least twice during the lifetime of the project: As an input to a mid-term review, and as a longer-term impact evaluation as an input to a project completion report. Such independent evaluation will focus on assessing whether the overall objectives of the project are being met, and will use the defined impact indicators as a basis for evaluation.

## **BORROWING OF EARTH**

### **DESIGN STAGE**

No borrow area shall be opened without permission of the Engineer. The borrowing shall not be carried out in cultivable lands, unless and until, it shall be agreed upon by the Engineer that there is no suitable uncultivable land in the vicinity for borrowing, or there are private land owners willing to allow borrowing on their fields. It will be ensured by the contractor that, there will be no loss of productive soil and the requisite environmental considerations are met with.

Location of source of supply of material for embankment or sub-grade and the procedure for excavation or transport of material shall be in compliance with the environmental requirements of the MoEF, MoST and as specified in IRC: 10-1961. Redevelopment of borrowed areas will need to be taken up to mitigate the impacts.

### **CONSTRUCTION STAGE**

To avoid any embankment slippage, the borrow areas will not be dug continuously. In case borrow areas other than specified are selected, the size and shape of borrow pits will be decided by the Supervision Consultant. Borrowing of earth shall be carried out at locations recommended as per IRC: 10-1961 whose salient features are described below:

**Non-Cultivable Lands:** Borrowing of earth will be carried out upto a depth of 1.0 m from the existing ground level. Borrowing of earth shall not be done continuously. Ridges of not less than 8m width shall be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges, if necessary, to facilitate drainage. Borrow pits shall have slopes not steeper than 1 vertical in 4 horizontal.

**Public or Private Agricultural Lands:** Borrowing of earth shall not be carried out on productive lands. However, in the event of borrowing from productive lands, topsoil shall be preserved in stockpiles. 150mm of the top soil shall be stripped off from the area designated for borrowing and it shall be stored in stock piles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2. At such locations, the depth of borrow pits shall not exceed 45 cm and it may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil aside.

**Borrow pits on the riverside:** The borrow pit should be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood. Precautionary measures like the covering of vehicles will be taken to avoid spillage during transport of borrow materials. To ensure that the spills likely to result from the transport of borrow and quarry materials do not impact the settlements, it will be ensured that the excavation and carrying of earth will be done during day time only. The unpaved surfaces used for the haulage of borrow materials will be maintained properly. The contractor shall evolve site-specific redevelopment plans for each borrow area location, which shall be implemented after the approval of the engineer.



**Borrow Area identified for Redevelopment should:**

**Typology only: Select one of each type (based on drainage, adjoining landuse) for detailing**

- Be located on Community/Government Land
  - Be located in vicinity of Settlement (within 100m)
  - Be located on or near sensitive environmental elements
- 

**DOCUMENTATION OF BORROW PIT**

**DETAILS TO INCLUDE/IDENTIFY**

- Chainage/ Distance from CW/Sub Package/Side of Road
- Size & length
- Type of Access/width/kuccha/pucca etc from carriageway
- Soil type
- Water Table of the area or identify from nearest well etc/ask people
- Existing Land use such as barren/agricultural/grazing land
- Location/Name/Population/Caste of Nearest Settlement/Community & distance from Borrow Area/Type and characteristics of settlement
- Daily/occasional use of the Borrow Area by the community, if any
- Additional facilities required by community such as drinking water tank seating etc.
- Probable reuse of Borrow pit-ask community
- Suggested Trees to be planted-ask community.
- Proposed enhancement materials locally available.
- Adjoining land use/Natural elements
- Drainage channels/slope/characteristics of the area

**GUIDELINES FOR ENHANCEMENT**

1. Any enhancement design proposed should be workable, maintenance free and preferably worked out in consultation with the community
2. If the borrow area is to be developed as a fishpond the site should be studied for natural available catchment for storing water/existing water table depth/fish species that can survive.
3. the borrow area site should be inspected for erosion control required
4. The design should propose additional trees to provide shade for the proposed activity and to control soil erosion
5. The design should include slope protection measures for erosion control. This can be in form of vegetable earth/ruble bunds to prevent erosion and formulation of gullies.
6. The borrow area can be developed as playfield/fishpond/orchard/or simply as nearby if a school is, if water is available, if the soil type is suitable a community space. Elements for enhancement can be introduced accordingly.
7. Preventive measures for

- leaching
  - mosquito breeding
  - Water run-off/contamination
  - Any other environmental degradation
8. The proposal should also be having in mind avenue for generation of income/equipment to the people of the adjoining community so than maintenance is ensured vis-à-vis. The design must thus ensure:
9. Protection against erosion & degradation
10. Provide perennial cover or introduce new productive use for the borrow area.

**TO REPRESENT ON WORKING PLAN**

- Access of Property /width of access/material
- Orientation of property with respect to the road
- Site Slope
- Local Drainage / water logging etc if any
- Location of nearest culvert etc if any to drain water if required
- Any other community resources such as tube well/well etc in vicinity
- Location of trees including Species/girth/foilage spread and afternoon shaded area on ground
- Surrounding land use; nearby settlements (name of structure/pattern of settlement)
- Mark on plan part of the borrow area, most suitable for storing and staking topsoil.

**TO REPRESENT IN CROSS SECTION**

- Contours if any/depth if any
- Height of trees
- Any other existing details at the road /property interface such as signage/railing/etc
- Details of immediate surrounding for at least 5m on either sides

**PHOTOGRAPHS TO INCLUDE**

- Overall View from access side
- Any other community resource in the vicinity
- All spots to be detailed such as access to borrow pit /cluster of existing trees etc

**OUTPUTS**

- Working plan
- Cross Section
- Longitudinal Section/Elevation of Site
- Details of all proposed Enhancements including signage etc.
- BoQ

## **GUIDELINES**

The locations of dumping sites have to be selected such that:

No residential areas are not located downwind side of these locations,

Dumping sites are located at least 100m away from locations of substantial ecosensitive places. The environmental expert hired for the purpose by the contractor will conduct the assessment. Such a list of the places is given in Appendix IV |

Dumping sites do not contaminate any water sources, rivers etc, and

Dumping sites have adequate capacity equal to the amount of debris generated.

Public perception about the location of debris disposal site has to be obtained before finalizing the location.

Permission from the Village Council President is to be obtained for the dumping site selected

The removal of pavement for the short stretches where it is being relaid will generate substantial quantities of debris. This shall be disposed off in an environmentally suitable manner. Certain guidelines for debris disposal are given below.

The debris generated shall be disposed of within designated areas only.

The filled up area shall be used for designated purposes such as:

### **PLAYING FIELDS**

These will be created by leveling of the filled up area and compacting the fill with several passes of a roller.

This compacted area will be covered with topsoil from excavation for a depth of 15-30 m.

The soil will be watered and grassed to develop a green cover over an area of the playing field.

### **SHORT REALIGNMENTS**

The short realignments provide ideal disposal sites for substantial quantities of debris of cutting.

The valley between the sharp curve shall be filled to the level of the sub-grade.

A retaining wall of dimensions as per engineering design shall be constructed and the road section shall be constructed on the filled area.

Debris will be continued to filled till the level of the top of the pavement is reached between the new and old roads.

**Comment:** Page: 1  
Appendix number same as taken from feasibility report. See the main report.

## Appendix v: ecosensitive areas along maintenance corridors

The lists of Reserve Forests along maintenance corridors are given in Table 1.

**Table 1: List of Reserve Forests along Maintenance Corridors**

District	Link	Start Point	End Point	Length (km)	Reserved Forest	Approximate length of traverse (km)
Dhamapuri	123-125	Rayakottai	Hosur	34.2	Sanamavaco Ext. RF	1
	119-120	Harur	Uttangri	26.6	Onnakerai RF	2
North Arcot	132-501	Gudiyattam	Pemumbut to Border	26.2	Nayakkaneri RF	3
Tiruvannamalai	028-029	Tiruvettipuram	Vandavasi	21.2	Venkunam RF	2.5
	120-131	Uttangari	Chengam	31.0	Anandavadi RF	1.5
	131-039	Chengam	Tiruvannamalai	33.2	Melchengam RF Iraiyumalai RF Pinjur	2.5 2 1.0
Sivaganga	086-030	Sivaganga	Melur	27.0	Vellamali Forest	0.8
	086-087	Sivaganga	Manumadurai	17.4	Katturani RF	7.0
South Arcot	104-047	Attur	Veppur	59.0	Krishnapuram RF	3
Villupuram	041-245	Tirukkivilur	Sankeapuram	35.2	Kaduvanur RF	2
	503-502	Tiyagal Durgam via Pishivandiyam	Link No. 3 Road	17.4	Swamimalai	3.1
	039-034	Tiruvannamalai	Gingee	39.0	Rshivandiyam RF	2
	041-046	Tirukkivilur	Ulundurpettai	42.9	Muttakadu RF	2.5
	030-031	Tindivanam	Marakkanam	34.0	Srupakkam Kurumpuram RF	2.0 2
Coimbatore Nilgiri	145-233	Mettupalayam	Udagamandalam	48.8	Trallar	5.5
	145-23	Mettupalayam	Udagamandalam	48.8	Ariyalur Tiger Hill	3.0 3.1
Tiruchirapalli	050-100	Sirangam	Turaiyur	36.0	Pulivalam RF	2
	100-101	Turaiyur	Perambalur	35.8	Kurichchimalai RF	0.5
	107-100	Namakkal	Turaiyur	47.6	Viranachchampatti	1.7
Pudukkottai	074-081	Pudukkottai	Aranthangi	33.2	Kurumbur	0.9

The lists of Wildlife Sanctuaries along maintenance corridors are given in Table 2.

**Table 2: Wildlife Sanctuaries (within Tamil Nadu) along Maintenance Corridor**

Name	Area ( ha)	Location (District)	D.SR* (km)	Corridor
<b>Declared under the Madras Forest Act, 1882</b>				
Mudumalai Wildlife Sanctuary	21776	Nilgiris	10.5	19
Point Calimere Sanctuary	1475	Nagapattinam	22.8	1
<b>Declared under the Wild Bird Protection Act, 1912</b>				
Mundanthurai Wildlife Sanctuary	56738	Tirunelveli	2.7	19
<b>Declared under Section 18 of the Wildlife Protection Act, 1972</b>				
Vedanthangal Birds Sanctuary	30	Kanchipuram, Villupuram	24.5	2
Kalakad Wildlife Sanctuary	22358	Tirunelveli	4.0	19
Ventangudiipatti Birds Sanctuary	38	Ramanathapuram	22.0	1
Udayanarthandapuram Birds Sanctuary	45	Thiruvarur	0.5	1
Vaduvoor Birds Sanctuary	128	Thanjavur	21.5	10
Kathankulam-Kadankulam Birds Sanctuary	129	Tirunelveli	21.0	14
Pulicat Lake Birds	15367	Tiruvallur	110.0	1
Srivilliputhur Grizzled Squirrel Wildlife Sanctuary	48520	Virudhunagar	50.0	14
Karikali Birds Sanctuary	61	Kanchipuram	24.0	2
Kanjirankulam Birds Sanctuary	104	Ramanathapuram	15.0	1
Chitrangudi Birds Sanctuary	48	Ramanathapuram	27.0	1
Indira Gandhi Wildlife Sanctuary	84149	Coimbatore	15.0	12
Vallanadu Black-buck Sanctuary	1641	Tuticorin	8.5	14
Vettangudi Birds Sanctuary	48	Ramanathapuram	25.0	12
Karaivetti Birds Sanctuary	280	Perambalur	9.0	10
Vellore Birds Sanctuary	77	Vellore	19.0	24
<b>Declared under Section 35 of the Wildlife Protection Act, 1972</b>				
Guindy National Park	282	Chennai	80.0	1
Indira Gandhi National Park	11711	Coimbatore	15.0	12
Mukurthi National Park	7846	Nilgiris	15.0	19
Gulf of Mannar National Park	623 <sup>1)</sup>	Ramanathapuram	7.5	1
Mudumalai National Park	10324	Nilgiris	10.5	19
<b>Total</b>	<b>283,788</b>			

Note: <sup>(1)</sup> Area of islands only; the national park also include (Forest Department, 1990) sea areas shallower than 3.5 fathoms (landward side of islands) and 5 fathoms (seaward side)

\* DSR refers to distance from study road.

## Appendix VI: reporting formats

**M 1: REPORTING FORMAT FOR SELECTION OF DUMPING SITE LOCATIONS**

Route _____ Stretch: _____ To _____ (Give chainage and nearest settlements from both ends)				
Criteria on which information for each site is to be collected	Site 1	Site 2	Site 3	Site 4
Area covered (m <sup>2</sup> )				
Total Material that can be dumped within the site (m <sup>3</sup> )				
Depth to which dumping is feasible (m)				
Distance of nearest watercourse (m)				
Nearest Settlement (m)				
Date/s of Community Consultation/s				
Whether the community is agreeable to siting of dumping site (Y/N)				
Date of Permission from Village Council President(VCP)				
Proposed future use of the Site				
<p>Selected Site (tick any one column only)</p> <p>Certified that the above information is correct to the best of my knowledge and belief.</p> <p>(Contractor) Verified: _____ Date: _____</p> <p>Recommendation on the suitability of the site</p> <p>Signed: _____ Date: _____ Name &amp; Designation: _____</p> <p>Decision Taken (tick one): _____ Approved/Not Approved</p> <p>Signed: _____ Date: _____</p> <p>Name and Designation of Deciding Authority</p> <p>Enclosures (Tick as appropriate)</p> <p>1 Maps of each location</p> <p>2 Photographs</p> <p>a Each dumping location</p> <p>b Each community consultation</p> <p>3 Photocopies of permissions from VCPs</p>				

Name and Designation of Verifier:

### C 1: REPORTING FORMAT FOR CONSTRUCTION CAMP AND STORAGE AREA

Construction Stage Report: Date \_\_\_\_ Month \_\_\_\_\_ Year \_\_\_\_\_

Site Layout of Construction camp and working drawings of dwelling units with allied facilities to be attached with format)

Format to be submitted before target date (decided by PP.) of establishing camps as  
Camp no. WC  
Location of Camp (km \_\_\_\_\_ Package \_\_\_\_\_)

Sl. No	Item	Unit	Details	Remarks by SC, if any
1	Detail of item camp			
a	Size of Camp	m <sup>2</sup> m		
b	Area of Camp	sq.m		
c	Distance from Nearest Settlement			
d	Distance from Nearest Water Source	Type/Size/Capacity/Present Use/Ownership		
	Date of camp being operational dd/mm/yy			
	Present land use			
	No other trees with girth > 0.3m.			
e	Details of Storage area(Availability of impervious surface)	m <sup>2</sup> m		
f	Availability of separate waste disposal from storage area	Cum		
2	Details of topsoil stacking			
a	Quantity of top soil removed	sq.m		
b	Detail of storage of topsoil	Describe stacking arrangement		
3	Details of workforce			
a	Total No of Labourers	No.		
b	Total no of Male Workers	No.		
c	No of Male Workers below 18 years of age	No.		
d	Total No of Female Workers	No.		
e	No of Female workers below 18 years of age	No.		
f	No of children	No.		
4	Details of dwelling units			
a	No of dwellings/huts	No.		
b	Minimum Size of Dwelling	m <sup>2</sup> m		
c	No of openings per dwelling	No.		
d	Minimum size of opening	m <sup>2</sup> m		
e	Walls	specifications		
f	Roofing	specifications		
g	Flooring	specifications		
h	Drinking Water Tank	specifications		
i	Capacity of Drinking water Tank	cum		
j	Size of Drinking Water Tank	m <sup>2</sup> m <sup>2</sup> m		
k	Total no of WC	No.		
l	No of Wcs for female workers	No.		
m	Minimum Size of WC	m <sup>2</sup> m		
n	Total No of Bathrooms for female workers	No.		
o	Size of septic tank for WC/Baths	m <sup>2</sup> m <sup>2</sup> m		
p	Capacity of Water Tank for WCs/ Bathrooms and general purpose			
q	Fencing around camp	Y/N		
5	Details of facilities			
a	Availability of security guard 24 hrs a day	Yes/No		

b	Details of First Aid Facility	Yes/No		
c	Availability of Day Care Centre	Yes/No		
d	Availability of dust bins (capacity 60 ltr)	nos		
<p>Certified that the furnished information is correct the quality of work is as per good practice and all relevant information as required is attached</p> <p><b>Project Engineer</b> <b>(Supervision Consultant)</b></p> <p><b>(Contractor)</b></p>				



**C 2: REPORTING FORMAT FOR POLLUTION MONITORING**

Construction Stage: Report - Date ____ Month Year ____ (Locations at which monitoring to be conducted as per ESMP)							
Sl. No	Chainage	Details of Location	Duration of Monitoring	Instruments Used	Completion Target		Reason for Delay if any
					Target Date	Date of Completion if task completed	
<b>Air Monitoring</b>							
1							
2							
3							
4							
<b>Water Monitoring</b>							
1							
2							
3							
4							
5							
<b>Soil Monitoring</b>							
1							
2							
3							
4							
5							
<b>Noise Monitoring</b>							
1							
2							
3							
4							
3							
Certified that the Pollution Monitoring has been conducted at all the locations specified in the EMP and as per the directions of the SC							
<b>Project Engineer (Supervision Consultant)</b>						<b>Contractor</b>	

**C 3 REPORTING FORMAT FOR TOPSOIL CONSERVATION MONITORING**

Contract \_\_\_\_\_

Report No. \_\_\_\_\_

Date \_\_\_\_\_

Location (Chainage)	Original Use of Topsoil removed	Measures for preventing spillage of topsoil on Haul Roads (Earthen/Metalled)	Present Method of Storage	Anticipated period of Storage (Months)	Distance of nearest Water course (m)	Present Slope of Pile (V: H)	Whether silt fencing provided ?	Is any other covering / measure provided ? If yes, what is it?	Improvements required	Extent of Compliance as on date of report

Certified that the above is true.

Verified

Signed \_\_\_\_\_

Signed \_\_\_\_\_

(Authorised Representative of the Contractor)  
PIU)

(Environmental Specialist of the

## Appendix VII: training modules

### TRAINING OF THE MEMBERS OF THE ENVIRONMENTAL CELL

Members of the Environmental Cell will be trained in environmental protection both in theoretical and practical aspects. While theoretical aspects will form the bedrock of the training programme, it will be the practical site visits and /or hands-on training at project site itself, which will be of direct use to the project. Basic training required for environmental awareness shall be provided initially and then experts in specific aspects of road-related works who will train the officials regarding the detailed procedures will be identified. Specific modules customized for the available skill set shall be devised after assessing the capabilities of the members of the Environmental Cell and the requirements of the project. The entire training would cover basic principles of environmental assessment and management; mitigation plans and programmes, implementation techniques, monitoring methods and tools. The training modules designed will be suitable for both upgradation and maintenance components. Specific issues for upgradation and maintenance shall be taken up in separate sessions.

Typical modules that would be present for the training session would be as follows:

- Introduction to Environment and statutory regulations
- Environmental Considerations in road project and major issues
- Environmental Assessment methodology and methodology for conduct of field surveys
- Impact assessment adopted for specific components
- Specific issues along maintenance corridors as hill roads maintenance and biodiversity
- Mitigation measures devised, application on field for both upgradation and maintenance components
- Environmental enhancements and landscaping
- Institutional setup and responsibilities
- Monitoring of measures suggested and required reporting

Number of sessions required and duration would be based on the skill set available with the Environmental Cell of PIU and Construction Supervision Consultants. Apart from the modules specified above, it is recommended to include short term training courses abroad for environmental officers of the PIU. The training would be in:

- Understanding the operation of ERMPs of advanced countries and the issues involved
- Having insight into prediction of highway pollution and management

The proposed orientation program along with the frequency of sessions is presented in the **Table 1**. A specific module for orientation of maintenance contractors is provided in Session III, Module IX. Based on the severity of issues, necessary items provided in the description shall be elaborated. Provision is made for 4 more sessions for training under maintenance corridors including site visits. These sessions shall be exclusively for AE's, ADE's of respective districts where issues have risen and the maintenance contractor.

**Table 1: Training Program for TN RSP**

Module No.	Description	Participants	Form of Training	Duration/Location
Pre-construction Stage				
Session I				

Module No.	Description	Participants	Form of Training	Duration/Location
Module I	<p><b>Introduction to Environment:</b></p> <ul style="list-style-type: none"> <li>Basic Concept of environmental pollution and control</li> <li>Environmental Regulations and Statutory requirements as per Government of India and World Bank</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts	Lecture	
Module II	<p>Environmental Considerations in road projects:</p> <ul style="list-style-type: none"> <li>Environmental components affected by the road development in construction and operation stages</li> <li>Activities causing pollution during construction</li> <li>Activities causing pollution during operation</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts	Workshop	1 working day for lecture / workshop / interactive session
Module III	<p>Methodology:</p> <ul style="list-style-type: none"> <li>Environmental Assessment methodology</li> <li>Methodology of assessment for Pollution monitoring</li> <li>Methodology for site selection of borrow areas, construction camps, debris dumping</li> <li>Methodology for selection of enhancement sites</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts	Interactive session and Field visit to enhancement site	1 working day site visit
<b>Session II</b>				
Module IV	<p>Baseline data generation:</p> <ul style="list-style-type: none"> <li>Identification of environmental components</li> <li>Impact Assessment::</li> <li>Assessment methodology for individual components as – air, noise, water, soil etc</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts	Lecture	½ working day
Module V	<p>Mitigation measures:</p> <ul style="list-style-type: none"> <li>Mitigation Measures devised for the project – General concepts</li> <li>Component wise measures to be implemented</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts	Lecture and field visit	½ working day lecture
Module VI	<p>Environmental Enhancements:</p> <ul style="list-style-type: none"> <li>Types of Measures</li> <li>Concepts for enhancements</li> <li>Design of enhancements</li> <li>Landscaping</li> <li>Implementation of EMP</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts	Lecture and Field visit	1 working day lecture (initial stages of construction) 7 days (including days of travel) field visit to locations where EMP is implemented
<b>Construction Stage</b>				
<b>Session III</b>				
Module VII	<p>Institutional Setup</p> <ul style="list-style-type: none"> <li>Roles and Responsibilities of officials/contractors/consultants towards protection of environment</li> <li>Monitoring mechanisms</li> <li>Reporting requirements with targets</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor	Lecture	1 working day in the initial stages of construction
Module VIII	Monitoring and reporting system	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor	Workshop	1/2 working day subsequent to Module VII
Module IX	<p>Hill roads and Bio-diversity along Maintenance roads</p> <ul style="list-style-type: none"> <li>Roads selected and treatments proposed</li> <li>Environmental issues along hill roads</li> <li>Ecological conditions &amp;</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor	Workshop	1/2 working day subsequent to Module VII

Module No.	Description	Participants	Form of Training	Duration/Location
	biodiversity <ul style="list-style-type: none"> <li>• Road maintenance and impacts on conservation efforts</li> <li>• Slope stability – issues of providing adequate formation width.</li> <li>• Mitigation strategy and measures for protection and enhancement</li> <li>• Unanticipated impacts and mitigations required before commencement of works</li> </ul>			
<b>Session IV</b>				
Module X	Feedback from participants on problems encountered in the implementation of EMP	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor, EA Experts, CSC, CE(General), Project Director	Workshop	½ Working day in the Second year of construction
Module XI	Solutions to unresolved issues raised in Module X	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor, EA Experts, CSC, CE(General), Project Director	Workshop	1 Working day in the Second year of construction
Module XII	Additional training needs and institutionalizing the solutions arrived at in Module XI	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor, EA Experts, CSC, CE(General), Project Director	Workshop	½ Working day in the Second year of construction
<b>Session V</b>				
Module XIII	Additional training as per Module XII	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor.	Lecture/workshop	1 working day in the second year construction
<b>Session VI</b>				
Module XIV	As per requirements of PIU staff	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor.	Lecture/workshop	1 working day in the final year of construction
<b>Session VII</b>				
Module XV	Feedback lectures on environmental management from Environmental officers	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor.	Workshop	1 Working day in final year of construction
<b>Session VIII</b>				
Module XVI	Environmental management in Operation period <ul style="list-style-type: none"> <li>• Environmental issues in Operation stage</li> <li>• Monitoring and reporting</li> <li>• Environmental management of issues subsequent to operation stage</li> </ul>	Assistant Divisional Engineers (ADE) & Assistant Engineers (AE) of PIU and AEs, ADEs & DEs of HD from all districts and Maintenance contractor.	Lecture/workshop	1 working day in the final year construction

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