ENVIRONMENTAL MANAGEMENT PLAN

1 INTRODUCTION

The Environmental Management Plan (EMP) is aimed at mitigating the possible adverse impact of a project and ensuring the existing environmental quality. The EMP converse all aspects of planning, construction and operation of the project relevant to environment. It is essential to implement the EMP right from the planning stage continuing throughout the construction and operation stage. Therefore the main purpose of the Environmental Management Plan (EMP) is to identify the project specific activities that would have to be considered for the significant adverse impacts and the mitigation measures required.

The construction phase impacts are mostly short term, restricted to the plot area and not envisaged on the larger scale. In the operational phase the environmental impacts are due to continuous operation of the project, hence, the emphasis in the Environment Management plan (EMP) is to minimize such impacts. The following mitigation measures are recommended in order to synchronize the economic development of the project area with the environmental protection of the region.

The emphasis on the EMP development is on the following;

- **Mitigation measures for each of the activities causing the environmental impact.**
- **Monitoring plans for checking activities and environmental parameters and monitoring responsibilities.**
- **Role responsibilities and resource allocation for monitoring; and**
- **Implementation of the Scheduled plan.**

Environmental management plan has been discussed in the following sections separately for Construction phase and Operational phase:

2 EMP DURING CONSTRUCTION PHASE

During Construction phase, the activities which need to be monitored and managed from the point of pollution are explained in detail in the subsequent sections.

2.1 LEVELLING AND SITE CLEARANCE

The proposed project site consists of few Eucalyptus plants and shrubs which will be cleared during site formation. As per the site scenario; site has a level difference of 5.0 m, so levelling and excavation will be done for basement preparation with of best management plan to minimize the excavated earth.

Table 1: Environmental Management during Levelling and Site Clearance

Environmental Impacts	Mitigation	Remarks
Noise generation: Caused due to Excavators and Bulldozers	• **Most optimum no. of operation by the heavy equipment.** • **Selection of equipment with less noise generation to be used.** • **The earth moving equipment shall be periodically checked and maintained for noise levels. The workers shall be provided with adequate PPE such as ear plugs to reduce impact of high noise levels.**	**To reduce noise level, Equipment provided with noise control devices is only used.**
Dust generation: Levelling operations results in the emission of the dust.	• **The site cleared shall be periodically watered to reduce emission of dust particles.** • **Barricades will be provided all around the site to suppress the dust.** • **The workers shall be provided with PPE such as nose masks and goggles to reduce impact on health.**	**The construction water requirement will be sourced from external tanker water.**

2.2 TRANSPORTATION OF CONSTRUCTION MATERIALS

During the Transportation of construction materials, minimum no. of vehicles will be used. Most optimum route is planned to reduce the impact of transportation activity on the environment.

2: Environmental Management during Transportation

Environmental Impacts	Mitigation
Noise generation	• **Quality fuel is used.** • **Periodic maintenance of vehicles is required.**
Dust generation	• **Quality packaging of the construction materials.** • **Construction materials shall be covered with tarpaulin sheets to prevent the material from being air borne.** • **Watering to the wheels of the construction vehicle will be done while entering to the construction site.** • **The vehicle speed shall be regulated.** • **The workers transporting materials shall be provided with PPE such as nose masks to reduce impact of air borne dust on their health.**
Vehicular emissions	• **Periodic emission check for vehicles is required** • **Clean fuel shall be used for vehicles**

2.3 CONSTRUCTION ACTIVITIES

During the construction work, the following impacts are identified to monitor and mitigate the level of impact.

Table 3: Environmental Management during Construction

Environmental impacts	Mitigation	Remarks
Noise generation	• **Selection of less noise generating equipment.** • **Personnel Protective Equipment (PPE) such as ear plugs and helmets shall be provided for construction workers.** • **The working hours shall be imposed on construction workers.**	**Implementation responsibility: Contractor – Civil Works.**
Dust generation	• **PPE in the form of nose masks shall be provided for construction workers.** • **Use of water sprays to prevent the dust**	**Implementation responsibility: Contractor**

	from being air borne. • **Providing barricades all around the project site.**	
Water Discharge from construction works	• **Sewage generated from the workers will be collected in collection tank & will be lifted to BWSSB treatment plant for further treatment.**	**Implementation responsibility: Contractor**
Air Emissions from construction machinery	• **Periodic check and regular maintenance of construction machinery for emissions.** • **Clean fuel shall be used in equipments**	**Implementation responsibility: Contractor**

2.3.1 WASTEWATER DISCHARGE

The sewage generated from the construction labours during construction is estimated to be about 4.3 KLD. This will be collected in collection tank & will be lifted to BWSSB treatment plant for further treatment.

2.3.2 DISPOSAL OF EXCAVATED EARTH

The excavated earth which is generated during construction will be reused within the site for backfilling, leveling and for the development of landscape & pavement area formations. Therefore there will not be any solid waste problem from the generation of excavated earth.

2.3.3 PERSONNEL SAFETY SYSTEM

It is planned to adopt the safe working practices which shall govern all construction works undertaken throughout the project. Following Safety Aids to all labourers will be provided:

- **Safety Helmets, Safety Belts, Safety Shoes, Hand gloves,**
- **Gumboots while concreting**
- **Safety Goggles while welding/ Stone dressing etc.**
- **Face masks and full body kit while Pest control**

Implementation of Safety procedures such as:

- **Using proper lifting techniques.**
- **Using Safe Scaffolds.**
- **Hot work permits for Fabrication and Welding.**

BUDGETARY ALLOCATION FOR EMP DURING CONSTRUCTION

Sl. No.	EMP Aspects	Cost
Capital Investment		In Lakh
1.	**Barricades all round the site**	**1.2**
	Total	1.2
During Construction		Lakhs/annum
1.	**Purchase of water from external authorized suppliers**	**2.8**
2.	**Plantation around periphery & maintenance**	**2.0**
3.	**Disposal of Solid Waste from project site**	**2.4**
4.	**Environmental Monitoring –Air, water, Noise**	**1.0**
5.	**EMP cell**	**3.6**
	Total	11.8

3 EMP DURING OPERATION PHASE

Following are the identified operational phase activities in the impact assessment, which may have impact on the environment.

1. **Air quality**
2. **Water quality**
3. **Noise quality**
4. **Solid waste disposal**
5. **Green belt development**
6. **Storm water Management**

3.1 AIR QUALITY MANAGEMENT

The air pollutants likely to be emanated from the proposed project are SPM, SO_2, NO_x, HC and CO mainly due to burning of liquid fuel (HSD) in DG.

Exhaust from DG set will be emitted from stack of adequate height for dispersion of gaseous pollutants. Following Table 10.4 presents the EMP for air quality management during operation phase.

Table 4: Air Quality Management during Operation Phase

Environmental Impacts	Mitigation
DG set	• **Equipment selected will ensure the exhaust**

	emission standard as prescribed as per the latest amendments from the CPCB. • **DG will be used as stand-by unit.** • **Periodic check and maintenance.**
Ambient air quality	• **Ambient air quality monitoring as per the prescribed norms at regular interval.**

3.2 WATER QUALITY MANAGEMENT

Water requirement of the project will be met through Singanaayakanahalli Village Panchayath, as mentioned earlier. Water balance is presented in Annexure 2(a).

The sewage generated from the proposed project is about 85.5 KLD which will be treated in the proposed STP of capacity 90 KLD. The treatment scheme for domestic effluents generated from project has also been discussed in Annexure 2(a). Treated water will be reused for flushing and gardening. Following Table – 10.5 presents the EMP for water quality.

Table 5: Water Quality Management during Operation Phase

Environmental impacts	Mitigation
Effluent from domestic water consumption	• **Treated with proposed State-of-the-art sewage treatment plant to produce tertiary treated water which is ultimately reused for secondary purposes such as flushing, landscaping, gardening, etc.** • **Water conservation measures will be encouraged.**

3.3 NOISE MANAGEMENT

High noise generating units such as DG sets will be provided with acoustic enclosures. Green belt on the project boundary will further act as noise barrier and helps in attenuation of noise. Following Table 6 presents the EMP for noise levels.

Table 6: Noise Management during Operation Phase

Environmental Impacts	Mitigation
Noise from DG set area	• **Acoustic enclosures will be provided to DG set.** • **DG set will be installed in an area (utility section) where the access will be restricted.** • **The use of PPE (ear plugs) will be mandatory in this area.** • **Selection of equipment to ensure that the residual noise level of < 65 dB (A)** • **Noise levels will be checked periodically using a noise dosi meter.**

3.4 SOLID WASTE MANAGEMENT

The solid wastes generated during operation phase can be categorized under three types:

Wet Garbage: Food waste, Lawn mowing wastes etc

Dry Garbage : Paper, Plastic, Bottles, etc.

Sludge from Sewage Treatment Plant (STP)

The solid waste generated in the premises is estimated to be about 328 kg/day. Out of this, 197 kg is biodegradable (organic) waste & 131 kg is non biodegradable/recyclable (inorganic) wastes. Further this organic biodegradable wastes will be segregated at household levels and will be processed in organic waste converter and the inorganic wastes such as plastic materials, glass & metal wastes are handed over to the waste recyclers.

The Sludge from the STP is estimated to be about 4 kg/day and will be used as manure for gardening purpose.

The various mitigation measures to be adopted during collection and disposal of wastes are as follows:

- **It is preferable that the container and bins used for collection of waste should be of closed type so that the waste is not exposed and thus the possibility of spreading of disease through flies and mosquitoes is minimized.**
- **Collection system should be properly supervised so that quick and regular removal of waste from the dustbin is practiced.**
- **Door to door collection shall be done in each unit to collect the solid wastes. The biodegradable wastes will be processed in organic waste converter and Non-biodegradable wastes such as plastic materials, glass & metal wastes are handed over to the waste recyclers; e-waste will collected separately and handed over to authorize e-waste recyclers for further processing.**

3.5 GREENBELT DEVELOPMENT

Vegetation is the natural extension of the soil ecosystem on a site. It can provide summer shade, wind protection, and a low-maintenance landscape that is adapted to the local environment.

Following approach will be adopted for Vegetation and Ground Management.

It is planned to include an ecologically knowledgeable landscape architect as an integral member of the design team.

Preservation of existing vegetation, especially native plants, will possibly be incorporated. Avoid fencing off property where possible to make landscape available to community increasing project integration.

- **Decrease paving and monoculture lawns.**
- **Avoid replacing mature trees with young seedlings.**
- **Protect existing plants during construction. Delineate the "drip line around trees and demark or fence off areas to avoid damage.**
- **Contain heavy equipment and stockpiling areas to predefined areas.**
- **Design new plantings as diverse communities of species well adapted to the site. Plant native species of varying ages. Select vegetation that attracts wildlife.**
- **Avoid invasive species and monocultures (same species, same age).**

3.6 STORM WATER MANAGEMENT

As the project location is blessed with fairly good rainfall, it is planned to collect the storm water at different gradients of the location. There will be rainfall runoff from building roof-tops, roads and pavements and landscape area. Necessary provision will be made to collect the quantity of rainfall runoff during the most rainy day of season. Necessary rain harvesting pit /recharge pit at equal intervals around the periphery of the site have been envisaged. A garland drains with RCC precast perforated cover will be provided around the periphery of property. The details of the rain water harvesting facilities are interpreted in the early section.

3.7 HEALTH, RISK AND DISASTER MANAGEMENT

Public health and safety

Since all the construction related activities shall be confined to the project site, minimal health related impacts are envisaged within the project influenced area during the construction stage.

At the project site on an average of 150 persons will be engaged, who face direct exposure to dust and noise generated from the construction activity. This is likely to cause health related affects such as asthma, bronchitis etc. and hearing impairments respectively.

To minimize these anticipated impacts, suitable actions like

- **Use of water sprinklers to prevent dust from being air borne.**
- **Providing suitable personal protective equipments (PPE) like mouth mask with filters, nose mask, helmets etc.**
- **Periodic health check up camp for the labourers will be arranged.**
- **Provision of safety belts.**
- **In case of injury, on site medical treatment and transport will be organized.**
- **Employing a safety engineer.**

Due to operation of the proposed project, there will be enhancement in public health and safety.

- **Regular visit of resident medical officer to take care of the first aid and primary medication in case of emergency for apartment occupants and workers.**

- **First aid kit with primary medicines will always be available in the medical centre.**
- **Display of action plan and preparedness measures during emergency situations.**

Risk and disaster management plan

Disaster is an unexpected event due sudden failure of the system, external threats, internal disturbances, earth quakes, fire and accidents. Thus an appropriate management plan shall be incorporated.

Precautions

- **Once the likelihood of the disaster is suspected, preventive actions should be undertaken by the project in-charge.**
- **Conditional maintenance of equipments, materials, and expertise for use during emergency.**
- **The electrical systems shall be provided with automatic circuit breakers activated by over current.**
- **Fire extinguishers are provided at pre-notified locations inside the apartments.**
- **Proper escape routes are planned and displayed in the public domain.**
- **Selected representatives are given proper training to guide other inhabitants during fire accidents.**
- **Periodic awareness programme is conducted for the occupants on their roles during emergency situations.**

Important telephone numbers like police authorities, fire department and hospitals etc. of use during emergency situations are made available.

3.8 EMP IMPLEMENTATION SCHEDULE

Phased according to the priority, the implementation schedule is presented in Table 7

Table 7: Implementation Schedule for EMP

Sl. No.	Recommendations	Requirement
1.	**Air pollution control measures**	**Before commissioning of respective units**

2.	**Water pollution control measures**	**Before commissioning of the project**
3.	**Noise control measures**	**Along with the commissioning of the project**
4.	**Solid waste management**	**During commissioning of the project**
5.	**Green belt development**	**Stage-wise implementation**

The responsibility of EMP implementation lies with the project promoter for a period of 3 years. Once the resident's society is established, the EMP responsibility will be properly handed over with clearly defined procedures and guidelines.

3.8 ENVIRONMENTAL MONITORING ROUTINES

A comprehensive monitoring programme is suggested in table 8:

Table 8: Monitoring Schedule for Environmental Parameters

Sl. No.	Particulars	Monitoring frequency	Duration of monitoring	Important parameters for monitoring
I.	Air Quality			
1.	**Ambient Air monitoring**			
	Project premises	**Once in a month**	**24 hourly sample**	**RSPM, SPM, SO_2, NO_2**
2.	**Stack Monitoring**	**Once in a month**	**Grab**	**SO_2, SPM, NO_2, HC, CO**
II	Water and Wastewater Quality			
1.	**Water Quality**			
i.	**Ground water at two locations (up-gradient and down-gradient) of treated effluent discharge area/ land**	**Once in a month**	**Grab**	**As per KSPCB requirements**
2.	**Waste water quality**			
i.	**Inlet to STP**	**Daily**	**Composite**	**-**
ii.	**Treated effluent prior to discharge**	**Daily**	**Composite**	**-**
III	Soil Quality			
1.	**Within project premises at 1 location on effluent discharging area / land**	**Once in a month**	**Composite Sample**	**As per KSPCB requirements**

2.	**Ecological preservation and up-gradation**	**Seasonal**	**Visual observations**	**Survival rate**
IV	Noise Monitoring			
1.	**Project premises**	**Once in a month**	**Day and Night**	**As per KSPCB requirements**

4 ENVIRONMENTAL LEGISLATIONS

There are many Environmental Acts & Rules which are formulated by Ministry of Environment and Forests (MoEF) for the prevention of Environmental squalor and are to be compiled by the Industry. All the regulations are not applicable to all. The Act and Rules which are to be constantly perused and followed by the Industry are enumerated in the following section.

Table 9: Particulars of Environmental Legislations

Year OF enactment	Legislation
1974	**The Water (Prevention and Control of pollution) Act**
1975	**The Water (Prevention and Control of pollution) Rules,**
1977	**The Water (Prevention and Control of pollution) Cess Act**
1978	**The Water (Prevention and Control pollution) Cess Rules.**
1988	**The Water (Prevention and Control of pollution) as amended**
1981	**The Air (Prevention and Control of pollution) Act**
1987	**The Air (Prevention and Control of pollution) and as amended**
1986	**The Environment (Protection) Rules**
1991	**The Environment (Protection) Rules(Amended)**

4.1 ENVIRONMENT PROTECTION ACT & RULES

Among the various notifications coming under the Environment (Protection) Act, following are the notifications applicable to this project:

Table 10: Notifications under Environmental Protection Act & Rules

Year of Notification	Rules
1989	**The Hazardous Waste (Management & Handling) Rules**

2000 & 2003	**The Hazardous Waste (Management & Handling) Rules (amended)**
1992/1993	**Environmental Statement**
2002	**DG Rules**
2000	**Noise Pollution (Regulation & Control) Rules and Amendment Rule 2006**
2000	**Municipal Solid Wastes (Management & Handling) Rules**
2001	**Batteries (Management & Handling) Rule, 2001 and Amendment Rule, 2010**
2008	**The Hazardous Wastes (Management, Handling & Transboundary Movement) Rules**

The Hazardous Waste (Management & handling) Rules 1989 (latest amendment 2008)

The DG Set Waste/used oil is included in the schedule-1 of list Of Hazardous Waste under Serial No.5 which states as under:

- **"Used/spent oil (category No.5.1) generated from industrial operations.**
- **Using mineral/synthetic oil as lubricant in hydraulic systems or other applications".**

Used oil defined under Rule 3 (34) means any oil derived from crude oil or mixtures containing synthetic oil including used engine oil, gear oil, hydraulic oil, turbine oil, compressor oil, industrial gear oil, heat transfer oil, transformer oil, spent oil and their tank bottom sludge and suitable for re-refining, if it meets the specifications laid down in Schedule 5, but does not include waste oil.

Responsibility of the occupier and operator of a facility for handling of the wastes is delineated as under:

1. **The Occupier and the operator of a facility shall be responsible for proper collection, reception, treatment, storage and disposal of hazardous wastes listed in schedule –1, 2 and3 { Rule 4(1)}**
2. **It shall be the responsibility of the occupier and the operator of a facility, to take all steps to ensure that the wastes listed in schedule 1,2 and 3 are properly handled and disposed of without any adverse effects to the environment {Rule 4(3)}.**

3. **Hazardous wastes shall be collected, treated, stored and disposed of only in such facilities as may be authorized for this purpose {Rule 5(1)}.**
4. **Every occupier handling, or a recycler recycling, hazardous wastes shall make application in Form-1 to the Member Secretary, State Pollution Control Board or committee, as the case may be or any Officer designated by the State Pollution Control Board of committee for the grant of authorization for any of the said activities {Rule 5(2)}.**
5. **The Occupier or operator of a facility shall ensure that the hazardous wastes are packaged, based on the composition in the manner suitable for handling, storage, and transport and the labeling and packaging shall be easily visible and be able to withstand physical conditions and climatic factors {Rule 7(1)}.**
6. **Packaging, labeling and transport of hazardous wastes shall be in accordance with provisions of the rules made by the Central Government under the Motor Vehicles Act 1988 and other guidelines issued from time to time {Rule 7(2)}.**
7. **All Hazardous waste containers shall be provided with a general label as given in Form-8 of Hazardous Waste (Management Handling) Rules 1989 as amended there after {Rule 7(3)}.**
8. **The Occupier shall prepare six copies of the manifest in Form 9 comprising of colour code indicated below (all six copies to be signed by transporter) {Rule 7(4)}.**
9. **The Occupier generating hazardous waste and operator of a facility for collection, reception, treatment, transport, storage and disposal of hazardous waste shall maintain records of such operations in Form-3 {Rule 9(1)}.**
10. **The occupier or an operator of a facility shall send annual reports to the State Pollution Control Board or committee in Form-4 {Rule 9(2)}.**
11. **Where an accident occurs at the facility or on a hazardous waste site or during transportation of hazardous waste the occupier or Operator of a facility shall report immediately to the State Pollution Control Board or committee about the accident in Form-5 {Rule 10}.**
12. **No owner or occupier generating non-ferrous metal waste specified in schedule 4 or generating used oil or waste oil of ten tons or more per annum shall sell or auction such non-ferrous metal wastes, used oil or waste oil to a registered re-refiner or recycler, as the case may be, who undertakes to re-**

refine or recycle the waste within the period of validity of his certificate of registration (Rule 20(1)).

Table 11: Colour Code for the manifest copies

Copy number with Colour Code	Purpose
Copy 1 (White)	**To be forwarded by the occupier to the State Pollution Control Board or committee.**
Copy 2 (Yellow)	**To be retained by the occupier after taking signature on it from the transporter and rest of the four copies to be carried by the transporter**
Copy 3 (Pink)	**To be retained by the operator of the facility after Signature**
Copy 4 (Orange)	**To be returned to the transporter by the operator of Facility after accepting waste**
Copy 5 (Green)	**To be returned by the operator of the facility to State Pollution Control Board/Committee after treatment and disposal of wastes**
Copy 6 (blue)	**To be returned by the operator of the facility to the occupier after treatment and disposal of wastes.**

ENVIRONMENTAL STATEMENT:

Under rule 14 of the Environmental protection Rules 1986, every person carrying on an industry, operation or process requiring consent under Section 25 of Water (Prevention and control of Pollution) Act, 1974 (6 of 1974) or under Section 21 of the Air (Prevention and control of Pollution) Act 1981. (14 of 1981 or both or authorization under the hazardous Waste (Management & Handling) Rules 1989 issued under the Environment (Protection) Act, 1986 (29 of 1986) shall submit an Environmental Statement report for the financial year ending the 31st March in Form-V to the concerned State Pollution Control Board on or before 15th Day of September every year.

BUDGETARY ALLOCATION FOR EMP DURING OPERATION

Sl. No	EMP Aspect	Cost in Rs
Capital Investment		In Lakhs
1.	**Sewage Treatment Plant**	20.0
2.	**Rainwater harvesting facilities**	5.7
3.	**Landscape development**	2.8
4.	**Acoustic & Stacks for DG sets**	6.0
5.	**Organic waste converter**	5.0
Total		39.5
Operation Investment		Lakhs/ Annum
1.	**STP Maintenance**	5.0
2.	**Landscape Maintenance**	4.3
3.	**Organic waste converter Maintenance**	3.0
4.	**EMP Cell**	2.4
5.	**Environmental Monitoring-Air, Water, Noise**	1.0
	Total	**15.7**