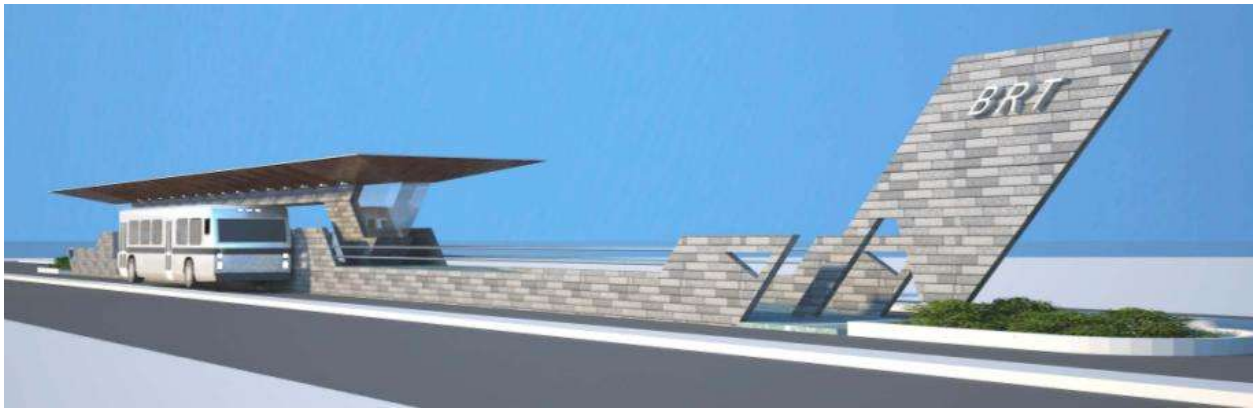
Directorate of Urban Land Transport

IMPLEMENTATION OF
BUS RAPID TRANSIT SYSTEM
IN HUBLI – DHARWAD

ENVIRONMENT MANAGEMENT PLAN
(BRTS COMPONENT)



HUBLI-DHARWAD BRTS COMPANY LIMITED

5-1-2013

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List of Abbreviation

AAQM	:	Ambient Air Quality Monitoring
BRTS	:	Bus Rapid Transit System
BSNL	:	Bharat Sanchar Nigam Ltd
CBT	:	Central Bus Terminal
CPCB	:	Central Pollution Control Board
CSC	:	Construction Supervision Consultant
CO	:	Carbon Monoxide
CoI	:	Corridor of Impact
DPR	:	Detailed Project Report
DULT	:	Directorate of Urban Land Transport
EA	:	Environmental Assessment
EMP	:	Environmental Management Plan
ESMF	:	Environmental and Social Framework
FGDs	:	Focus Group Discussions
GEF	:	Global Environment Facility
GPS	:	Global Positioning Systems
GoI	:	Government of India
HC	:	Hydro Carbon
HDMC	:	Hubli Dharwad Municipal Corporation
ITS	:	Intelligent Transport System
IRC	:	Indian Roads Congress
KRDCL	:	Karnataka Road development Corporation Ltd
KSPCB	:	Karnataka State Pollution Control Board
LMV's	:	Light Motor Vehicle
MoEF	:	Ministry of Environment and Forest
MSL	:	Mean Sea Level
MLD	:	Million Litres Per Day
NAQMP	:	National Air Quality Monitoring Programme
NGO	:	Non-Government Organisation
NWKRTC	:	North West Karnataka Road Transport Corporation
NoC	:	No Objection Certificate
NO_2	:	Nitrogen Oxide
OCBS	:	Old Central Bus Stand
PAP's	:	Project Affected People
PUC	:	Pollution under Control Certificate
PWD	:	Public Works Department
RAP	:	Resettlement Action Plan
RoW	:	Right of Way
RTO	:	Regional Transport Office
SPV	:	Special Purpose Vehicle
SUTP	:	Sustainable Urban Transport Project
SEIAA	:	State/Union territory Environment Impact Assessment Authority
VUP's	:	Vehicle Under Pass

1. INTRODUCTION

1.1 Project description

1. Hubli – Dharwad state highway is the one of the most congested road stretches in North West Karnataka region. To ease the growing traffic from Hubli – Dharwad, the Government of Karnataka, through the Karnataka Road Development Corporation Limited (KRDCL) has taken up the widening of the existing two lane state highway to a divided four lane carriageway. To provide better transportation facilities between the two urban areas of Hubli and Dharwad, and with an objective to improve travel speeds, reliability, and quality of public transport services, a BRTS facility is proposed along the corridor. For incorporating the BRTS facility an additional 4 lane has been added to the current KRDCL proposal, making it an 8 lane carriage way (4 lane for BRTS and 4 lane for mixed traffic).

2. An SPV: "Hubli-Dharwad BRTS Company Ltd" is formed to take up the proposed infrastructure facilities for the BRTS. As part of the BRTS; the existing infrastructure facilities like workshop, bus stations, depot, terminals etc. are proposed to upgrade in high quality.

3. The salient features of the proposal are:

- All state transport and regional buses to terminate at the new terminal facility on Gokul road at Hubli. This will help in decongesting at OCBS near Rani Chenamma. The Hosur circle too will get decongested. Only city and suburban services along with some moffusil services will come to OCBS Hubli. An interchange station at new terminal will enable people to transfer to BRT.
- Regional buses now terminate at new terminal in Dharwad. This arrangement will continue in future. Transfer to BRT feeder will be available at new terminal.
- Two dedicated depot cum workshops for BRT, one at Hubli and one at Dharwad will be constructed. At Hubli, this facility will be adjacent to the new terminal and will cater to 113 standard buses. At Dharwad, the depot cum workshop will be constructed next to the new terminal and will service 52 standard buses.
- All regional city bus services and moffusil services will have central depot, at the site near Hosur circle, Hubli.
- The BRT services in both cities will use the existing CBT land for terminal facilities. The existing terminals will be upgraded to handle BRT services.
- Turn around facilities are proposed at Hubli railway station, Rani Chennam circle, Hosur circle, Unkal Lake, Navanagar, Court circle and Jubilee circle. Of these, Hubli railway station, Rani Chenamma circle and Jubilee circle will be major turnaround points.
- There shall be three interchange locations with city bus at CBT at Hubli, near Rani Chenamma circle and OCBS Dharwad. These locations will also have commercial development and parking facility.
- Commercial development will be permitted at the Hosur site, OCBS at Hubli and Dharwad and CBTs at Hubli and Dharwad.

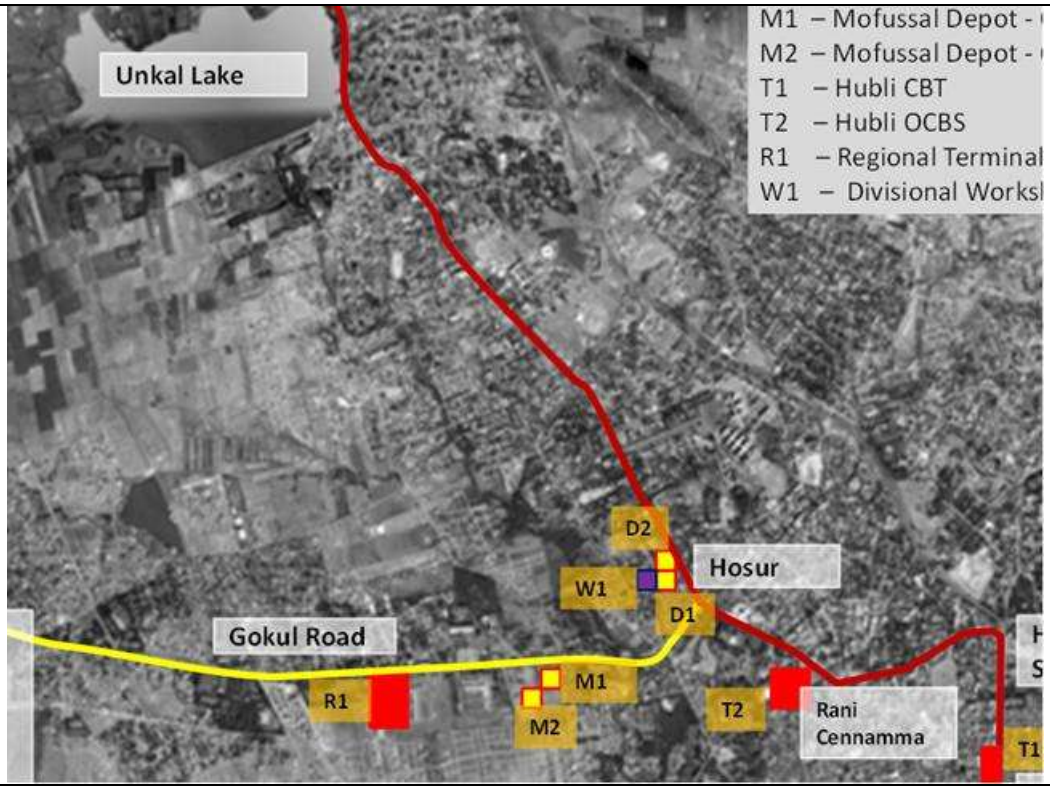

Figure 2-1: Public transit Infrastructure facilities at Hubli

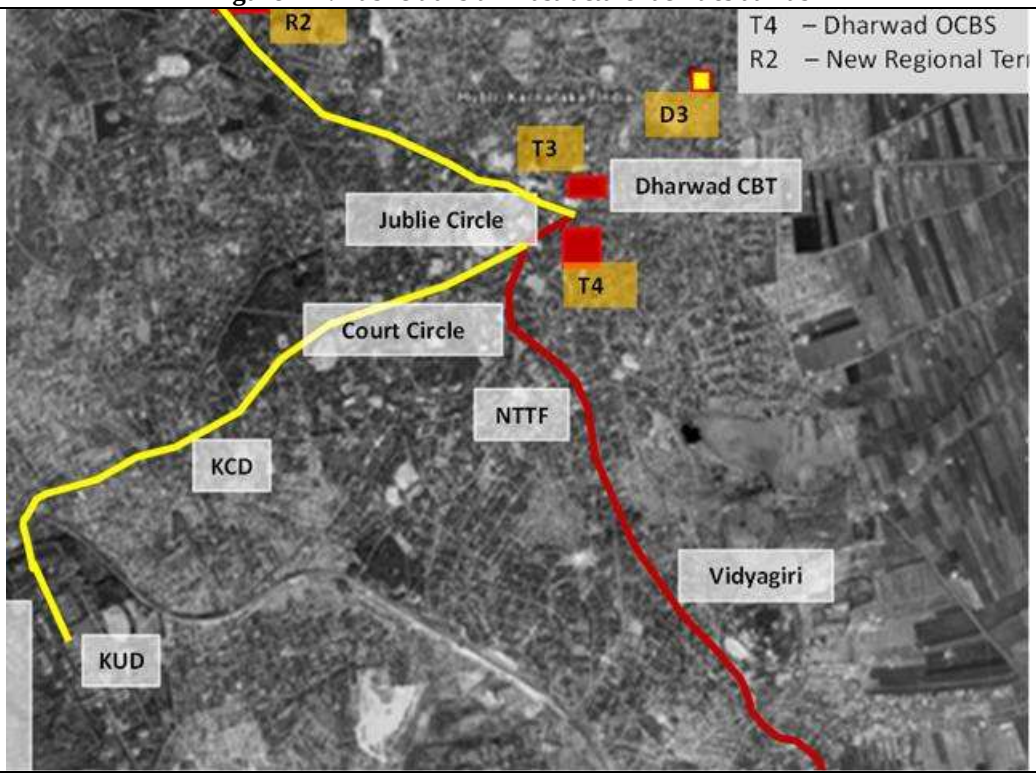

Figure 2-2: Public transit Infrastructure facilities at Dharwad

4. This Environmental Management Plan provides the mitigation measures to be implemented as part of BRTS physical infrastructure facilities (workshop, stations, depot, terminals etc.)

1.2 Context for the EMP

5. The management measures have been identified for the specific environmental issues identified in the EIA. This EMP document is structured to be standalone document, and included as part of the bid documents for implementation by the contractor. In addition, this EMP provides guidance to SPV in effective supervision and monitoring of the implementation of the environmental measures proposed.

1.3 Clearance Requirements

6. The proposed infrastructure facilities for BRTS do not attract any environmental clearance as per EIA notification 2006 stipulated by Ministry of Environment and Forest (MoEF). However, the project shall require obtaining consent from competent authorities such as the KSPCB, for '***Consent to Establish***' by submitting a Common Application (as per Schedule-I), under Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981) and authorization under Hazardous Wastes (Management and Handling) Rules, 1989, as amended. Other clearances to be obtained by SPV / contractor prior to commencement of civil works are presented in **Table 2-1**.

Table 2-1: Applicable Laws and Regulations

Sl. No	Clearances	Acts	Approving Agency	Applicability to the Project	Time Required	Responsibility	
						Execution	Supervision
PROJECT PREPARATION STAGE							
1	No Objection Certificate (NOC)	Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981	Karnataka Pollution Control Board	Applicable	3 months	SPV	SPV, WB Projects, CSC
2	Permission for removal of tree growth within the terminal/ depot area Felling conversion and removal from stump site	Forest Conservation Act 1980 Karnataka Tree Preservation Act 1976	Local Divisional Forest Officer	Applicable	1 month	Forest department	SPV
PROJECT IMPLEMENTATION STAGE							
3	Permission for Withdrawal of Ground Water	Environment Protection Act 1986	Central Ground Water Board Water resource department, Karnataka	Applicable	2 months	Contractor	SPV, WB Projects, CSC
4	Permission for Withdrawal of Surface Water from Reservoirs/ Ponds/ Irrigation canals	Karnataka State Water Policy, 2002	Irrigation Department, Karnataka	Applicable (If the contractor is extracting surface water)	3 months	Contractor	SPV, WB Projects, CSC
5	Crushers, Cement Batching Plant	Air (Prevention and Control of Pollution) Act. 1981	Karnataka Pollution Control Board	Applicable	3 months	Contractor	SPV, WB Projects, CSC
6	Storage of Hazardous Chemicals	Hazardous Waste (Management and Handling) Rules 1989 and Manufacturing Storage and Import of Hazardous Chemicals Rules 1989	Karnataka Pollution Control Board	Applicable	3 months	Contractor	SPV, WB Projects, CSC

Sl. No	Clearances	Acts	Approving Agency	Applicability to the Project	Time Required	Responsibility	
						Execution	Supervision
7	Disposal of Hazardous Waste	Hazardous Waste (Management and Handling) Rules 1989	Karnataka Pollution Control Board	Applicable	2 months	Contractor	SPV, WB Projects, CSC
8	Disposal of Construction Waste and liquid effluent from Labour camps	Water (Prevention and Control of Pollution) Act 1974	Karnataka Pollution Control Board	Applicable	2 months	Contractor	SPV, WB Projects, CSC
9	Pollution Under Control Certificate	Central Motor Vehicles Act 1988	Department of Transport, Govt. of Karnataka	Applicable	1 Month	Contractor	SPV, WB Projects, CSC
10	Employing Labour	Executing Agency of Building and other construction act, 1996	District Labour Commissioner	Applicable	1 Week	Contractor	SPV, WB Projects, CSC
11	Registration of Workers	Labour welfare Acts.	District Labour Commissioner	Applicable	1 Month	Contractor	SPV, WB Projects, CSC

Source: MoEF

2. ENVIRONMENTAL IMPACTS IDENTIFIED

7. Based on the baseline environmental features of the project area and the proposed engineering works this section assesses the impacts of the proposed activities on various environmental and social attributes of the project area. Road Infrastructure projects are generally expected to bring in positive impacts to the project area/town. However, these projects are expected to induce negative impacts especially during construction phase, if due care is not taken.

2.1 Prediction of Impacts

8. The environmental impacts caused due to infrastructure projects can be categorised either as primary (direct) or secondary (indirect) impacts. Primary impacts are those which are induced directly by the project whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action. Typically, the potential direct impacts of such infrastructure projects are mainly during the construction phase and the most of the indirect impacts are during the operational phase.

2.1.1 Activities under Construction and Operation Phase

9. The major activities during the construction of the workshops, bus stations, depot, bus terminals and shopping complex would include earthwork excavation, material movement, construction of building, provision of infra structural facilities like construction of storm water drains, sewerage lines, septic tanks, electrical and communication network etc. Rigid pavements would have to be provided for bus bays and driveways. The support activities would include employment of labour, material transport, use of construction equipment's etc. The activities under operation phase would include increase in the movement of public and private vehicles, public and commercial activities in the bus terminal and the proposed commercial complex. These activities are expected to cause minor environmental problems during the construction and operation phase of the project, which are discussed in the following sections.

2.2 Environmental Impacts

2.2.1 Impact on Land

10. In the proposed project, the major activity that is expected to cause an impact on land is earthwork excavation and filling for the construction. Since the proposed site is an existing reclaimed land and is almost flat, there is no major works of levelling required and hence filling is involved only to a minor extent. Hence it can be inferred that impact on land environment because of excavation and filling during construction activities is marginal and no major changes in the topography of the project area is expected. However, these activities will necessitate appropriate plans for safety measures for the workers involved in these works.

2.2.2 Impacts on Climate

11. Due to the proposed activities for the project, no changes in climatic conditions are anticipated.

2.2.3 Impacts on Air Quality

12. **Construction Phase**: Suspended Particulate Matter (SPM) and dust are the major sources of air quality impacts during the construction phase. However, when viewed with respect to the existing ambient air quality or with respect to compliance of ambient air quality standards, the impact on air quality during the construction phase of the project is temporary in nature and adequate dust suppression measures during construction will significantly reduce the impacts.

13. **Operation Phase**: During the operation phase the particulate dust and emission from the vehicular traffic movement will have an impact on the existing ambient air quality of the project area. However, the emission from the proposed special BRT buses will be minimum, due to their adherence to the stipulated emission levels (preferably Bharat IV Standards). This will bring a positive impact to the air quality.

2.2.4 Impact on Noise Levels

14. **Construction Phase:** During the construction phase of the project, the major sources of noise pollution are movement of vehicles transporting the construction material and the noise generating activities at the construction site itself. Mixing and material movement will be the primary noise generating activities in the project area and will be distributed over the entire construction period. Construction activities are expected to produce noise levels in the range of 80 - 95 dB (A) and can affect the personnel working at the site and the population residing near the project site. Hence the use of proper personal protective equipment (PPE) such as earmuffs is recommended to mitigate any adverse impact of the noise generated by any equipment. Noise generating tools such as pneumatic tools, generators etc, should be avoided during late hours to minimise the impact of noise on the population residing near the project area.

15. Operation Phase: During the operation phase the movement of vehicles is expected to contribute some noise pollution. Providing vegetation (green barrier) to act as a sound barrier on the periphery of the proposed terminals, workshops and depot is recommended as a positive impact to minimise the dispersion of sound to surroundings.

2.2.5 Impact on Water Quality

16. **Impact on Surface Water Quality:** No impact on the surface water quality is anticipated during the construction phase of the project. During the operation phase the generation of sewage from the proposed terminal and the commercial area are the likely source of water pollution. However, proper planning for safe disposal of the sewage generated, during the project design, will mitigate the anticipated impact due to water pollution.

Recycling of water is suggested for all bus depots and terminals, the recycled water would be utilized for vehicle washing and gardening. This activity is considered as a positive impact.

17. **Impact on Ground Water Quality:** No activities of the project construction are expected to impact the ground water quality of the project area. But during the operation phase the generation of sewage from the proposed terminal and the commercial area if not disposed properly is expected to interfere with the ground water characters of the project area. However, proper planning for safe disposal of the sewage generated, during the project design, will mitigate the anticipated impact due to water pollution.

2.2.6 Impact on Ecological Resources

18. The project activities do not involve encroachment of sensitive environmental features or cutting of trees / vegetation and hence no impacts are predicted on the ecological resources of the project area. It is planned to install energy efficient lightening systems for BRTS components (including lightening system for signals), this in term gives positive impact on ecological resources.

2.2.7 Impact on Soils

19. The impact on soil due to the BRTS project will be in terms of topsoil erosion due to construction activities. Since the proposed project site is an existing reclaimed land no impacts on the top soil erosion is anticipated during the construction and the operation phase.

2.2.8 Other impacts

20. **Oil Spillage:** In the operation phase oil spillage from vehicles should be minimized by preventing vehicle maintenance activities within the workshop at Hubli and immediate cleaning of accidental oil spills if any from the pavement surfaces to prevent the contamination of storm water drains.

2.3 Social impact Assessment

2.3.1 Land Acquisition

21. Since the project is proposed on a designated existing land, no land acquisition is proposed. For the construction of bus terminals, land acquisition has already been done as part of the road improvement work. Hence no negative social impacts are anticipated.

2.3.2 Other Issues

22. During the project construction, the road side vendors occupying the bus terminals have to be vacated. This activity will have a direct negative impact on their livehood. However, assistance shall be given as per entitlement framework (refer **Resettlement Action Plan**).

Table 2-1: Summary Matrix of Predicted Impacts

Sl.no	Components	Activities	Predicted impacts	Extent of Impacts
Construction Phase				
1.	Ambient Air Quality	Dust emissions from site preparation, excavation, material handling and other construction activities at Site.	Minor negative impact inside project site (depot, workshop, terminals etc.) premises. No negative impact outside the site.	Impacts are temporary during construction phase. Impacts will be confined to short distances, as coarse particles will settle within the short distance from activities.
2.	Noise	Noise generated from construction activities and operation of construction equipment	Minor negative impact near noise generation sources inside project site (depot, workshop, terminals etc.) premises. No significant impact on ambient noise levels at sensitive receptors.	Temporary impacts during construction phase. No blasting or other high intensity noise activities envisaged. Contribution of noise during operation will be confined in time and space
3.	Water quality	– Surface runoff from project site – Improper debris disposal – Discharge of sewage from labour camp.	Minimal due to effective EMP proposal	Impact will be temporary. Local labour will be employed to reduce size of labour camps. Labour colonies shall be provided potable water for drinking.
4	Landuse and Aesthetics	Land development	**Permanent positive impact**	As open areas and green spaces, interconnected lawns and with sustainable infrastructure plan will enhance the visual appeal of the area.
5	Topography and Geology	The proposed site is an existing reclaimed land and is almost flat	No Significant Impacts	Project site is flat and hence no impacts on topography. Structures will be designed as per IS standards for earthquake protection.
6.	Soils	Construction activity leading erosion.	Minor negative impact	
7.	Ecology Flora and Fauna	Habitat disturbance during construction activity	Minor negative impact	The site and adjacent areas does not have any significant flora and fauna diversity and density. No endangered species recorded on site.
8.	Socio-economy	Increased job opportunity. Economy related to commercial, material supply etc.	**Overall positive impact**	
9.	Traffic Pattern	Haul Truck movement and possibility of traffic congestion outside site.	Minor negative Impact	
Operational Phase				
1.	Ambient Air Quality	Particulate and gaseous emissions from heavy vehicles & DG sets	Minor negative impact inside and downwind direction of project (depot, workshop, terminals etc.) premises.	Vehicles Engines with emission control (Bharath IV standard) shall be prescribed for BRT Buses. Soundproof DG sets will be used only as back up. The generators would be provided with scrubbers, which will help reduce the sulphur contents thereby improving the quality of air.

Sl.no	Components	Activities	Predicted impacts	Extent of Impacts
2.	Noise	Noise from vehicle movement and operation of diesel generator sets during power failure.	Minor negative impact inside premises. No significant impact at sensitive receptors.	Provision of trees as landscaping will attenuate the noise pollution and in turn minimise the noise from traversing outside the premises.
3.	Water Quality	Discharge of contaminated storm water	No significant adverse impact	
4	Soils	Storage and disposal of solid and other wastes during oil change	No negative impact	
5.	Ecology Flora and Fauna	Landuse change. Discharge of wastewater to surface water bodies	No negative impact	No significant flora and fauna is recorded in impact zone
6.	Socio-economy	Increased job opportunity during construction and operation phase.	**Overall positive impact**	

3. MITIGATION MEASURES FOR THE IDENTIFIED ENVIRONMENTAL IMPACTS

23. In order to address the impacts predicted in the earlier section mitigative measures are discussed in this section and an Environmental Management Plan (EMP) is recommended. The EMP also identifies the role of various agencies in the implementation of these measures.

24. Since the site is not an ecologically or environmentally sensitive area no major environmental or social issues are anticipated. The critical issue will however be to minimise air and noise impacts during the execution of the project. While the impacts are not very severe and permanent, care has to be taken to ensure that the ambient environmental conditions do not deteriorate.

3.1 Impact During Construction Phase

3.1.1 Impact on Air Quality

25. During construction period the impacts on air quality are mainly due to the material movement and actual construction activities. Even though there will be an increase in the dust levels the air quality is not expected to be affected to significant levels and will be temporary.

MITIGATION MEASURES

- Provisions should be made for sprinkling of water at the excavation areas and it has to be ensured that the construction debris is removed daily
- Earthwork should be covered with polythene/ tarpaulin covers during transport.
- Idling of delivery trucks or other equipment should not be permitted during periods of unloading or when they are not in active use
- As soon as construction is completed, the surplus earth should be utilised to fill up low-lying areas if possible or as a filling material for pavement base preparation. In no case, loose earth should be allowed to pile up around the project site.

3.1.2 Impact on Noise Levels

26. The prime sources of noise levels during the construction phase are the construction machinery and the vehicular noise due to material movement at the site. Though the effect of noise would be insignificant during daytime, the residential areas located in the near vicinity of the construction site may experience increase in the night time ambient noise levels.

MITIGATION MEASURES

- Construction contract should clearly specify the use of equipment emitting noise of not greater than 90 dB(A) for the eight hour operation shift
- Noise measurements should be conducted during the construction to assess the prevailing noise levels.
- Noise generating construction activities should be preferably is planned during the day time.
- For protection of construction workers, earplugs should be provided to those working very close to the noise generating machinery.

3.1.3 Impact on Water Quality

27. The construction phase of the proposed bus terminal, depot, workshop, bus station etc. is not expected to alter the existing water quality in the project area. However if proper bypass and temporary drainage arrangement are not provided during construction it may cause flooding of the project area and disturb the existing drainage facilities at the project site.

MITIGATION MEASURES

28. Adequate bypass and temporary drainage arrangements should be provide during construction to avoid flooding and disruption to the existing drainage facilities in the project site.

3.2 Impact During Operation Phase

3.2.1 Impact on Air and Noise Quality

29. During the operation phase the particulate dust particles and emission due to traffic movement will have an impact on the existing ambient air and noise quality of the project area.

MITIGATION MEASURES

30. Provision of a vegetative cover around the bus terminals, depot and workshop will act as a barrier to minimise the impact on the existing ambient air and noise levels.

3.2.2 Impact on Water Quality

31. During the operation phase the generation of sewage from the proposed toilets and the commercial areas are likely to cause an impact on the surface and ground water quality if proper sanitation and waste water disposal facilities are not provided.

MITIGATION MEASURES

32. Adequate sewerage and disposal arrangements such as septic tanks, soak pits etc, should be provided for the sewerage generated from proposed toilets and commercial areas in order to avoid the pollution of ground and surface water resources.

3.2.3 Other Impacts

33. Solid waste generated from the commercial, stations and terminal areas if not managed will affect the aesthetics of the stations and terminals and create unhygienic conditions

MITIGATION MEASURES

34. Adequate number of garbage collection bins should be placed at prominent locations within the proposed terminals, bus stations and the commercial areas. A plan for the timely clearing of the garbage bins and disposal of the waste should be worked out and followed after discussion with the local body. Adequate number of sweepers to collect the littered garbage in the terminal area should be engaged. Display boards to create awareness among the public on solid waste management, should be placed at strategic locations within the proposed terminal and the commercial area.

4. ENVIRONMENTAL MANAGEMENT PLAN

35. A description of the various management measures during various stages of the project is provided in the **Table 4-1.**

4.1 Pre-Construction Stage

4.1.1 Pre-Construction Activities by Contractor/Engineer

36. The pre-construction stage involves mobilisation of the contractor, the activities undertaken by the contractor pertaining to the planning of logistics and site preparation necessary for commencing construction activities. The activities include:

- Joint field verification of EMP by the Engineer and Contractor
- Modification (if any) of the contract documents by the Engineer
- Procurement of construction equipment / machinery such as crushers, batching plants, mixing plant for concrete and other construction equipment and machinery
- Identification and selection of material sources (quarry and borrow material, water, sand etc.)
- Selection, design and layout of construction areas, batching plants, labour camps etc.
- Planning traffic diversions and detours, including arrangements for temporary land acquisition

4.2 Construction Stage

4.2.1 Construction stage activities by the contractor

37. Construction stage activities require careful management to avoid environmental impacts. Activities that trigger the need for environmental measures to be followed include:

- Imbibing environmental principles at all stages of construction as good engineering practices
- Implementation of site-specific mitigation/management measures suggested
- Monitoring the quality of environment along the construction sites (as air, noise, water and soil)

38. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the Engineering Costs.

4.2.2 Construction Stage Activities by the SPV

39. The construction stage involves the following activities by SPV:

- Tree plantation/ landscaping in the bus terminal, depot, workshop etc.
- Monitoring of environmental conditions through approved monitoring agency

4.3 Operation Stage

40. Operation stage actives are to be carried out by the Environmental Cell includes mostly environmental monitoring (Ambient air quality, Noise levels, Water quality and Soil quality) of

operational performance of the various mitigation/enhancement measures carried out as a part of BRTS.

4.4 Other Activities

- Orientation of Implementation agency staff towards project specific issues of EMP implementation
- Conducting additional studies for issues identified during any stage of project preparation/ implementation

4.5 Implementation of Environmental Management Plan

41. **Table 4-1** presents a summary of the EMP, with an objective to minimise negative environmental impacts of the proposed works. The table includes the environmental issues and necessary mitigative measures for the same. It is envisaged that mitigatory measures for the construction phase impacts will form part of tender documents inviting proposals for construction. The responsibility for their compliance thus would be binding for the prospective contractor as part of the contract condition. The overall responsibility for implementation of mitigative measures will, however, remain with the project implementing agency, which will supervise the construction of improvements.

Table 4-1: Environmental Management Plan

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
1.0	**PRE-CONSTRUCTION STAGE**					
1.1	**Pre-construction activities by SPV**					
1.1.1	Tree Cutting:	Existing trees (12 nos) within the terminal, depot and workshop areas shall be retained and will be maintained as a part of landscaping. Any trees to be cut due to design/ under unavoidable circumstances, it shall be informed to the forest department and permission shall be obtained to fell the trees. SPV will co-ordinate with NWKRTC and ensure that all necessary permissions are taken from the Forest Dept before felling any trees. The trees cut shall be disposed off through auction (inclusive of tree stumps). Progress of tree cutting shall be reported to the SPV.	Project site/ area (terminal, depot, stations and workshop areas)	Design MoRTH 201.6	Karnataka Forest Department, Tree Felling Contractor, SPV	SPV, Site Engineer/ Supervision Consultant
1.1.2	Utility Relocation	All community utilities and common property resources such as stand posts, supply lines, toilets, sewage lines, drainage systems, optical fiber cables, electric power supply lines, telephone and television cables shall be relocated and restored before the commencement of the project activity. While relocating these utilities and facilities, all concerned agencies	Project site/ area (terminal, depot, stations and workshop areas)	Design MoRTH 110.7	SPV; Concerned Agencies/ Departments; Contractor	SPV, Site Engineer/ Supervision Consultant

1 MoRTH Clause 111.1 with modifications mentioned in Appendix 3.15 shall be applicable for all the EMP Clauses

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		including SPV shall take necessary pre-cautions and shall provide barricades/ delineation of such sites to prevent accidents including accidental fall into bore holes, pits, drains both during demolition and construction/ relocation of such facilities. Standard safety practices shall be adopted for all such works.				
1.1.3	Orientation of Implementing Agencies	The SPV shall organize orientation sessions during all stages of the project. This shall include on-site training (general as well as specific to the context of this subproject) as well. These sessions shall involve concerned division-level staff of the SPV involved in the sub-project, Staff of the Site Engineer/ Supervision Consultant and the implementing agencies.			SPV, Site Engineer/ Supervision Consultant	SPV
1.2	**Pre-construction activities by the Contractor/Engineer of CSC**					
1.2.1	Joint Field Verification	The Engineer - Incharge of Supervision Consultant and the Contractor shall carry out joint field verification to ascertain the necessity of saving trees, environmental resources (if any) wherever such representations or suggestions in writing have been received and forwarded by the project authority or by the site engineer in accordance with the local situations. The complaints/suggestions together with the observations and expert opinion of the joint verification team containing the need for additional protection measures or changes in	Project area/ site (terminal, depot, stations and workshop areas)	EMP	Contractor; Environmental Officer of SC	SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		design/ scale/ nature of protection measures including the efficacy of enhancement measures suggested in the EMP shall be summarized in a written document containing all the details with date, time, place and signature of the individuals involved and this shall be sent to SPV for approval. The SPV shall maintain proper documentation and justifications/ reasons in all such cases where deviation from the original EMP is proposed.				
1.2.2	Assessment of Impacts due to Changes/ Revisions in the Project Work	The Engineer - Incharge of CSC shall assess the impacts and revise/ modify the EMP in consultation with the SPV in accordance to the recommendation made by the field survey party in the event of changes/ revisions (including addition or deletion) in the project's scope of work.	Project area/ site (terminal, depot, stations and workshop areas)	EMP	Contractor; Environmental Officer of SC	SPV
1.2.3	Procurement of Machinery					
1.2.3.1	Crushers & Batching Plants	Specifications of crushers and batching plants shall comply with the requirements of the relevant current emission control legislations. (Preferably Bharat stage – III for Diesel Construction Machinery) and Consent / NOC for all such plants shall be submitted to the CSC and SPV. Crusher and Batching plants shall be located 1000m away from settlements and commercial establishments, preferably in the downwind direction. No plants can be set-up within 1000m from the	Project area/ site All construction machineries (Crushers & Batching Plants) should be keep/station 1000 m away from the settlements. (Unakal Revenue, Bhairidevarakoppa Amaragol, Rayapur, Sattur, Navalur and Lakkammanahalli)	Contract, MoRTH: 111.1, GoI Air & Noise Standards, OSHA Standards	Contractor	Environmental Officer of SC ; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		residential/ settlement locations. The Contractor shall submit a detailed layout plan for all such sites and seek prior approval of Engineer - Incharge of CSC before entering into formal agreement with a land owner for setting-up such sites. Actions by CSC and SPV against any non-compliance shall be borne by the Contractor at his own cost. Arrangements to minimize dust pollution through provision of windscreens, mist spray units, and dust encapsulation shall have to be provided at all such sites. No such installation by the Contractor shall be allowed till all the required legal clearances are obtained from the competent authority and the same is submitted to the SPV and the CSC. The contractor shall procure metals and other construction materials from the KSPCB licensed quarry/ borrow areas (where the environmental monitoring/ management plan are in place) and submit a copy of their license to KRDCL and CSC for verification				
1.2.3.2	Other Construction Vehicles, Equipment and Machinery	The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery to be procured for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms.		Contract, Environment Protection Act, 1986 & MoRTH: 111.1	Contractor	Environmental Officer of SC ; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Noise limits for construction equipment's to be procured such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A),when measured at one metre distance from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. Efficient and environment friendly equipment confirming to the latest noise and effluent emission control measures available in the market shall be used in the project. The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced to the and the Supervision Consultant for verification whenever required.				
1.2.4	Identification & Selection of Material Sources					
1.2.4.1	Borrow Areas	Arrangement for locating the source of supply of material as well as compliance to environmental requirements, as applicable, shall be the sole responsibility of the contractor. The environmental personnel shall be required to inspect every borrow area location prior to approval. Format for reporting shall be as per the Reporting Format (**Format EM-3 – Annexure 2 Environmental Reporting System and Guideline - 3 Borrow area management**) for Borrow Area. The Engineer -	Ecologically sensitive area (If any)	MoRTH: 305.2.2.2	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Incharge of the CSC shall be required to inspect every borrow area location and evaluate such proposals in accordance to environmental requirements prior to issuing approval for use of such sites. No borrow areas shall be opened within 500m of wildlife movement zones and forest areas. The borrow areas shall be atleast 300m from schools and village access roads. The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the Engineer – In-charge of the CSC. The Supervision Consultant shall report these facts to the SPV along with the remarks in the prescribed format with documentary proofs. Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate it as per Borrow Area guideline given in the **Annexure - 4** or as approved by the Engineer – In-charge of CSC. Haul roads shall be maintained throughout the operation period of the borrow areas by undertaking the required maintenance and repair				

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		works, which may include strengthening, pot hole repairing and diversions. Improvements shall be done to reduce inconvenience to users of these roads, residents living along the haul roads and minimize air and water pollution. Such measures shall include, but not limited to, frequent sprinkling of water, repairing of the road, road safety provisions (warning and informatory signage, flagmen etc.), and ensuring covering of loaded vehicles by waterproof tarpaulin; consultation with public and special precautions are required when measures are implemented near schools, health centers and settlement areas. All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved rehabilitation plan (**Format OP2 - Annexure 2 - Redevelopment of Borrow Areas**) immediately upon completion of the use of such a source.				
1.2.4.2	Quarries	The Contractor shall identify materials from existing licensed quarries with the suitable materials for construction. Apart from approval of the quality of the quarry materials, the Engineer's representative shall verify the legal status of the quarry operation, as to whether approval from Karnataka State Government is obtained.	Quarry area should be located 1000m away from the settlements (Unakal Revenue, Bhairidevarakoppa Amaragol, Rayapur, Sattur, Navalur and Lakkammanahalli).	MoRTH: 111.3	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		No quarry and/or crusher units shall be selected or used, which is within 1000m from the forest boundary, wildlife movement path, breeding and nesting habitats and national parks/sanctuaries. No plants can be set-up within 1000m from the residential/ settlement locations Contractor shall also work out haul road network used for quarry transport and report to Engineer - Incharge of Supervision Consultant who shall inspect and in turn report to SPV on the suitability of such haul roads from safety of residents, biodiversity and other environment point of views.				
1.2.4.3	Arrangement for Construction Water	The contractor shall source the requirement of water preferentially from surface water bodies, as lakes and tanks in the project area. The contractor shall be allowed to pump only from the surface Water bodies. Boring of any tube wells shall be prohibited. To avoid disruption/disturbance to other water users, the contractor shall extract water from fixed locations. The contractor shall consult the local people before finalizing the locations. Only at locations where surface water sources are not available, the contractor can contemplate extraction of ground water. Consent from the Engineer that "no surface water resource is available in the	All surface water bodies that can be used in the project	Contract	Contractor	Environmental Officer of SC ; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		immediate area for the project" is a pre-requisite prior to extraction of ground water. The contractor shall need to comply with the requirements of Irrigation Department, Karnataka and seek their approval for doing so.				
1.2.4.4	Sand (all river and stream beds used directly or indirectly for the project)	The contractor shall identify sand quarries with requisite approvals for the extraction of sand. In case of selection of new sites for sand quarrying, the Contractor shall obtain prior approval and concurrence from Competent District Authority and the Engineer – Incharge of the CSC keeping in view the objections and convenience of the local population, who may restrain such activities for their own security and safety. Where the supplier of sand is another party, the authentic copy of lease agreement that has been executed between the local Tahasildar and the supplier has to be submitted to CSC and SPV of the project, before any procurement is made from such a site. To avoid accidents and caving in of sand banks at quarry sites, sand shall be removed layer by layer. Digging deeper than the permissible limit has to be completely avoided by the Contractor. Such quarry shall be barricaded 10m away from the periphery on all sides except the entry point, so as to prevent accidental fall of domestic cattle, wildlife and human beings.	All riverbeds recommended for sand extraction for the project.		Contractor	Environmental Officer of SC ; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
1.2.5	Labour Requirements	The contractor shall use unskilled labour drawn from local communities to avoid any additional stress on the existing facilities (medical services, power, water supply, etc.)	Project area at construction sites	Contract	Contractor	Supervision Consultant; SPV
1.2.6	Setting up construction sites					
1.2.6.1	Construction Camp Locations – Selection, Design & Layout	Construction camps shall not be proposed: (i) Within 1000m of Ecologically sensitive areas (ii) Within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. Layout of construction camps shall be as per the conceptual design presented in **Annexure 1.** Location's for stockyards for construction materials shall be identified at least 1000 m from watercourses. The waste disposal and sewage system for the camp shall be designed, built and operated such that no odour is generated. Unless otherwise arranged by the local sanitary authority, arrangements for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by Engineer shall be provided by the contractor.	All Construction Workers Camps including areas in immediate vicinity.	Contract **Annexure 1**	Contractor	Supervision Consultant; SPV
1.2.6.2	Arrangements for Temporary Land Requirement	The contractor as per prevalent rules shall carry out negotiations with the land owners for obtaining their consent for temporary use of lands for construction sites/ hot mix plants /traffic detours /borrow areas etc.	Areas temporarily acquired for construction sites / batching plant/ borrow areas / diversions / detours	Contract Document	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		The Engineer shall ensure that the site is cleared prior to handing over to the owner (after construction or completion of the activity) and it is included in the contract.				
2.0	**CONSTRUCTION STAGE**					
2.1	**Construction Stage Activities by Contractor**					
2.1.1	**Site Clearance**					
2.1.1.1	Clearing and Grubbing	Site clearance including clearance of marked trees for felling (if any) and removal has to be carried out much before the actual construction takes place. Structures and utilities (power transmission lines, cable connections, telephone lines, stand posts, etc.) shall be relocated; clearing or grubbing activities are to be undertaken as these activities may damage structures (private and govt.) and essential facilities/utilities of public use. All works shall be carried out in a manner such that the damage or disruption to flora is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from Engineer - Incharge of CSC.	Project area/ site	Design MoRTH 201	Contractor	Supervision Consultant; SPV
2.1.1.2	Generation & disposal of Debris	Debris generated due to the dismantling of the structures shall be suitably reused in the proposed construction The Contractor shall suitably dispose off unutilized non-toxic	Project area/ site	MoRTH 202.5 MoRTH 517	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		debris either through filling up of borrows areas located in wasteland or at pre-designated disposal sites, subject to the approval of the Engineer In-charge of CSC. The pre-designated disposal locations shall be part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Engineer In-charge of CSC and approval local competent authority.				
2.1.1.3	Construction wastes disposal	Location of disposal sites shall be finalized prior to completion of the earthworks. The Engineer shall approve these disposal sites conforming to the following (a) These are not located within designated forest area (b) The dumping does not impact natural drainage courses (c) No endangered/rare flora is impacted by such dumping. (d) Settlements are located at least 1.0km away from the site.	Disposal site locations	Contract MoRTH: 201.4 & 202.5 Section 2.1.1.3	Contractor	Supervision Consultant; SPV
2.1.1.4	Planning for Traffic Diversions and Detours for Terminals	Detailed traffic control plans for terminals, Depot shall be prepared by the contractor and the same shall be submitted to the Engineer - Incharge of CSC for approval.	Traffic diversion and detour at Terminals	MoRTH: 112; IRC SP:55	Contractor	Supervision Consultant; SPV
2.1.2	**Construction Materials**					
2.1.2.1	Earth from Borrow Areas for Construction	No borrow area shall be opened without permission of the Engineer – Incharge of CSC.	All access roads, sites temporarily acquired & all borrow areas	MoRTH: IRC 10 1961	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Borrow pits shall not be dug continuously in a stretch. The location, shape and size of the designated borrow areas shall be as approved by the Engineer and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas The unpaved surfaces used for the haulage of borrow materials shall be maintained dust free by the contractor. Since dust rising is the most significant impact along the hauled roads, sprinkling of water shall be carried out twice a day along such roads during their period of use.				
2.1.2.2	Quarries	The Contractor shall obtain materials for quarries only after the approval of Department of Mines and Geology, Karnataka and the District Administration. A copy of this consent must be submitted to SPV through Engineer –Incharge of CSC. The Contractor shall develop a Comprehensive Quarry Redevelopment Plan, as per the Mining Rules of the State and submit a copy to SPV and CSC prior to opening of the quarry site. The quarry operations shall be undertaken within the rules and	All along the haul roads	Department of Mines and Geology, Karnataka	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		regulations in vogue.				
2.1.2.3	Blasting	Blasting shall be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.	All blasting and Pre-splitting Sites.	MoRTH: 302.4	Contractor	Supervision Consultant; SPV
2.1.2.4	Water Extraction	Procurement of water is to be carried out as per Section 1.2.4.3. The contractor shall minimize wastage of water during construction.	All water bodies recommended to be used in the project	Section 1.2.4.3	Contractor	Supervision Consultant; SPV
2.1.2.5	Transporting Construction Materials	All vehicles delivering materials to the site shall 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 and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles The unloading of materials at construction sites close to settlements shall be restricted to daytime only.	All along the haul roads	MoRTH: 111.9	Contractor	Supervision Consultant; SPV
2.1.3	**Construction work**					
2.1.3.1	Drainage and Flood Control	Contractor shall ensure that no construction materials like earth, stone, ash or appendage disposed off so as not to block the flow of water of any water course and cross drainage channels.	Surface water sources/ drains/ irrigation canal etc. Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)	MoRTH:305.3.7; MoRTH:306	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Where necessary adequate mechanical devices to bailout accumulated water from construction sites, camp sites, storage yard, excavation areas are to be pre-settled and arranged well in advance of the rainy season besides providing temporary cross drainage systems.				
2.1.3.2	Slope Protection and Control of Soil Erosion	The contractor shall construct slope protection works as per design, or as directed by the Engineer - Incharge of CSC to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fiber mats, mulches, grasses, slope drains and other devices as required under specific local conditions.	High raise embankment	MoRTH: 305.2.2.2; MoRTH: 306.2; Guideline for Slope Stability and Erosion Control	Contractor	Supervision Consultant; SPV
2.1.4	**Pollution Control**					
2.1.4.1	**Water Pollution**					
2.1.4.1.1	Water Pollution from Construction Wastes	The Contractor shall take all precautionary measures to prevent the wastewater generated during construction from entering into water bodies or the irrigation system. All waste arising from the project are to be disposed off in the manner that is acceptable to the Karnataka State Pollution Control Board or as directed by Engineer – Incharge of CSC. The Engineer – Incharge shall certify that all liquid wastes disposed off from the sites meet the discharge standards.	Surface water sources/ drains/ irrigation canal etc. Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)	MoRTH: 111.4; MoRTH: 111.1; Water Act, 1974	Contractor	Supervision Consultant; SPV, KSPCB
2.1.4.1.2	Water Pollution from Fuel,	Contractor shall ensure that all vehicle/ machinery and equipment	Surface water sources/ drains/ irrigation canal	MoRTH: 111.4; MoRTH: 111.1;	Contractor	Supervision Consultant; SPV, KSPCB

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
	Lubricants and Chemicals	operation, maintenance and refueling shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors shall be provided for vehicle parking, wash down and refueling areas as per the design provided. Contractor shall arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites approved by the Engineer – Incharge. All spills and collected petroleum products shall be disposed off in accordance with MoEF and KSPCB guidelines. Engineer – Incharge shall certify that all arrangements comply with the guidelines of KSPCB/ MoEF or any other relevant laws.	etc. Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)	Petroleum Act and Rules; MoEF/CPCB Notifications; Guideline -2 for Construction Camps		
2.1.4.2	**Air Pollution**					
2.1.4.2.1	Dust Pollution	The contractor shall take every precaution to reduce the level of dust (SPM and RSPM) from crushers, material storage yards, haul roads and construction sites (including earthwork, dismantling, scarification and material mixing sites) by sprinkling of water, mist spray, encapsulation of dust source and erection of screen / barriers. Batch mix plant shall be fitted with dust extraction units and mist spray to keep down the dust emission levels. The suspended particulate matter value at a distance of 40m	Construction area/ site, Construction camps, Materials Loading / unloading facilities	MoRTH:111.1; MoRTH:111.5; MoRTH:111.9; MoRTH:111.10; Air Act; SPCB Rules and Guidelines	Contractor	Supervision Consultant; SPV KSPCB

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		from a unit located in such a cluster should be less than 500 µg/m^3. The contractor shall provide necessary certificates to confirm that all crushers used in the project conform to relevant dust emission control legislation. Air pollution monitoring shall be conducted as per the Pollution Monitoring Plan and results shall be used to strengthen/rectify problematic areas. If other existing crushers are used, such units need to have valid license from the KSPCB.				
2.1.4.2.2	Emission from Construction Vehicles, Equipment and Machineries	Contractor shall ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm to the emission standards specified by the CPCB. Certification issued for such contrivances obtained from designated/approved authority shall be submitted along with the specified reporting format. The contractor shall maintain a separate file and submit PUC certificates for all vehicles/equipment/ machinery used for the project. Monitoring results shall also be submitted to CSC and SPV as per the Pollution Monitoring Plan in the specified format.	Construction camps, Materials Loading / unloading facilities	Motor Vehicles Act Pollution Monitoring Format - Format EC1	Contractor	Supervision Consultant; SPV, KSPCB
2.1.4.3	**Noise Pollution**					
2.1.4.3.1	Noise Pollution: Noise from Vehicles, Plants and Equipment's	The Contractor shall confirm the following: • All plants and equipment used in construction shall strictly conform to the MoEF/ CPCB noise standards.	At Sensitive locations (temple, schools and Hospitals) Govt Training Institute & Womens Poly	Noise rules, 2002` MoRTH - Section: 201.2 MoRTH - Section 111.3	Contractor	Supervision Consultant; SPV; KSPCB, Affected Communities; PRIs; NGOs; Staff at Schools and Health

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		• All vehicles and equipment used in construction shall be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced. • Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter distance from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. • Idling of temporary trucks or other equipment shall not be permitted during periods of unloading or when they are not in active use. (MoRTH - Section: 201.2) At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching shall `be stopped during the night time between 9.00 pm to 6.00 am. No noisy construction activities shall be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e.,	Technique (0/500) KLE Society (Jagadguru Gangadhar college of Commerce) (0/740) KLE Society (College of Pharmacy, PC Jabian College, SK& SKS Arts and Science College & BV Bhoomaraddi Engineering College) (1/460) Chetana College (2/850) SANA Institute (5/620) Cancer Hospital (7/120) SDM Dental College (12/700) SDM Medical College (10/920)			Centres

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		school, health centers and hospitals between 9.00 am to 6.0 pm. Monitoring shall be carried out at the construction sites as per the monitoring schedule and results shall be submitted to Engineer-Incharge of CSC. Engineer shall be required to inspect regularly to ensure the compliance of EMP. (Refer MoRTH - Section 111.3)				
2.1.4.4	**Safety**					
2.1.4.4.1	Safety Procedures	The Contractor shall: • Comply with all applicable safety regulations, • Take care for the safety of all persons entitled to be on the site, • use reasonable efforts to keep the site and works clear of unnecessary obstruction so as to avoid danger to these persons, • provide fencing, lighting, guarding and watching of the works until completion and taking over and provide any temporary works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the works, for the use and protection of the public and of owners and occupiers of adjacent land • A construction safety checklist has been included in the reporting format EM-7	All construction sites		Contractor	Supervision Consultant; SPV
2.1.4.4.2	Care and Supply of Documents	• The Contractor shall prepare, submit and obtain approval of the Engineer for Construction	All construction sites		Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Safety Management Plan 14 days prior to commencement of Construction Works at site.				
2.1.4.4.3	Health and Safety	• The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site • The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority. • The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence. • The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.	All construction sites and labour camp		Contractor	Supervision Consultant; SPV
2.1.4.4.4	Personal Safety Measures for	Contractor shall provide all necessary safety appliances such as	All construction sites	Factories Act, 1948;	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
	Labour, Material handling , Painting etc.	safety goggles, helmets, safety belts, ear plugs, mask etc. to workers and staff. • Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc. • Welder's protective eye-shields to workers engaged in welding works • Protective goggles and clothing to workers engaged in stone breaking activities and workers shall be seated at sufficiently safe intervals • Earplugs to workers exposed to loud noise (above 75dB (A)), and workers working in crushing, compaction, or concrete mixing operation. • Adequate safety measures for workers during handling of materials at site are taken up. • The contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed for the work of painting with products containing lead in any form. The contractor shall also ensure that no paint containing lead or lead		Building and Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996		

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		products is used except in the form of paste or readymade paint. Contractor shall provide facemasks to the workers when paint is applied in the form of spray or a surface having dry lead paint is rubbed and scrapped. The Contractor shall mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These shall be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and shall be approved by Engineer.				
2.1.4.4.5	Traffic Safety & Pedestrian Safety	• Pedestrian Safety shall be ensured. Pedestrian circulation shall be demarcated prior to start & unsafe areas shall be cordoned off.	At construction site	Clause 112. of MoRTH (Arrangement for traffic during construction)	Contractor	Supervision Consultant; SPV
2.1.4.4.6	Risk from Electrical Equipment(s)	The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that - • No material shall be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights shall be provided to protect the public in construction zones. All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be free from patent defect, shall be kept in good working order,	All construction equipment		Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		shall be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer - Incharge.				
2.1.4.4.7	First Aid	The contractor shall arrange for - A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone. Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital Equipment and trained nursing staff at construction camp.	All construction sites and labour camps	Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Supervision Consultant; SPV
2.1.4.5	**Labour Camp Management**					
2.1.4.5.1	Location of Construction labour camps: Accommodation	• The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the Engineer- Incharge. • Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp. • Construction camps shall not be proposed within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic	At the location of construction labor camps	Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		facility provision of each labour camp shall be submitted to Engineer prior to their construction. The construction shall commence only upon the written approval of the Engineer - Incharge.				
2.1.4.5.2	Potable Water	The Contractor shall construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996). The contractor shall also guarantee the following: • Supply of sufficient quantity of potable water (as per IS) in every workplace/labor camp site at suitable and easily accessible places and regular maintenance of such facilities. • If any water storage tank is provided that shall be kept such that the bottom of the tank is at least 1mt. from the surrounding ground level. • If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well shall be disinfected before water is used for drinking. • All such wells shall be entirely covered and provided with a trap door, which will be dust proof	Construction labor camps	Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		and waterproof. • A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. • Testing of water shall be done every month as per parameters prescribed in IS 10500:1991. Compliance to EMP shall be reported to Engineer - Incharge every week. Engineer - Incharge shall inspect the labour camp periodically, to ensure compliance of the EMP.				
2.1.4.5.3	Sanitation and Sewage System	The contractor shall ensure that - • The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place • Separate toilets/ bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women • Adequate water supply is to be provided in all toilets and urinals • All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition • Night soil is to be disposed off by putting layer of it at the bottom of a permanent tank	Construction labor camps	Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight. Adequate health care is to be provided for the work force during the entire phase.				
2.1.4.5.4	Waste Disposal	The contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Engineer - Incharge. Unless otherwise arranged by local sanitary authority. The contractor has to make arrangements for disposal of night soils (human excreta) either by suitably approved by the local medical health or municipal authorities or as directed by Engineer - Incharge as provided by the contractor.	Construction labor camps	Environment Protection Act, 1986 and Rules	Contractor	Supervision Consultant; SPV, KSPCB, Local Authorities
2.1.4.5.5	Stock-yards	Location for stockyards for construction materials shall be identified at least 1000 m from water course and separated and sufficiently away from the labour camps. Separate enclosures shall be planned for storing construction materials containing fine particles such that sediment-laden water does not drain into nearby storm water drain & underground sewerage pipes.	Construction labor camps	MoRTH - Section 306	Contractor	Supervision Consultant; SPV, KSPCB, Local Authorities
2.1.4.5.6	Fuel storage and refueling areas	The contractor shall ensure that all construction vehicle parking location, fuel/ lubricants storage sites, vehicle, machinery and equipment maintenance and	Construction labor camps		Contractor	Supervision Consultant; SPV, KSPCB, Local Authorities

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		refueling sites are located at least 500 m from surface water bodies. All location and lay-out plans of such sites shall be submitted by the Contractor prior to their establishment and shall be approved by the Engineer. The plan for the construction camp site shall also include the process of collection and disposal of spent oil and grease. The collection and disposal methods for the spent oil and grease submitted as part of the construction camp plan should be duly approved by the Engineer - Incharge.				
2.2	**Contractor Demobilization**					
2.2.1	Clearing of Construction of Camps & Restoration	Contractor to prepare site restoration plans for approval by the Engineer. The plan has to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer. Residual topsoil shall be distributed on adjoining/proximate barren/rocky areas as identified by the Engineer in a layer of thickness of 75mm - 150mm.	All Construction Workers' Camps		Contractor; Resident Engineer of SC; Environment Officer of SC	SPV
2.2.2	Redevelopment of Borrow Areas	Redevelopment of borrow areas shall be taken up in accordance with	At all borrow area locations suggested for		Contractor; Resident Engineer of SC;	SPV

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		the plans approved by the Engineer.	the project.		Environment Officer of SC	
3.0	**Environmental enhancement and special issues**					
3.1	Enhancement measures	Enhancement of all incidental spaces shall be planned and carried out prior to completion of construction. Some of the enhancement measures to be considered in the depot, terminal and workshop include tree plantation at the available space, Planting of shrubs, rain water harvesting, adequate storm water drainage, Landscaping to improve aesthetics etc.	At suitable locations in the project site		SPV; DPR consultants; Forest Department; Supervision Consultant	SPV
4.0	**OPERATION STAGE (Activities to be Carried Out by the SPV/ Forest Department, GoK)**					
4.1	Monitoring and Evaluation of Operational Performance of Environmental Mitigation Measures provided in the Project	The SPV shall monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project. Monitoring and performance indicators have been indicated in **Chapter 5 (section 5.1 Environmental Monitoring Plan)**.	BRTS Infrastructure facilities (terminals, workshops and depot	-	SPV	SPV
4.2	Maintenance of Drainage	SPV shall ensure that all drains (within the terminals, depot and workshop) are periodically cleared (once in every three months) especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.	BRTS Infrastructure facilities (terminals, workshops and depot	MoRTH specifications; IRC guidelines	SPV	SPV
4.3	Atmospheric Pollution	Ambient air concentrations of various pollutants shall be monitored as envisaged in the Environmental Monitoring Plan at all BRTS facilities.	BRTS Infrastructure facilities (terminals, workshops and depot	Environmental Monitoring Plan (section 5.1)	SPV, KSPCB	SPV, KSPCB
4.4	Noise Pollution	Noise pollution shall be monitored as per environmental monitoring plan at the BRTS facilities. Diesel	BRTS Infrastructure facilities (terminals, workshops and depot	Environmental Monitoring Plan (section 5.1)	SPV, KSPCB	SPV, KSPCB

Sl. No	Activities	Management Measure	Location	Reference[1]	Responsibility	
					Planning and Execution	Supervision and Monitoring
		generators used within the terminals and depots shall be checked for its acoustic proof.				
4.5	Soil Erosion and Monitoring of Borrow Areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried out before monsoon, during monsoon and after winter rains to record and monitor the effectiveness of such structures after the completion of project, so as to evaluate the beneficial effects of each type of activity together with the cost involved.	Borrow areas	Guideline – 3 for Borrow Area Management (**Annexure - 4**)	SPV	SPV
4.6	Safety	Factory acts and rules shall be strictly followed to maintain safety among the workers within the terminals, workshops and depot for handling of machineries, Fire safety, worker safety etc.	BRTS Infrastructure facilities (terminals, workshops and depot	The Factories Act, 1948 as amended by the Factories (Amendment) Act, 1987	SPV	SPV
4.7	Handling of Hazardous waste	The hazardous waste as detailed in the section 43 - Performance of maintenance and repair work on vehicles under schedule - 1 List of processes generating hazardous wastes. It shall be disposed as per the hazardous waste handling rules 2000	BRTS Infrastructure facilities (terminals, workshops and depot)	Hazardous Wastes (Management and Handling) Amendment Rules, 2000	SPV	SPV

5. IMPLEMENTATION ARRANGEMENTS

42. Effective implementation of the environmental measures suggested based on the baseline environmental conditions and environmental impact assessment requires robust procedures. Implementation could be ensured only when a pragmatic approach for environmental management is adopted. This chapter provides the necessary tools and approaches for ensuring effective implementation.

5.1 Environmental Monitoring Plan

43. The monitoring programme is devised to ensure that the envisaged purpose of the project is achieved and results in the desired benefit to the target population. To ensure the effective implementation of the EMP, it is essential that an effective monitoring programme be designed and carried out. Broad objectives of the monitoring programme are:

- To evaluate the performance of mitigation measures proposed in the EMP
- To suggest improvements in the management plans, if required
- To satisfy the statutory and community obligations
- To provide feedback on adequacy of Environmental Impact Assessment

5.1.1 Monitoring Indicators

44. The monitoring programme contains monitoring plan for all performance indicators, reporting formats and necessary budgetary provisions. Physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations have been suggested as Performance Indicators (PIs). The Performance Indicators shall be evaluated under three heads as:

- Environmental condition indicators to determine efficacy of environmental management measures in control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures.

45. Operational performance indicators have also been devised to determine efficacy and utility of the mitigation/enhancement designs proposed.

Table 5-1: Environmental Monitoring Indicators

Sl. No.	Indicator	Details	Stage	Responsibility
A	**Environmental Condition Indicators and Monitoring Plan**			
1	Air Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared **(Refer Table 5-2)**	Construction	Contractor under the monitoring of SPV
			Operation	SPV through approved monitoring agency
			Pre-Construction	SPV through approved monitoring agency
2	Noise Levels		Construction	Contractor under the monitoring of SPV
			Operation	SPV through approved monitoring agency
			Pre-Construction	SPV through approved monitoring agency
3	Water Quality		Construction	Contractor under the monitoring of SPV
			Operation	SPV through approved monitoring agency
			Pre-Construction	SPV through approved monitoring agency
4	Soil Quality		Construction	Contractor under the monitoring of SPV

Sl. No.	Indicator	Details	Stage	Responsibility
			Operation	SPV through approved monitoring agency
B	**Environmental Management Indicators and Monitoring Plan**			
1	Construction Camps	Location of construction camps have to be identified and parameters indicative of environment in the area has to be reported	Pre-construction	SPV
2	Borrow Areas	Location of borrow areas have to be identified and parameters indicative of environment in the area has to be reported.	Pre-construction	SPV
3	Tree Cutting	Progress of tree removal marked for cutting is to be reported	Pre-construction	Forest Department to SPV
4	Tree Plantation	Progress of measures suggested as part of the Strategy is to be reported	Construction	Forest Department
C	**Management & Operational Performance Indicators**			
1	Survival Rate of Trees	The number of trees surviving during each visit will be compared with the number of saplings planted	Operation	Forest Department/ SPV
2	Status Regarding Rehabilitation of Borrow Areas	The SPV will undertake site visits to determine how many borrow areas have been rehabilitated in line with the landowner's request and to their full satisfaction.	Operation	The SPV will be responsible for a period of three years.
3	Soil Erosion	Visual monitoring and operation inspection of embankments will be carried out once in three months.	Operation	The SPV will be responsible for a period of three years.

46. For each of the environmental condition indicator, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for environmental condition indicators of the project in construction and operation stages is presented in **Table 5-2**.

Table 5-2: Environmental Monitoring Plan

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation
Air	Construction	SO_2, NO_x, PM_{10} $\mu g/m^3$ $PM_{2.5}$ $\mu g/m^3$and CO	High volume sampler to be located 50m from the plant in the Downwind direction. Use method specified by CPCB for analysis	Air (prevention and Control of Pollution) Rules, CPCB, 2009	Three seasons per year	24 hours Sampling	Batching plant / surrounding the project area	Contractor / SPV
	Operation[2]				Continuous monitoring (Three seasons in a year)		Surrounding the BRTS facilities	Contractor / SPV
Water	Construction	All essential characteristics and some of the desirable characteristics for water recycling/ harvesting etc.as decided by the Environmental Specialist of the CSC and SPV	Grab sample collected from source and Analyse as per Standard Methods for Examination of Water and Wastewater	Indian Standards for Inland Surface Waters (IS: 2296), 1982	Four seasons per year	Grab Sampling	Surface water sources	Contractor / SPV
	Operation				Continuous monitoring (Four seasons in a years)			Contractor / SPV
Noise	Construction	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 Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement	MoEF Noise Rules, 2000	Three seasons per year	Leq in dB(A) of day time and night time	Batching plant/ surrounding the project area	Contractor / SPV
	Operation				Continuous monitoring (Three seasons per year).		Surrounding the BRTS facilities	Contractor / SPV
Soil	Construction	Monitoring of Pb, SAR and Oil & Grease	Sample of soil collected to acidified and analysed using absorption Spectrophotometer	Threshold for each contaminant set by IRIS database of USEPA until national	Four seasons per year	Grab Sampling	Batching plant/ construction camp	Contractor / SPV

[2] Parameters to be monitored for Operation stage is same as Construction stage

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation
				standards are promulgated				
	Operation				Continuous monitoring (Four seasons per year)		Within/ Surrounding the BRTS facilities	Contractor / SPV
Borrow area	Construction	As per Guidelines	Visual Observation	-	Once in a month	-	Borrow area location	Contractor
Tree plantation	Operation stage	As per Design			Continuous monitoring (Quarterly)	-	Areas where plantation is being done	Contractor / SPV
Health and Safety	Construction	As per World Bank EHS Guidelines	-	Environmental, Health and Safety (EHS) standards	Quarterly	-	Construction and Labour Camp sites	Contractor / SPV

5.2 Reporting System

47. Reporting system for the suggested monitoring program operates at two levels as:

- Reporting for environmental condition indicators and environmental management indicators (except tree cutting indicator)
- Reporting for operational performance indicators at the SPV level

48. Contractor and Engineer operate the reporting system for environmental condition and environmental management indicators (except tree cutting). The Environmental Cell of SPV will operate the reporting system for environmental management tree cutting indicator and operation performance indicators. The SPV will set the targets for each activity envisaged in the EMP beforehand and all reports will be against these targets.

49. Contractor will report to the Engineer on the progress of the implementation of environmental conditions and management measures as per the monitoring plans. The Engineer will in turn report to the SPV on a quarterly basis which will be reviewed. Along with these reports, Environmental Cell of the SPV shall report progress of tree cutting, compensatory plantation, landscaping and survival rate as per the monitoring plan. Reporting formats have been prepared, which will form the basis of monitoring, by the Engineer and/or the Environmental Cell as required and presented as **Annexure-2**.

Table 5-3: Summary details of Reporting

Format No.	Item	Stage	Contractor	Construction Supervision Consultant (CSC) /		Project Implementation Unit (SPV)
			Implementation & Reporting to CSC	Supervision	Reporting to SPV	Oversee / Field Compliance Monitoring
EM1	Identification of Disposal Locations	Pre-Construction	One Time	One Time	One Time	One Time
EM2	Setting up of Construction Camp	Pre-Construction	One Time	One Time	One Time	One Time
EM3	Borrow Area Identification	Pre-Construction	One Time	One Time	One Time	One Time
EM4	Tree Cutting	Pre-Construction	-	-	-	Quarterly
EM5	Tree Plantation	Construction	-	-	-	Quarterly
EM6	Top Soil Monitoring	Construction	Quarterly	Continuous	Quarterly	Quarterly
EM7	Construction Safety	Construction	Quarterly	Continuous	Quarterly	Quarterly
EC1	Pollution Monitoring	Construction	As Per Monitoring Plan	Quarterly	Quarterly	Quarterly
EC2	Pollution Monitoring	Operation	-	-	-	As Per Monitoring Plan
OP1	Survival Rate of Trees	Operation	-	-	-	Quarterly
OP2	Status Regarding Rehabilitation of Borrow Areas	Operation	-	-	-	Half Yearly

50. In addition to these formats, to ensure that the environmental provisions are included at every activity of the implementation by the contractor, it is suggested that the approval of the environmental personnel of the engineer is required in the request for application to proceed or other similar reporting formats used by the contractor. These will not only ensure that the

environmental provisions are addressed but also link the satisfactory compliance to environmental procedures prior to approval of the Interim Payment Certificate (IPC) by the Engineer. The activities by the contractor that can impact the environment will be identified based on discussions between the Environmental Specialist of the SPV, team leader of the Engineer and the Environmental personnel of the Engineer. The decisions will be communicated to the contractor prior to the start of the construction activities.

5.3 Environmental Audit

51. The Hubli-Dharwad BRTS Company would get an Environmental Audit conducted at the end of each year of implementation of project to assess the status of implementation of Environmental management plans, identify constraints, if any during implementation, document best practices, if any and suggest measures for effective implementation and monitoring. The draft ToR is in **Annexure 3.**

5.4 Institutional Setup

52. The Environmental Management Plan, EMP process does not stop once a project (planning and design) has been approved for implementation. During implementation of project, Construction Supervision Consultant, CSC (if any) and Contractor will be responsible for ensuring that the environmental commitments made to regulatory agencies, lending agencies and other stakeholders during the EIA process are met. To execute EMP is a cumulative responsibility of all three parties involved, indicative responsibility mechanism has been presented in **Table 5-4**.

Table 5-4: Institutional Responsibilities

System	Designation	Responsibilities
Coordinating/Facilitating Agency	Managing Director (SPV/KRDCL)	• Overview of the project implementation • Ensure timely budget for the EMP • Coordination with different state level committee, to obtain Regulatory Clearances • Participate in state level meetings • Monthly review of the progress.
	Project Manager (SPV/KRDCL)	• Overall responsible for EMP implementation • Reporting to various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation • Coordination with SPV/KRDCL Staff (Environmental officer). • Responsible for obtaining Regulatory Clearances • Review of the progress made by contractors • Ensure that BOQ items mentioned in EMP are executed as per Contract provisions.
	Environmental Officer (SPV/KRDCL)	• Assisting Project Manager in overall implementation of EMP • Review of periodic reports on EMP implementation and advising Project Manager in taking corrective measure**.** • Conducting periodic field inspection of EMP implementation • Assisting Project Manager to reporting various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation • Preparing environmental training program and conducting the same for field officers and engineers of contractor
Implementing/ Monitoring	Engineer- Incharge	• Act as an "Engineer" for supervising EMP implementation

System	Designation	Responsibilities
Agency	(CSC)	• Responsible for maintaining quality of EMP envisioned in Detail Project Report • Maintaining progress reports on EMP implementation • Periodic reporting to SPV/KRDCL about the status of EMP implementation • Work in close coordination with Environmental officer (SPV/KRDCL) and contractor
Executing Agency	Environmental Manager / Engineer of Contractor	• Responsible for ensuring the implementation of EMP as per provision in the document. • Directly reporting to the Project Manager of the Contractor • Discussing various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly • Assisting his project manager to ensure social and environmentally sound and safe construction practices • Conducting periodic environmental and safety training for contractor's engineers, supervisors and workers along with sensitization on social issues that may be arising during the construction stage of the project • Assisting the SPV/KRDCL on various environmental monitoring and control activities including pollution monitoring; and • Preparing and submitting monthly/bio-monthly reports to SPV/KRDCL on status of implementation safeguard measures

5.5 Good Environmental Construction Guidelines

53. Comprehensive environmental construction guidelines have been prepared to guide the planning and implementing agency in preparing the project specific environmental code of conduct for contractor. The list of good environmental practices is as follows. All guidelines listed are presented as **Annexure 4** for reference and implementation into the Environmental Management Plans for the specific projects.

Table 5-5: Guideline for Good Environmental Practices

Guidelines	Activities
Guideline-1	Site Preparation
Guideline-2	Construction and Labour Camps
Guideline-3	Borrow Areas
Guideline-4	Topsoil Salvage, Storage and Replacement
Guideline-5	Quarry Management
Guideline-6	Water for Construction
Guideline-7	Slope Stability and Erosion Control
Guideline-8	Waste Management and Debris Disposal
Guideline-9	Water Bodies
Guideline-10	Drainage
Guideline-11	Construction Plants & Equipment Management
Guideline-12	Labour and Worker's Health and Safety
Guideline-13	Cultural Properties
Guideline-14	Tree Cutting and Afforestation
Guideline-15	Forests and Other Natural Habitats
Guideline-16	Air and Noise Pollution
Guideline-17	Environmental Monitoring

6. EMP BUDGET

54. Budgetary estimates for environmental management in the project include all items envisaged as part of the EMP. The environment budget includes provisions for various environmental management measures (other than measures considered under good engineering practices) and the environmental monitoring costs. Budgetary provisions for the project are presented in **Table 6-1**.

Table 6-1: Budgetary Provisions for Environmental Management Measures

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)
A	**CONSTRUCTION PHASE**				
1	*Mitigation Measures*				
1.1	Oil Interceptors	Number	5000	6	30,000
1.2	Recharge pits	Number	20000	10	2,00,000
2	*Tree Plantation and Protection*				
2.1	Trees	Covered under project cost			
2.2	Landscaping				
3	*Monitoring of Environmental Attributes during Construction Activity*				
3.1	Air Quality				
3.1.1	Monitoring of Air Quality near Hot mix plants	No. of Samples	6000	36	2,16,000
3.1.2	Monitoring of Air Quality at Critical Locations	No. of Samples	6000	18	1,08,000
3.2	Noise Levels				
3.2.1	Monitoring of Noise Level at Equipment Yards	No. of Samples	4000	36	1,44,000
3.2.2	Monitoring of Noise Levels at Critical Locations	No. of Samples	4000	18	72,000
3.3	Water Quality	No. of Samples	6000	36	2,16,000
3.4	Soil Quality	No. of Samples	6000	48	2,88,000
	Environmental Budget During Construction Phase				**12,74,000**
B	**OPERATION PHASE**				
1	*Monitoring of Air Quality during Operation Phase*				
1.1	Monitoring of Air Quality at Critical Locations	No. of Samples	6000	24	1,44,000
1.2	Monitoring at additional locations	No. of Samples	6000	12	72,000
2	*Monitoring of Noise during Operation Phase*				
2.1	Monitoring of Noise Levels at Critical Locations	No. of Samples	4000	36	1,44,000
2.2	Monitoring at additional locations	No. of Samples	4000	18	72,000
3	Monitoring Soil Quality	No. of Samples	6000	12	72,000
	Environmental Budget During Operation Phase				**5,04,000**
	Sub Total (A+B)				17,78,000
	Grand Total INR. (Environmental Budget Exclusive of Cost of Measures Included Under Good Engineering Practices, A+B+10% contingency)				**19,55,800**