

## **ENVIRONMENT MANAGEMENT PLAN**

- The Environment Management Plan (EMP) would consist of all mitigation measures for each item wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts resulting from the activities of the project.
- It would also delineate the environmental monitoring plan for compliance of various environmental regulations. It will state the steps to be taken in case of emergency such as accidents at the sites including fire.
- The Environment Management Plan (EMP) is aimed at mitigating the possible adverse impacts of a project and for ensuring to maintain the existing environmental quality.
- The Environment Management Plan (EMP) will be site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all contractors and sub contractors, including consultants, understand the potential environmental risks arising from the proposed project and take appropriate actions to properly manage the risk.
- The main objective of the Environmental Management Plan (EMP) is to identify the project specific activities that would have to be considered for investigation of the significant adverse impacts and the mitigation measures required.
- EMP will also ensure that the project implementation is carried out in accordance with the design by taking appropriate mitigate actions to reduce adverse environmental impacts during its life cycle.
- The plan will outline existing and potential problems that may adversely impact the environment and recommends corrective measures where required.
- Also, the plan will outline roles and responsibility of the key personnel and contractors who are charged with the responsibility to manage the project site.

While evolving effective and feasible EMP, many parameters are considered on the basis of technological as well as economical aspects.

The EMP is generally:

1. It will be prepared in accordance with rules and requirements of the MoEF and the State Pollution Control Board.

2. Care will be taken to ensure that the component of facility are operated in accordance with design;
3. All precautions will be taken to addresses public complaints during construction and operation of the facility
4. Plan will be to ensure remedial measures are implemented immediately.

**EMP will include four major elements:**

- Commitment & Policy: The management will strive to provide and implement the Environmental Management Plan that incorporates all issues related to air, water, land and noise.
- Planning: This includes identification of environmental impacts, legal requirements and setting environmental objectives.
- Implementation: This comprises of resources available to the developers, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken.

**EMP for Air Environment**

- Mitigation measures will be provided

**Construction Phase**

To mitigate the impacts of PM (dust) during the construction phase of the project, the following measures are recommended for implementation:

- A dust control plan.
- Procedural changes in construction activities.

**Dust Control Plan**

The most cost-effective dust suppressant is water because water is easily available on construction site. Water can be applied using water trucks, handled sprayers and automatic sprinkler systems. Furthermore, incoming loads could be covered to avoid loss of material in transport, especially if material is transported off-site.

**Procedural Changes in Construction Activities**

**Idle time reduction:** Construction equipment is commonly left idle while the operators are on break or waiting for the completion of another task. Emission from idle equipment tends to be high, since catalytic converters cool down, thus reducing the efficiency of hydrocarbon and carbon monoxide oxidation. Existing idle control technologies comprise of power saving mode, which automatically off the engine at preset time and reduces emissions, without intervention from the operators.

**Improved Maintenance:** Significant emission reductions can be achieved through regular equipment maintenance. Contractors will be asked to provide maintenance records for their fleet as part of the contract bid, and at regular intervals throughout the life of the contract. Incentive provisions will be established to encourage contractors to comply with regular maintenance requirements.

**Reduction of On-Site Construction Time:** Rapid on-site construction would reduce the duration of traffic interference and therefore, will reduce emissions from traffic delay.

### **Operation Phase**

To mitigate the impacts of pollutants from DG sets and vehicular traffic during the operational phase of the Group housing, following measures are recommended for implementation:

- DG set emission control measures
- Vehicular emission controls and alternatives
- Greenbelt development

### **Diesel Generator Set Emission Control Measures**

Adequate stack height will be maintained to disperse the criteria air pollutants generated from the operation of DG sets to dilute the pollutants concentration within the immediate vicinity. Hence no additional emission control measures have been suggested.

### **Vehicle Emission Controls and Alternatives**

Use of clean Fuel by vehicles on-site: Vehicles only with proper PUC certificates will be allowed. This will reduce emissions on-site and in areas from where these vehicles pass.

Footpaths and Pedestrian ways: Adequate footpaths and pedestrian ways would be provided at the site to encourage non-polluting methods of transportation.

### **Greenbelt Development**

The total green area provided is 603344.96 m<sup>2</sup> which is 82.5% of the net plot area

## **1.2.2 EMP FOR NOISE ENVIRONMENT**

### **Construction Phase**

To mitigate the impacts of noise from construction equipment during the construction phase on the site, the following measures are recommended for implementation.

Time of Operation: Noisy construction equipment would not be allowed to used at the time of construction.

Job Rotation and Hearing Protection: Workers employed in high noise areas will be rotated. Hearing protection such as earplugs/muffs will be provided to those working very close to the noise generating machinery.

### **Operation Phase**

To mitigate the impacts of noise from diesel generator sets during operational phase, the following measures are recommended:

- Adoption of Noise emission control technologies
- Greenbelt development

### **Noise Emission Control Technologies**

DG sets will be housed in a suitable acoustic enclosure so that noise level at a distance of 1 m does not exceed 75 dB(A) at 75% load, as per CPCB standards or is meeting the local standard (whichever is higher). It would be ensured that the manufacturer provides acoustic enclosure as an integral part along with the diesel generators sets. Further,

enclosure of the services area with 4 m high wall will reduce noise levels and ensure that noise is at a permissible limit for resident of the site and surrounding receptors.

### **1.2.3 EMP FOR WATER ENVIRONMENT**

#### **Construction Phase**

To prevent degradation and to maintain the quality of the water source, adequate control measures have been adopted. To check the surface run-off as well as uncontrolled flow of water into any water body check dams with silt basins are adopted. The following management measures are suggested to protect the water source being polluted during the construction phase:

- Avoid excavation during monsoon season
- Care would be taken to avoid soil erosion
- Common toilets will be constructed on site during construction phase and the waste water would be channelized to the septic tanks in order to prevent waste water to enter into the water bodies
- To prevent surface and ground water contamination by oil and grease, leak-proof containers would be used for storage and transportation of oil and grease. The floors of oil and grease handling area would be kept effectively impervious. Any wash off from the oil and grease handling area or workshop shall be drained through impervious drains.
- Collection and settling of storm water, prohibition of equipment wash downs and prevention of soil loss and toxic release from the construction site are necessary measure to be taken to minimize water pollution.

#### **Operation Phase**

In the operation phase of the project, water conservation and development measures will be taken, including all possible potential for rain water harvesting. Following measures will be adopted:

- Water source development
- Minimizing water consumption

- Promoting reuse of water after treatment and development of closed loop systems for different water streams

### **Water Source Development**

Water source development shall be practiced by installation of scientifically designed Rain Water Harvesting system. Rainwater harvesting promotes self-sufficiency and fosters an appreciation for water as a valuable resource.

### **Minimizing Water Consumption**

Consumption of fresh water will be minimized by combination of water saving devices and other domestic water conservation measures. Further, to ensure ongoing water conservation, an awareness program will be introduced for the residents. The following section discusses the specific measures, which shall be implemented:

### **Domestic and Commercial Usage**

- Use of water efficient plumbing fixtures (ultra flow toilets and urinals, low flow sinks, water efficient dishwashers and washing machines). Water efficient plumbing fixtures uses less water with no marked reduction in quality and service
- Leak detection and repair techniques
- Sweep with a broom and pan where possible, rather than hose down for external areas
- Meter water usage: Implies measurement and verification methods. Monitoring of water uses is a precursor for management.

### **Horticulture**

- Drip irrigation system shall be used for the lawns and other green area. Drip irrigation can save 15-40% of the water, compared with other watering techniques.
- Plants with similar water requirements shall be grouped on common zones to match.
- Use of low-angle sprinklers for lawn areas.

- Select controllers with adjustable watering schedules and moisture sensors to account for seasonal variations and calibrate them during commissioning.
- Place 3 to 5 inches of mulch on planting beds to minimize evaporation.

### **Promoting Reuse of Water after Treatment and Development of Closed Loop Systems**

To promote reuse of waste water and development of closed loop system for waste water segregation. Two wastewater schemes are suggested, namely:

- 1) Storm Water Harvest
- 2) Waste water recycling.

Storm water harvest as discussed in earlier, will be utilized for artificial recharge of ground water sources; and waste water will be reused on site after treatment.

Treated waste water will be used for landscaping, flushing and DG water cooling. Following section discuss the scheme of waste water treatment.

### **Waste Water Treatment Scheme**

Proponent will treat the waste water of the Project in well designed sewage treatment plant.

### **Storm Water Management**

Most of the storm water produced on site will be harvested for ground water recharge. Thus proper management of this resource is a must to ensure that it is free from contamination.

Contamination of Storm Water is possible from the following sources:

- Diesel and oil spills in the diesel power generator and fuel storage area
- Waste spills in the solid / hazardous waste storage area
- Oil spills and leaks in vehicle parking lots
- Silts from soil erosion in gardens
- Spillage of sludge from sludge drying area of sewage treatment plant

A detailed storm water management plan will be developed which will consider the possible impacts from above sources. The plan will incorporate best management practices which will include following:

- Regular inspection and cleaning of storm drains
- Clarifiers or oil / separators will be installed in all the parking areas. Oil / grease separators installed around parking areas and garages will be sized according to peak flow guidelines. Both clarifiers and oil / water separators will be periodically pumped in order to keep discharges within limits
- Covered waste storage areas
- Avoid application of pesticides and herbicides before wet season
- Secondary containment and dykes in fuel / oil storage facilities
- Conducting routine inspection to ensure cleanliness
- Provision of slit traps in storm water drains
- Good housekeeping in the above areas

#### **1.2.4 EMP FOR LAND ENVIRONMENT**

##### **Construction Phase**

The waste generated from construction activity includes construction debris, biomass from land clearing activities, waste from the temporary make shift tents for the labours and hazardous waste. Following section discuss the management of each type of waste. Besides waste generation, management of the topsoil is an important area for which management measures are required.

##### **Construction Debris**

Construction debris is bulky and heavy and re-utilization and recycling is an important strategy for management of such waste. As concrete and masonry constitute the majority of waste generated, recycling of this waste by conversion to aggregate can offer benefits of reduced landfill space and reduced extraction of raw material for new construction activity. This is particularly applicable to the project site as the construction is to be completed in a phased manner.

Mixed debris with high gypsum, plaster, shall not be used as fill, as they are highly susceptible to contamination, and will be send to designated solid waste landfill site.

Metal scrap from structural steel, piping, concrete reinforcement and sheet metal work shall be removed from the site by construction contractors. A significant portion of wood scrap will be reused on site. Recyclable wastes such as plastics, glass fiber insulation, roofing etc shall be sold to recyclers.

### **Hazardous waste**

Construction sites are sources of many toxic substances such as paints, solvents wood preservatives, pesticides, adhesives and sealants. Hazardous waste generated during construction phase shall be stored in sealed containers and disposed off as per the Hazardous Waste (Management, Handling & Trans boundary Movement) Rule, 2008.

Some management practices to be developed are:

- Herbicides and pesticide will not be over applied (small-scale applications) and not applied prior to rain
- Paintbrushes and equipment for water and oil based paints shall be cleaned within a contained area and will not be allowed to contaminate site soils, water courses or drainage systems
- Provision of adequate hazardous waste storage facilities. Hazardous waste collection containers will be located as per safety norms and designated hazardous waste storage areas will be away from storm drains or watercourses
- Segregation of potentially hazardous waste from non-hazardous construction site debris
- Well labeled all hazardous waste containers with the waste being stored and the date of generation
- Instruct employees and subcontractors in identification of hazardous and solid waste

Even with careful management, some of these substances are released into air, soil and water and many are hazardous to workers. With these reasons, the best choice is to avoid

their use as much as possible by using low-toxicity substitutes and low VOC (volatile organic compound) materials.

### **Waste from Temporary Makes Shift Tents for Labours**

Wastes generated from temporary make shift labour tents will mainly comprise of household domestic waste, which will be managed by the contractor of the site. The wastewater generated will be channelized to the septic tank.

### **Top Soil Management**

To minimize disruption of soil and for conservation of top soil, the contractor shall keep the top soil cover separately and stockpile it. After the construction activity is over, top soil will be utilized for landscaping activity. Other measures, which would be followed to prevent soil erosion and contamination include:

- Maximize use of organic fertilizer for landscaping and green belt development
- To prevent soil contamination by oil/grease, leaf proof containers would be used for storage and transportation of oil/grease and wash off from the oil/grease handling area shall be drained through impervious drains and treated appropriately before disposal
- Removal of as little vegetation as possible during the development and revegetation of bare areas after the project.
- Working in a small area at a point of time (phase wise construction)
- Construction of erosion prevention troughs/ berms.

### **Operational Phase**

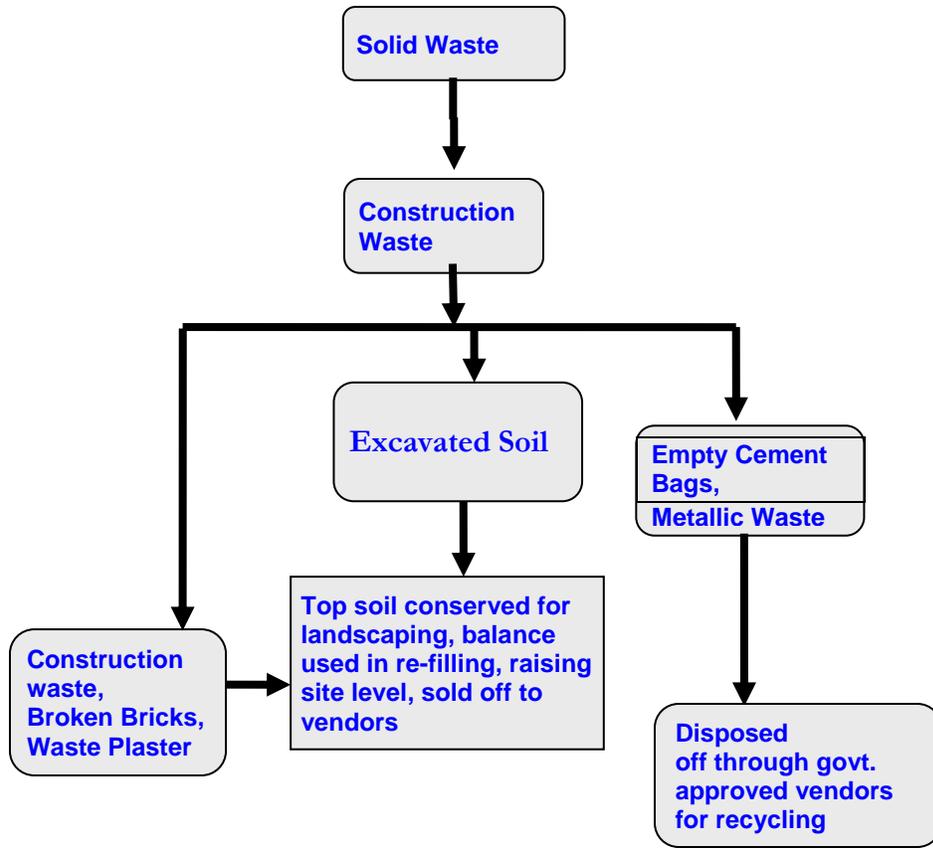
The philosophy of solid waste management at the complex will be to encouraging the four R's of waste i.e. **Reduction, Reuse, Recycling and Recovery** (materials & energy). Regular public awareness meetings will be conducted to involve the residents in the proper segregation and storage techniques.

The Environmental Management Plan for the solid waste focuses on three major components during the life cycle of the waste management system i.e., collection and

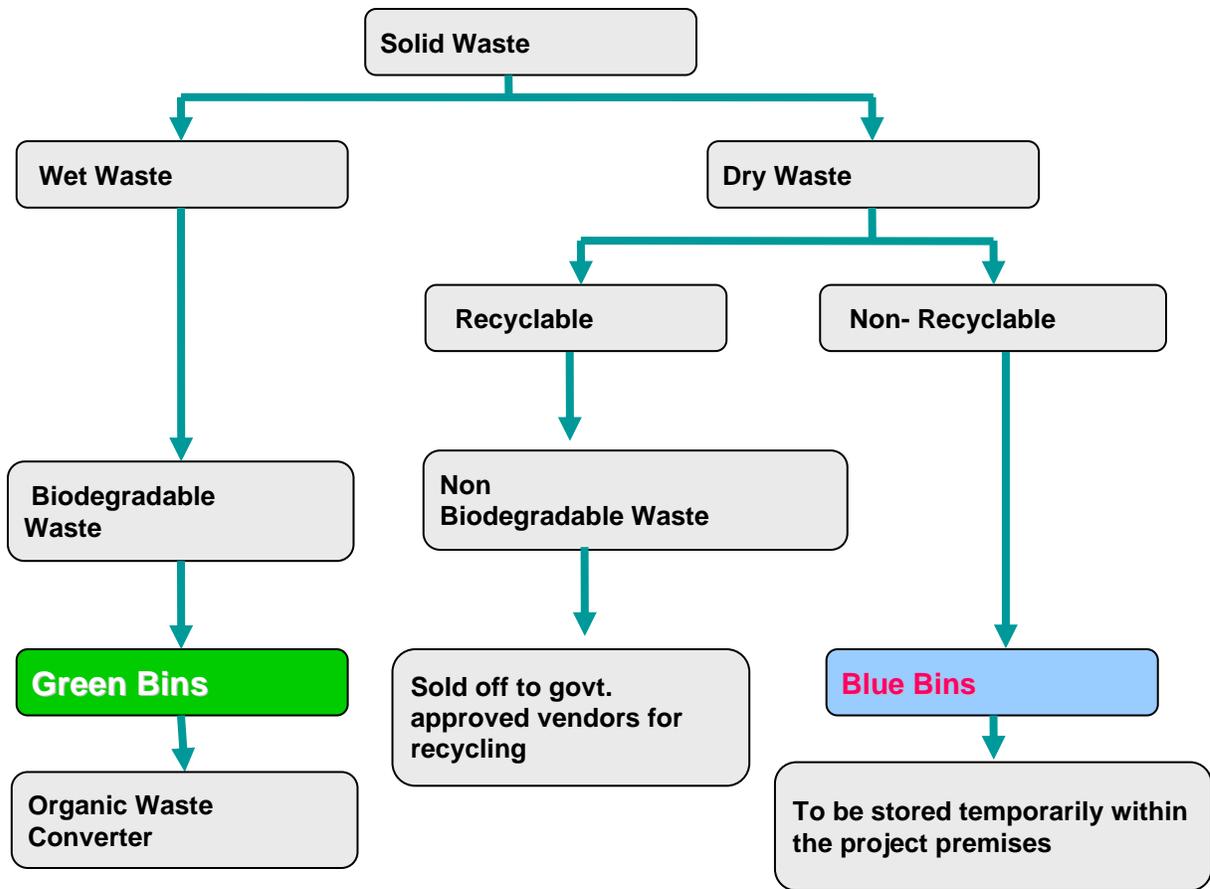
transportation, treatment or disposal and closure and post-closure care of treatment/disposal facility.

### **Collection and Transportation**

- During the collection stage, the bio-degradable and non recyclable/non biodegradable waste will be stored and collected separately. Only the non-recyclable and non-biodegradable waste will be transported to the waste disposal site. The segregation, transportation and disposal of wastes will be done by the authorized agency that will take care of the waste management of the Residential group housing during the operational phase of the project
- To minimize littering and odour problem, waste will be stored in well-designed containers/ bins that will be located at strategic locations to minimize disturbance in traffic flow
- Care would be taken such that the collection vehicles are well maintained and generate minimum noise and emissions. During transportation of the waste, it will be covered to avoid littering.



**Fig 1: WASTE MANAGEMENT FLOW DIAGRAMS FOR CONSTRUCTION PHASE**



**Fig 2: WASTE MANAGEMENT FLOW DIAGRAM FOR OPERATIONAL PHASE**

**Disposal**

With regards to the disposal/ treatment of waste, the management would practice vermin composting for treating bio degradable waste, recyclable waste would be sold to approved vendors and inert waste would be stored within the project premises temporarily till a government designated landfill site comes up in the city.

### **1.2.5 EMP FOR ECOLOGICAL ENVIRONMENT**

Construction activity changes the natural environment. But Residential Group housing also creates a built environment for its inhabitants. The project requires the implementation of following choices exclusively or in combination.

#### **Construction Stage**

- Restriction of construction activities to defined project areas, which are ecologically sensitive
- Restrictions on location of temporary labour tents and offices for project staff near the project area to avoid human induced secondary additional impacts on the flora and fauna species
- Cutting, uprooting, coppicing of trees or small trees if present in and around the project site for cooking, burning or heating purposes by the labours will be prohibited and suitable alternatives for this purpose will be made
- Along with the construction work, the peripheral green belt would be developed with suggested native plant species, as they will grow to a full-fledged covered at the time of completion

#### **Operation Stage**

Improvement of the current ecology of the project site will entail the following measures:

- Plantation and Landscaping
- Green Belt Development
- Park and Avenue Plantation

The section below summarizes the techniques to be applied to achieve the above objectives

#### **Plantation and landscaping**

Selection of the plant species would be done on the basis of their adaptability to the existing geographical conditions and the vegetation composition of the forest type of the region earlier found or currently observed.

### **Selection of Plant Species for Green Belt Development**

The selection of plant species for the development depends on various factors such as climate, elevation and soil. The plant species, which can be suitably and have significant importance, are planted. The plants would exhibit the following desirable characteristics in order to be selected for plantation

1. The species should be fast growing and providing optimum penetrability
2. The species should be wind-firm and deep rooted
3. The species should form a dense canopy
4. As far as possible, the species should be indigenous and locally available
5. Species tolerance to air pollutants like SPM, SO<sub>2</sub> and NO<sub>x</sub> should be preferred
6. The species should be permeable to help create air turbulence and mixing within the belt
7. There should be no large gaps for the air to spill through
8. Trees with high foliage density, leaves with larger leaf area and hairy on both the surfaces
9. Ability to withstand conditions like inundation and drought
10. Soil improving plants (Nitrogen fixing rapidly decomposable leaf litter)
11. Attractive appearance with good flowering and fruit bearing
12. Bird and insect attracting tree species
13. Sustainable green cover with minimal maintenance

### **Parks and Avenue Plantation**

- Parks and gardens maintained for recreational and ornamental purposes will not only improve the quality of existing ecology at the project site but also will improve the aesthetic value.
- Avenue Plantation
  1. Trees with colonial canopy with attractive flowering
  2. Trees with branching at 7 feet and above
  3. Trees with medium spreading branches to avoid obstruction to the traffic
  4. Fruit trees to be avoided because children may obstruct traffic and general movement of public.

### **1.2.6 EMP for Socio-Economic Environment**

The social management plan has been designed to take proactive steps and adopt best practices, which are sensitive to the socio-cultural setting of the region. The social Management Plan for complex focuses on the following components:

- **Income Generation Opportunity During Construction and Operation Phase**

The project would provide employment opportunity during construction and operation phase. There would also be a wide economic impact in terms of generating opportunities for secondary occupation within and around the complex. The main principles considered for employment and income generation opportunities are out lined below:

- Employment strategy will provide for preferential employment of local people
- Conditions of employment would address issues like minimum wages and medical care for the workers

Contractors would be required to abide to employment priority towards locals and abide by the labour laws regarding standards on employee terms and conditions.

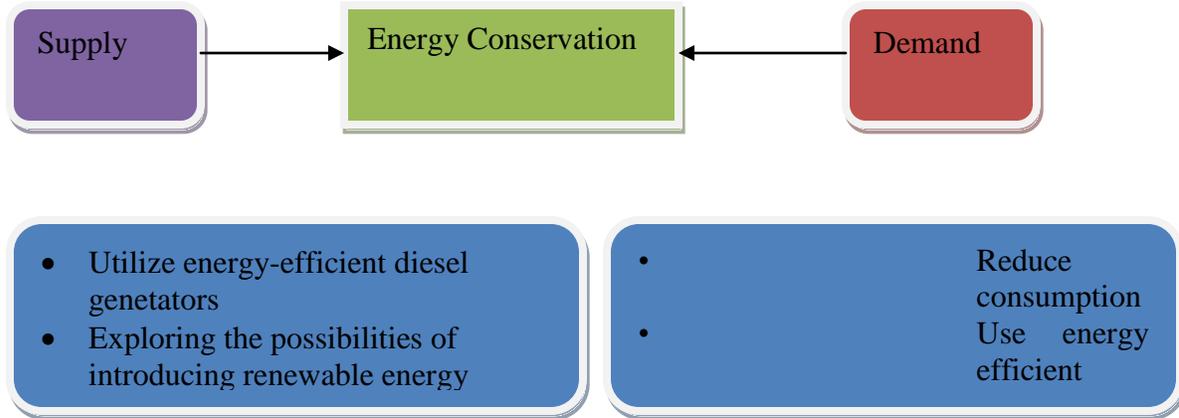
- **Improved Working Environment for Employees**

The project would provide safe and improved working conditions for the workers employed at the facility during construction and operation phase. With the ambience and facilities provided, the complex will provide a new experience in living and recreations. Following measures would be taken to improve the working environment of the area:

- Less use of chemicals and biological agents with hazard potential
- Developing a proper interface between the work and the human resource through a system of skill improvement
- Provision of facilities for nature care and recreation e.g. indoor games facilities
- Measures to reduce the incidence of work related injuries, fatalities and diseases
- Maintenance and beautifications of the complex and the surrounding roads

### 1.2.7 EMP FOR ENERGY CONSERVATION

Energy conservation program will be implemented through measures taken both on energy demand and supply.



**Fig 3 EMP for energy conservation**

Energy conservation will be one of the focuses during the complex planning and operation stages. The conservation efforts would consist of the following:

#### **Architectural design**

- Maximum utilization of solar light will be done
- Public areas will be cooled by natural ventilation as opposed to air-conditioning
- Maximize the use of natural lighting through design
- The orientation of the buildings will be done in such a way that maximum daylight is available
- The water bodies and green areas will be spaced, so that a significant reduction in the temperature can take place.

#### **Energy Saving Practices**

- Energy efficient lamps will be provided within the complex

- Constant monitoring of energy consumption and defining targets for energy conservation
- Adjusting the settings and illumination levels to ensure minimum energy used for desired comfort levels

#### **Behavioral Change on Consumption**

- Promoting resident awareness on energy conservation
- Training staff on methods of energy conservation and to be vigilant to such opportunities

### **1.3 ENVIRONMENTAL MANAGEMENT SYSTEM AND MONITORING PLAN**

For the effective and consistent functioning of the complex, an Environmental Management system (EMS) would be established at the site. The EMS would include the following:

- An Environmental management cell
- Environmental Monitoring
- Personnel Training
- Regular Environmental audits and Correction measures
- Documentation – standards operation procedures Environmental Management Plan and other records

#### **1.3.1 ENVIRONMENTAL MANAGEMENT CELL**

Apart from having an Environmental Management Plan, it is also adopted to have a permanent organizational set up charged with the task of ensuring its effective implementation of mitigation measures and to conduct environmental monitoring. The major duties and responsibilities of Environmental Management Cell shall be as given below:

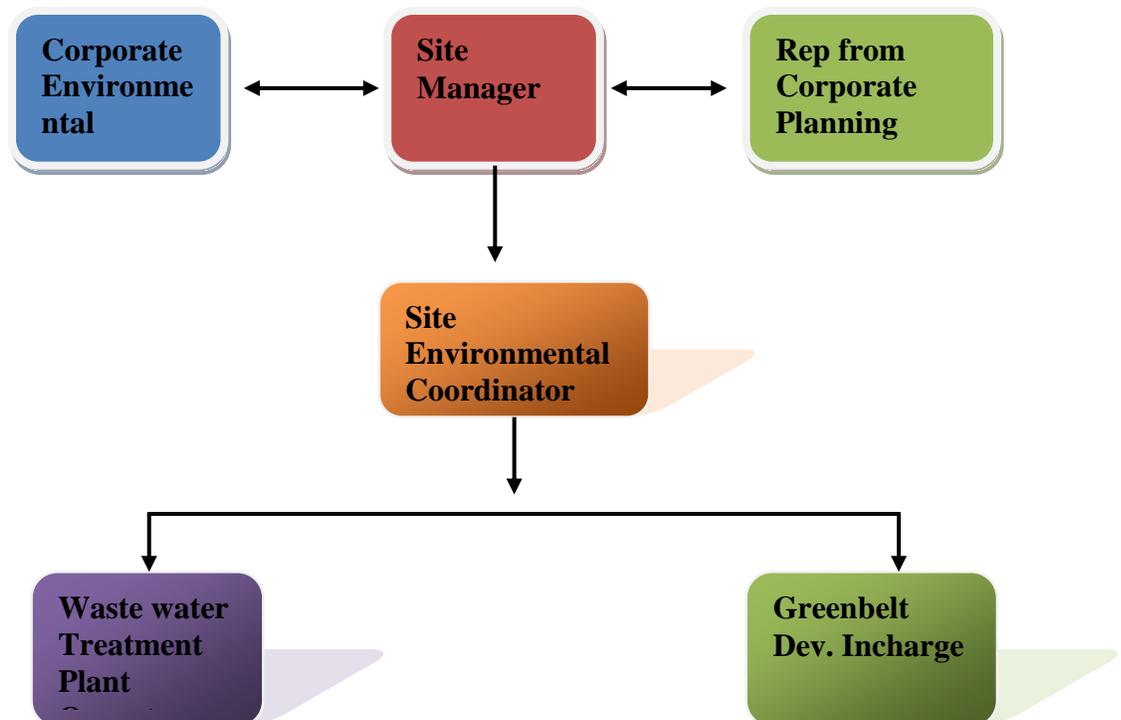
- To implement the environmental management plan
- To assure regulatory compliance with all relevant rules and regulations
- To ensure regular operation and maintenance of pollution control devices
- To minimize environmental impact of operations as by strict adherence to the EMP

- To initiate environmental monitoring as per approved schedule
- Review and interpretation of monitored results and corrective measures in case monitored results are above the specified limit
- Maintain documentation of good environmental practices and applicable environmental laws for a ready reference
- Maintain environmental related records
- Coordination with regulatory agencies, external consultants, monitoring laboratories
- Maintenance of log of public complaints and the action taken.

### **Hierarchical Structure of Environmental Management Cell**

Normal activities of the EMP cell would be supervised by a dedicated person who will report to the site manager / coordinator of the Residential Group housing. The hierarchical structure of suggested Environmental Management Cell is given in following

Fig 1.4



## **FIG. 1.4 ENVIRONMENT MANAGEMENT CELL STRUCTURE**

### **1.3.2 ENVIRONMENTAL MONITORING**

The purpose of environmental monitoring is to evaluate the effectiveness of implementation of Environmental Management Plan (EMP) by periodic monitoring. The important environmental parameters within the impact area are selected so that any adverse affects are detected and time action can be taken.

The project proponent will monitor ambient air Quality, Ground Water Quality and Quantity, and Soil Quality in accordance with an approved monitoring schedule. A suggested monitoring protocol, based on the predicted impact is given in Table 1.4.

**Table 2: SUGGESTED MONITORING PROGRAM FOR PORPOSE COMPLEX ENVIRONMENTAL MONITORING PLAN**

**(Construction Phase)**

<b>S. No.</b>	<b>Particulars</b>	<b>Parameters</b>	<b>Frequency</b>
1.	Ambient Air Monitoring	PM 2.5, PM 10, SO <sub>2</sub> , NO <sub>x</sub> , O <sub>3</sub> & CO	Once in six months
2.	Water Quality Monitoring	Drinking Water Specifications	Once in six months
3.	Noise Level Monitoring	24 Hrs. Noise Level	Once in six months

### **ENVIRONMENTAL MONITORING PLAN**

**(Operational Phase)**

<b>S. No.</b>	<b>Particulars</b>	<b>Parameters</b>	<b>Frequency</b>
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1.	Ambient Air Monitoring	PM 2.5, PM 10, SO <sub>2</sub> , NO <sub>x</sub> , CO, HC, O <sub>3</sub>	Once in six months
2.	Stack Emission Monitoring	PM, SO <sub>2</sub> , NO <sub>x</sub> , HC	Once in six months
3.	Treated Effluent Monitoring	pH, BOD, COD, Oil, Grease & Total Suspended solids	Once in six months
4.	Noise Level Monitoring	24 Hrs. Noise Level	Once in six months

### **1.3.3 Awareness and Training**

Training and human resource development is an important link to achieve sustainable operation of the facility and environment management. For successful functioning of the project, relevant EMP would be communicated to residents and contractors.

Residents must be made aware of the importance of waste segregation and disposal, water and energy conservation. The awareness can be provided by periodic Integrated Society meetings. They would be informed of their duties.

### **1.3.4 Environmental Audits and Corrective Action Plans**

To assess whether the implemented EMP is adequate, periodic environmental audits will be conducted by the project proponent's Environmental division. These audits will be followed by Correction Action Plan (CAP) to correct various issues identified during the audits.