
IMPLEMENTATION OF BUS RAPID TRANSIT SYSTEM

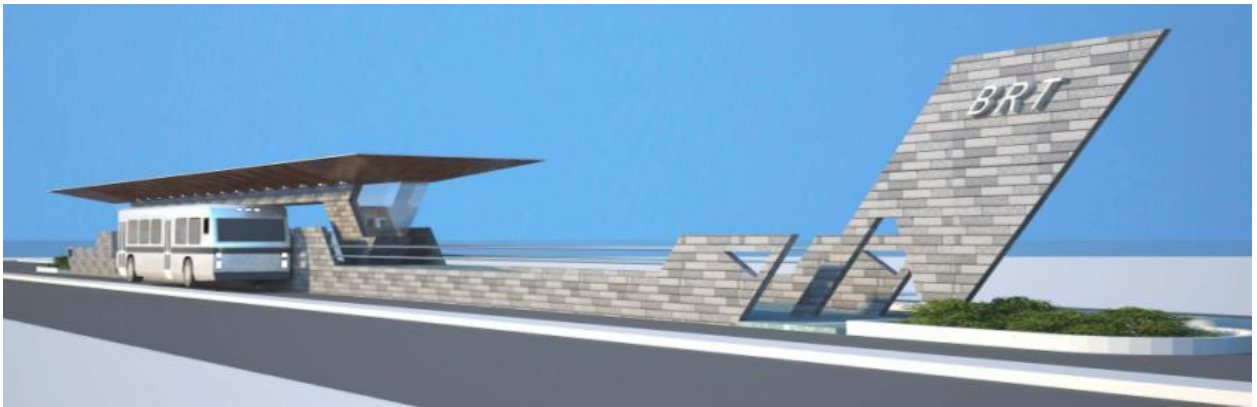
IN HUBLI – DHARWAD

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

FOR

BUS TERMINAL OF BRTS INFRASTRUCTURE

(MITRA SAMAJ)



HUBLI-DHARWAD BRTS COMPANY LIMITED

DECEMBER-2015

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1. Introduction

The Environmental Impact Assessment (EIA) of BRTS Bus Terminal at Mitra Samaj has been prepared to address the anticipated impacts arising out of the project and mitigation measures. Impacts are analysed keeping in view the sensitive receptors on and off the project site.

2. Purpose of Project & Need

In the detailed feasibility report prepared by CEPT University, it was proposed to construct a bus terminal at Jubilee Circle. However, due to non-availability of land at the location, the terminal had to be shifted to Mitra Samaj.

3. Location of proposed Site

The proposed site is located 1.5km from the Jubilee Circle. The area of proposed site is 36Gunte and 10Annas. As per the land use patterns, the entire stretch i.e. from Jubilee Circle to Anjuman Circle and from Anjuman Circle to Jubilee Circle surrounded by commercial, Government land and only few residential buildings. As per JMC three properties will be affected, One title holder is private person. Out of the two remaining properties one belongs to HDMC and the other is Government property.

The detail plan at proposed site is illustrated in the next page:

3.1 Project Description:

The proposed bus terminal at Mitra Samaj is exclusively for BRTS buses and as this terminal is in the middle of the city, the terminal design is unique and aesthetic. The salient features of the bus terminal are as follows:

Ground Floor:

1. Passenger information centre, public rest rooms and one or two kiosks along with bus bays with sufficient space for movement of people and vehicles.

First Floor:

1. Office and discussion room.
2. Roof-top restaurant, passenger concourse and public rest rooms.
3. Provision for connectivity to OCBS and CBT through skywalks.

Second Floor:

1. Library building.

4. Baseline Environmental Study

The environmental impact study includes all the aspects of physical changes expected. Field studies have been carried out to substantiate project impacts and develop mitigation plans to protect the ecosystem and environment on and off the proposed site at Mitra Samaj.

A detail survey has been conducted for the study of environmental scenario at proposed site. The field observations include baseline environmental setup of the study corridor (10 Km radius of the proposed project) in general and within the Right of Way (ROW) in particular, as described in subsequent sections. The baseline environmental components which are assessed along the project site are as follows:

- *Land Use Pattern*
- *Drainage*
- *Wetlands*
- *Forests*
- *Religious & Cultural Property*
- *Ecological Sensitive Areas*
- *Archaeological, Historical & Heritage Sites etc.*

4.1 Land Use Pattern

The present location is directly beneficial for the commuters of twin city Hubli-Dharwad and the commuters can access the bus terminal from Old City Bus Stand, Dharwad and Dharwad CBT by using foot over bridge. The entire corridor i.e. from Jubilee Circle to Anjuman Circle and from Anjuman Circle to Jubilee Circle has commercial establishments that include markets, hubs and a few residential buildings.

The land-use pattern of proposed project site is described in **Table: 4.1.**

Table 4-1: Land use at Proposed Bus Terminal

Land use on Left Side	Chainage (m)		Land use on Right Side
	From	To	
Commercial	000	100	Commercial
Government Land	100	200	Government Land
Government Land	200	300	Residential
Government Land	300	400	Residential
Commercial	400	500	Residential
Government Land	500	600	Residential
Government Land	600	700	Commercial
Government Land	700	800	Commercial
Government Land	800	900	Commercial
Government Land	900	1000	Commercial
Government Land	1000	1100	Commercial
Commercial	1100	1200	Commercial
Commercial	1200	1300	Commercial
Commercial	1300	1400	Commercial
Commercial	1400	1500	Commercial

4.2 Drainage Pattern

Natural drains are not located in the proximity of proposed bus terminal site.

4.3 Wetlands/Water Bodies

There is no wetland of national and international importance, ponds and reservoirs exist in close proximity of the proposed location.

4.4 Forests

There are no natural forest, reserve forest, protected forest and natural heritage sites of national and international importance in the proximity of project influence area.

4.5 Biological Environment

4.5.1 Local Flora

The trees reported at project site are mainly *Ficus religiosa*, *Syzygium cumini*, *Polyalthia longifolia* and *Prunus dulcis* these are illustrated in **Table – 4.2**

Table 4-2: Trees at Bus – Terminal

Plant Species		Girth (Cm)	Height (Mtr)	No. of trees	No. of Trees Saved
Scientific Name	Vernacular Name				
<i>Ficus benghalensis</i>	Banyan	150	6.00	3	3

Plant Species		Girth (Cm)	Height (Mtr)	No. of trees	No. of Trees Saved
Scientific Name	Vernacular Name				
Ficus benghalensis	Banyan	90	2.50	1	1
Syzygium cumini	Jamun	60	4.00	2	2
Prunus dulcis	Badam	15	3.00	5	-
Prunus dulcis	Badam	25	3.00	3	-
Polyalthia longifolia	Ashok	40	6.00	8	8
Polyalthia longifolia	Ashok	15	3.00	3	-
Polyalthia longifolia	Ashok	10	2.00	6	6
Polyalthia longifolia	Ashok	40	4.00	4	-
Others (A)	Others	60	6.00	1	1
Others (B)	Others	25	3.00	1	-
Total				37	21
Trees to be cut				16	

Compensatory plantation of 1:2 ratio i.e. planting of 2 trees for felling of 1 tree will be done.

4.5.2 Local Fauna

There are no forests (reserve and protected forests), Ramsar site and no fauna reported within 10 Km radius of proposed project site, which has ecological importance as per EIA notifications, 14th September -2006 and its amendment, 22nd August 2013.

4.6 Ecological Sensitive Areas

There is no biosphere reserve, national park and world heritage sites etc. within 10 km radius of the proposed project site.

4.7 Religious and Cultural Properties

No religious and cultural properties within the site.

4.8 Cultural Heritage (Archaeological Sites and Historical Monuments)

There are no Cultural Heritage properties such as archaeological sites and historical monuments of national and international importance within radius of 300 meter from the proposed project site, as per Govt. of India, Gazette Notification No.- 13, dated 30 March, 2010 on “The Ancient Monuments and Archaeological Sites and Remains (Amendment & Validation) Act, 2010”.

4.9 Finding of Environmental Issues

The environmental issues within radius of 10 km of proposed project site are

- Trees
- Noise and dust during construction

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- Traffic management
 - Wastes like garbage, debris etc. generated during construction.
 - Safety of road users.

Therefore, detailed Environmental Management Plan (EMP) and solid wastes management plan has been developed, to safeguard and protect the environment during the construction period.

5. Environmental Management Plan

Environment management plan deals with the management measures recommended to avoid, minimise and mitigate foreseen environmental impacts of the project. To mitigate the impacts best engineering practices are recommended to ensure that the bus terminal optimizes the use of available land, resources to minimize costs and to ensure environmental safeguards as per the World Bank guideline and requirements.

The following are the aspects of environmental management and recommended mitigation measures that should be followed by the agency during construction of bus terminal at Mitra Samaj, Dharwad as shown in table 5.1.

TABLE –5.1: ENVIRONMENTAL MANAGEMENT MEASURES FOR BUS – TERMINAL

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
BT 1	Construction Stage				
BT 1.1	Debris Disposal	<p>The Contractor shall identify disposal sites and shall report the same to the Environmental Engineer. These locations shall be checked on site and accordingly approved by Environmental Engineer prior to any disposal of waste materials.</p> <p>The Contractor shall prepare Comprehensive Solid Waste Management Plan in consultation with Environmental Engineer and after approval of plan by Environmental Engineer debris shall be disposed off accordingly.</p> <p>No dismantling shall be carried out without identification and approval of site by Environmental Engineer.</p>	At Construction site	Contractor	HDBRTS assisted by PMC.
BT 1.2	Safety Arrangement	<p>The Contractor shall prepare plan of safety arrangements and submit it to the Environmental Engineer for approval, five days prior to the commencement of works of Bus terminal site.</p> <p>The cautionary sign boards should be placed, 50 m ahead the construction zone with retro reflective tapes. The signs boards, lights, barriers, safety cones shall be maintained in a satisfactory manner as directed by the Engineer.</p>	At the construction site, labour camp and construction camp	Contractor	HDBRTS assisted by PMC.
BT 1.3	Handling and storing of materials	<p>The Contractor shall prepare a plan for storage of material at bus terminal site and shall submit for the approval to Engineer.</p> <p>Area of storage of material near the work site shall be earmarked in consultation with Environmental Engineer.</p>	Material storage area and handling area	Contractor	HDBRTS assisted by PMC.

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
		The ground for storage of materials should be levelled. All construction materials should be stored properly on platforms and other supports in line with IS: 7293 & IS: 7969.			
BT 1.4	Damage and Disruption of Utilities Services, existing green vegetation	The Contractor shall not obstruct any utilities services and existing vegetation during the construction of bus terminal infrastructure. The Contractor shall carry out excavation carefully for foundation work during the bus terminal construction without damage to existing water pipeline, telephone line, electrical poles and transformers.	At construction site	Contractor	HDBRTS assisted by PMC.
BT 1.5	Flora	The Contractor must take measures to protect all existing trees during the construction of bus terminal.	At construction site	Contractor	HDBRTS assisted by PMC.
BT 1.6	Labour	The Contractor shall make necessary arrangement for toilets and drinking water requirement at site.	At construction site and labour camp.	Contractor	HDBRTS assisted by PMC.
Pollution					
Water Pollution					
BT 1.7	Water Pollution from Construction Wastes	All waste generating from the Bus terminal construction activity is to be disposed off at municipal landfill site and as per approval of the Engineer. The wastes must be collected and stored at the wastes storage yards and should be disposal at approved disposal sites. The Environmental Engineer shall certify that all wastes generated at Bus terminal site have been disposed off as to have no pollution to any water body and to the environment.	At construction site.	Contractor	HDBRTS assisted by PMC.

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
BT 1.8	Drainage and runoff	<p>The Contractor shall ensure that no construction of materials like earth, stone or any other construction material shall be left inside the storm water channel to which impede the flow of water. All vents should be cleared and clean from the extraneous wastes in order to free intake of surface run off in the storm water drain of bus - terminal infrastructure.</p> <p>The Contractor shall take all measures as directed by the Environmental Engineer to prevent temporary or permanent flooding at the site or any adjacent area.</p>	At construction site.	Contractor	HDBRTS assisted by PMC.
BT 1.9	Borrow Materials	No borrow materials should be taken from river beds, irrigation canals and any other water course.		Contractor	HDBRTS assisted by PMC.
Air Pollution					
BT 1.10	Dust Pollution	The Contractor shall take all measures to suppress dust fumes. Water Tankers should be placed, for sprinkling of water to control dust.	At construction site.	Contractor	HDBRTS assisted by PMC.
Noise Pollution					
	Noise Control	<p>The excavation should be made using good engineering practices so that noise levels are kept at acceptable levels.</p> <p>Ear muff should be provided to the workers.</p> <p>Job rotation should be made to reduce the noise expose to the workers.</p>	At construction site.	Contractor	HDBRTS assisted by PMC.
BT 1.11	Safety				
	Tool Box Talk	Tool Box Talk should be held at the first hrs.	At construction site.	Contractor	HDBRTS assisted by PMC.

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
		<p>Toolbox is the routine exercise for the workers to alert on accidental risks and to ensure personal safety, hazards at work place and preventing measures.</p> <p>The Tool Box Talks should be made at designed place fixed for assembly points to raise awareness followed by information of hazardous risks, near miss, and injuries.</p> <p>Toolbox meeting improve workplace safety, health environment by deciding what action needs to be taken to reduce the risks.</p>			
BT 1.12	Personal Safety for Labour	<p>The Contractor shall provide:</p> <ul style="list-style-type: none"> ✓ Safety Shoes, Gum boots, Goggles and Safety Jackets to all workers employed on cement mortars, brick work, concreting, and painting ✓ Welders should have protective eye shields when engaged in welding works. ✓ Earplugs should be provided to workers who exposed to loud noise, working with jack hammer, joint cutting machines, vibrators. ✓ Adequate safety measures for workers during handling of materials. ✓ The Contractor shall comply with all regulations for safe working zone at excavations and trenches. ✓ At every workplace, drinking water shall be made available to avoid waterborne diseases. ✓ The Contractor at his own expenses shall put up necessary shuttering and planking or cut slopes to a safer angle or both with due regard to the safety 	At construction site.	Contractor	HDBRTS assisted by PMC.

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
		<p>of personnel and workers and to the satisfaction of the Engineer.</p> <p>The Contractor shall comply with all the precautions as required for ensuring safety of the works as per the International Labour Organization (ILO) Convention No. 62 as far as those are applicable to this Agreement.</p> <p>The Contractor shall make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</p> <p>The Contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed on the work of painting with products containing lead in any form.</p> <p>The Contractor shall also ensure that no paint containing lead or lead products is used to except in the form of paste or readymade paint. The Contractor shall provide facemasks for use to the workers when paint is applied in the form of spray.</p> <p>The Contractor shall develop a Construction Safety Plan and the same be submitted for the approval of Engineer. The Contact numbers of Police, Fire Brigade, Ambulance, Police Station, Environmental Engineer, and HDBRTS should be displayed at each bus - terminal Site.</p>			
BT 1.13	Handling of Chemicals	<p>Any skin contacts with epoxy materials, solvents and epoxy strippers should be avoided.</p> <p>The resin and hardener should not be allowed to come into direct contact with skin. The most effective protection is</p>	At construction site.	Contractor	HDBRTS assisted by PMC.

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
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		<p>achieved by wearing polythene gloves, rubber gloves, with a cloth liner, and protective clothing.</p> <p>If materials are sprayed, a respirator shall be used.</p> <p>All discarded buckets and containers shall be removed from site. These shall be stored in waste disposal site.</p>			
BT 1.14	Management of Safety	<p>The Contractor shall submit the pedestrian safety management plan for safe working zone and the same should be approved by Environmental Engineer. Delineator post should be provided at the interval of 20 meter along the entire bus - terminal construction site.</p> <p>The Contractor shall take all necessary measures for the safety of local communities during the construction of bus - terminal. The Contractor shall provide, erect and maintain the bamboo barricades including the signs boards, markings, red flags, warning sign boards.</p> <p>The Contractor shall ensure that all signs, barricades markings are provided as per the standards & specifications.</p>	At construction site.	Contractor	HDBRTS assisted by PMC.
BT 1.15	Informatory Safety Sign Boards	The Contractor shall provide, erect and maintain informatory/ safety signs written in English and Hindi, Kannada wherever required or as suggested by the Environmental Engineer.	At construction site.	Contractor	HDBRTS assisted by PMC.
BT 1.16	Pollution Monitoring	The Contractor shall monitor Air Quality at bus- terminal site at peak hrs of construction, quarterly except the monsoon.	At construction site.	Contractor	HDBRTS assisted by PMC.
H.1	Health				

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
BT - H 1.1	Medical Facilities at Construction camps/ sites	<p>Sanitation Facilities: The Construction camps shall be provided with sanitary latrines and urinals. Closed drainage systems and the proper treatment systems according to the local conditions should be constructed for the proper flow and effective drainage.</p> <p>Shelter at work place: At such work places where the duration of the works will prevail for more than one month some form of shelters will be provided for meals, resting, change of clothes and for keeping the tools of the work and personal protective equipment. The height of shelter shall not less than 3m from floor level to lowest part of the roof.</p> <p>Health care Facilities: The Contractor should be provided basic health care facilities at the construction camps. The health centre will have at least a doctor (part time), nurses, duty staff, medicines and minimum medical facilities to tackle first-aid requirements for minor accidental cases. The arrangements will be made with the nearest hospital to refer patients of major illnesses or critical cases.</p> <p>Day crèche facilities At construction sites where women with very young children are employed, provision of a day crèche shall be provided. At construction sites where 20 or more women are ordinarily employed, a hut for children under the age of 6 years shall be provided.</p>	At construction site.	Contractor	HDBRTS assisted by PMC.

Sl. No.	Environmental Aspects	Management Measures	Location	Responsibility	
				Implementation	Supervision
BT – H 1.2	First Aid	<p>A readily available first- aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules, should be kept at Bus - Terminal Construction site.</p> <p>The first-aid box should contain antibiotics, pain killers, anti-diarrhoeal medicines, sterilized dressing material, antiseptics, bandage and other necessary appliances be available as per the factory rules.</p>	At construction site and labour camp.	Contractor	HDBRTS assisted by PMC.
BT D 1	The Contractor 's Demobilization				
BT D 1.1	Cleanup Operations, Restoration and Rehabilitation	<p>The Contractor shall prepare site restoration plans, which shall be approved by the Engineer of HDBRTS. The clean-up and restoration operations are to be implemented by the Contractor prior to demobilization.</p> <p>All excavated sites which are not used for construction works shall be re-filled and the entire site left clean and tidy at the Contractor 's expense, to the satisfaction to the Engineer</p> <p>The Contractor shall clear all the temporary structures, residual spoils, other wastes laying in and around the project site as per Comprehensive Waste Management Plan.</p>	At construction site.	Contractor	HDBRTS assisted by PMC.

6. Budget for EMP

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 that considered under good engineering practices and the environmental monitoring costs. Budgetary provisions for the project are presented in **Table 6.1**.

Table 6.1: Budget - Environmental Management Measures

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)
A	Construction Phase				
1	<i>Tree Plantation and Protection</i>				
1.1	Trees	Number	1000	32	32,000.00
2.0	Landscaping	LS			100,000.00
3	<i>Monitoring of Environmental Attributes during Construction Activity</i>				
3.1	Air Quality				
3.1.1	Monitoring of Air Quality near ready mix concrete yard/HMP	No. of Samples	6000	4	24,000.00
3.2	Noise Levels				
3.2.1	Monitoring of Noise Level at Equipment Yards/HMP	No. of Samples	4000	4	16,000.00
Total					1,72,000.00
10% Contingency					17,200.00
Grand Total					1,89,200.00