ENVIRONMENT MANAGEMENT PLAN

The Environment Management Plan (EMP) would consist of all mitigation measures for each component of the environment due to the activities increased 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 detailed EMP for the complex is given below.

Environmental Management Plan

The Environment Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmental sustainable manner where all contractors and subcontractors, including consultants, understand the potential environmental risks arising from the project and take appropriate actions to properly manage that risk. EMP also ensures that the project implementation is carried out in accordance with the design by taking appropriate mitigation actions to reduce adverse environmental impacts during its life cycle. The plan outlines existing and potential problems that may adversely impact the environment and recommends corrective measures where required. Also, the plan outlines roles and responsibility of the key personnel and contractors who will be in-charge of the responsibilities to manage the project site.

The EMP is generally

- Prepared in accordance with rules and requirements of the MoEF and CPCB/SPCB
- To ensure that the component of facility are operated in accordance with the design
- A process that confirms proper operation through supervision and monitoring
- A system that addresses public complaints during construction and operation of the facilities and
- A plan that ensures remedial measures is implemented immediately.

The key benefits of the EMP are that it offers means of managing its environmental performance thereby allowing it to contribute to improved environmental quality. The other benefits include cost control and improved relations with the stakeholders.

EMP includes 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 Society, accountability of contractors, training of operational staff associated with environmental control facilities and documentation of measures to be taken.

• **Measurement & Evaluation:** This includes monitoring, counteractive actions and record keeping.

It is suggested that as part of the EMP, a monitoring committee would be formed by Indian Railway Welfare Housing Organisation comprising of the site in-charge/coordinator, environmental group representative and project implementation team representative. The committee’s role would be to ensure proper operation and management of the EMP including the regulatory compliance.

The components of the environmental management plan, potential impacts arising, out of the project and remediation measures are summarized below in Table 1.
## TABLE 01: SUMMARY OF POTENTIAL IMPACTS AND REMEDIAL MEASURES

|--------|--------------------------|-------------------|----------------------------|-------------------------------|-------------------|------------------|
| 1.     | Ground Water Quality     | Ground Water Contamination | Construction Phase Wastewater generated from temporary labor tents. | **Operation Phase**  
        |                           |                   |                            | • No surface accumulation has been allowed.  
        |                           |                   |                            | Mobile toilets has been provided.  
        |                           |                   |                            | Sullage has been collected in septic tanks. | | No significant impact as majority of labors would be locally deployed |
| 2.     | Ground Water Quantity    | Ground Water Depletion | Construction Phase  
        |                           |                   |                            | **Operation Phase**  
        |                           |                   |                            | • Sewage from the project  
        |                           |                   |                            | • Indian Railway Welfare Housing Organisation provides the STP to treat the discharge of Residential Project | | No negative impact on ground water quality envisaged. Not significant. |
|        | Ground Water Depletion   |                   |                            | • Black and Grey water treatment and reuse.  
        |                           |                   |                            | • Storm water | No significant impact on ground water quantity envisaged. | In an unlikely event of non-availability of water supply, water will be brought using tankers. |
|                          |                            |                    | • Awareness Campaign to reduce the water consumption | EMP

3. **Surface Water Quality**  

**Surface water contamination**  
- **Construction Phase**  
  - Surface runoff from site during construction activity.  
  - Silt traps and other measures such as additional on site diversion ditches will be constructed to control surface run-off during site development  
  
  **Operation Phase**  
  - Discharge of domestic sullage to STP.  
  - Domestic water will be treated in STP.  

**No off-site impact envisaged as no surface water receiving body is present in the core zone.**

4. **Air Quality**  

**Dust Emissions**  
- **Construction Phase**  
  - All heavy construction activities  
  - During construction phase the contractors are advised to  

**Not significant because dust generation will be temporary and will settle fast due to dust suppression techniques.**
<table>
<thead>
<tr>
<th>EMP</th>
<th>Facility masks for the labors. Water sprinklers has been used for suppression of dust during construction phase.</th>
<th>Not significant.</th>
<th>Regular monitoring of emissions and control measures will be taken to reduce the emission levels.</th>
</tr>
</thead>
</table>
| Construction Phase | Emissions of PM2.5 & PM10, SO\textsubscript{2}, NO\textsubscript{2} and CO | • Rapid on-site construction and improved maintenance of equipment  
• Use of Personal Protective Equipment (PPE) like earmuffs and earplugs during construction activities | Not significant. |
| • Operation of construction equipment and vehicles during site development.  
• Running D.G. set (back up) | Operation Phase | • Use of low sulphur diesel if available  
• Stack height of DG set above the tallest building as per CPCB standards  
• Providing Footpath and pedestrian ways within the site for the | Not significant. |
| • Power generation by DG Set during power failure  
• Emission from vehicular traffic in use | Operation Phase | | |

There are no sensitive receptors located within the vicinity of site.
| 5. Noise Environment | EMP | employees and visitors  
• Green belt will be developed with specific species to help reduce PM2.5 & PM10 level  
• Proper maintenance of equipment  
5. Noise Environment | Operation Phase  
• Noise from vehicular movement  
• Noise from DG set operation  
• Green Belt Development  
• Development of silence zones to check the traffic movement  
• Provision of noise shields near the heavy construction operations and acoustic enclosures for DG set.  
• Construction activity has been limited to day time only  
5. Noise Environment | Soil contamination | Construction Phase  
Construction debris has been collected and suitably used on site as  
No significant impact. Impact will be local, as waste generated will be
| Rail Vihar  
| Group Housing Project  
| VIP Road, Zirakpur  
| Distt. Mohali, Punjab |

<table>
<thead>
<tr>
<th>EMP</th>
</tr>
</thead>
</table>

| 7. Biological Environment (Flora and Fauna) | Displacement of Flora and Fauna on site | Construction Phase  
| Site Development during construction | Landscaping is being carried out. |

| • Disposal of construction debris | per the solid waste management plan for construction phase | reused for filling of low lying areas etc. |

| Operation Phase  
| • Generation of municipal solid waste  
| • Used oil generated from D.G. set | • It is proposed that the solid waste generated will be managed as per MSW Rules, 2000.  
| • Collection, segregation, transportation and disposal will be done as per MSW Management Rules, 2000 by the authorized agency  
| • Used oil generated will be sold to authorized recyclers |

| Since solid waste is handled by the authorized agency, waste dumping is not going to be allowed. Not significant.  
| Negligible impact. |

**INDIAN RAILWAYS WELFARE ORGANIZATION**

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<table>
<thead>
<tr>
<th>Operation Phase</th>
<th>Construction Phase</th>
<th>EMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in green covered area</td>
<td>There is no displacement due to the construction.</td>
<td>Beneficial impact.</td>
</tr>
<tr>
<td>Suitable green belts will be developed as per landscaping plan in and around the site using local flora</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Socio-Economic Environment

Population displacement and loss of income

Construction Phase

- There is no displacement due to the construction.

No negative impact.

Operation Phase

- Site operation

- Project will provide employment opportunities to the local people in terms of labor during construction and service personnel (guards, securities, gardeners, etc) during operations

- Providing quality-Integrated infrastructure.

Beneficial impact
<table>
<thead>
<tr>
<th>EMP</th>
<th>Traffic Pattern</th>
<th>Increase of vehicular traffic</th>
<th>Construction Phase</th>
<th>Operation Phase</th>
<th>No negative impact Beneficial Impact</th>
<th>No major significant impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Traffic Pattern</td>
<td>Increase of vehicular traffic</td>
<td>Construction Phase</td>
<td>Operation Phase</td>
<td>Adequate parking facility has been provided</td>
<td>Vehicular movement will be regulated inside the project with adequate roads and parking lots.</td>
</tr>
</tbody>
</table>

- Heavy Vehicular movement during construction
- The peak hours has been avoided for transportation of materials.
- Traffic due to people once the project is operational
ENVIRONMENT MANAGEMENT PLAN

An Environmental Management Plan (EMP) will be required to mitigate the predicted adverse environmental impacts during construction and operation phase of the project and these are discussed in later subsections.

EMP for Air Environment

Construction Phase
To mitigate the impacts of PM10 & PM2.5 during the construction phase of the project, the following measures are recommended for implementation:

- A dust control plan
- Procedural changes to 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 to 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 cools down, thus reducing the efficiency of hydrocarbon and carbon monoxide oxidation. Existing idle control technologies comprises 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 set and vehicular traffic during the operational phase of the Project, 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 air pollutants generated from the operation of DG set to dilute the pollutants concentration within the immediate vicinity. Hence no additional emission control measures have been suggested.

Vehicle Emission Controls and Alternatives
During construction, vehicles will be properly maintained to reduce emission. As it is an Educational project, vehicles will be generally having “PUC” certificate.

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

Greenbelt Development
Increased vegetation in the form of greenbelt is one of the preferred methods to mitigate air and noise pollution. Plants serve as a sink for pollutants, act as a barrier to break the wind speed as well as allow the dust and other particulates to settle on the leaves. It also helps to reduce the noise level to a large extent. The following table indicates various species of the greenbelt that can be used to act as a barrier.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Botanical Name</th>
<th>Local name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Grevillea robusta</td>
<td>Silver Oak</td>
</tr>
<tr>
<td>2.</td>
<td>Delonix regia</td>
<td>Gulmohar</td>
</tr>
<tr>
<td>3.</td>
<td>Mimosops elengi</td>
<td>Molshri</td>
</tr>
<tr>
<td>4.</td>
<td>Ficus glomerata</td>
<td>Gular</td>
</tr>
<tr>
<td>5.</td>
<td>Terminalia arjuna</td>
<td>Arjuna</td>
</tr>
<tr>
<td>6.</td>
<td>Ficus infectoria</td>
<td>Pilkhān</td>
</tr>
<tr>
<td>7.</td>
<td>Terminalia bellirica</td>
<td>Bahera</td>
</tr>
<tr>
<td>8.</td>
<td>Putranjiva roxburghii</td>
<td>Patījia</td>
</tr>
<tr>
<td>9.</td>
<td>Syzygium cumini</td>
<td>Jamun</td>
</tr>
</tbody>
</table>
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 has not been be allowed to use at night time.
Job Rotation and Hearing Protection: Workers employed in high noise areas are not employed on
shift basis. 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 set during operational phase, the
following measures are recommended:
• Adoption of Noise emission control technologies
• Greenbelt development

Noise Emission Control Technologies
Source of noise in the operational phase will be from backup DG sets (which will be in operation
only during power failure) and pumps & motors. All the machinery will be of highest standard of
reputed make and will comply with standard i.e. The DG set room will be provided with acoustic
enclosure to have minimum 75 dB(A) insertion loss or for meeting the ambient noise standard
whichever is on higher side as per E (P) Act, GSR 371 (E) and its amendments.

Greenbelt Development
The following species can be used, as in a greenbelt, to serve as noise breakers:
- Acacia auriculiformis
- Anona squamosa
- Acacia farnesiana
- Acacia mearnsii
- Acacia nilotica
- Achras sapota

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

- Avoid excavation during monsoon season
- Care has been taken to avoid soil erosion
- Common toilets have been constructed on site during construction phase and the sullage would be channelized to the septic tanks in order to prevent sullage to enter into the water bodies
- To prevent surface and ground water contamination by oil and grease, leak-proof containers have been used for storage and transportation of oil and grease. The floors of oil and grease handling area have been kept effectively impervious. Any wash off from the oil and grease handling area or workshop has been drained through imperious 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 measures to be taken to minimize water pollution
- All stacking and loading area have been provided with proper Garland drains equipped with baffles, to prevent run off from the site, to enter into any water body.

**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 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 students and employees. The following section discusses the specific measures, which shall be implemented:

**Domestic and Commercial Usage**
- Use of water efficient plumbing fixtures (ultra low flow toilets and urinals). 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 precipitation heads and emitters.
- 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 sullage and development of closed loop system for sullage segregation. Two water conservation schemes are suggested, namely:

1) Storm Water Harvest
2) wastewater recycling.

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

Treated wastewater will be used for landscaping, flushing purpose. Following section discuss the scheme of wastewater treatment.

**Wastewater Treatment Scheme**
It is expected that the project will generate approx 272 KLD of sullage. The sullage will be treated in the STP provided within the complex generating 245 KLD of recoverable water from STP which will be recycled within the project and remaining will be discharged to Sewer.

**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

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 labors 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, has not been be used as fill, as they are highly susceptible to contamination, and will be sent to designated solid waste landfill site.
Metal scrap from structural steel, piping, concrete reinforcement and sheet metal work has been removed from the site by construction contractors. A significant portion of wood scrap has been 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 Wastes (Management, Handling & Transboundary Movement) Rules, 2008.
Some management practices to be developed are:
- Herbicides and pesticide has not been 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 has not been allowed to contaminate site soils, water courses or drainage systems.
- Provision of adequate hazardous waste storage facilities. Hazardous waste collection containers has been 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 Labors
Wastes generated from temporary make shift labor tents have mainly comprise of household domestic waste, which will be managed by the contractor of the site. The sullage generated will be channelized to the septic tank.
Top Soil Management
To minimize disruption of soil and for conservation of top soil, the contractor has kept 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 has been used for storage and transportation of oil/grease and wash off from the oil/grease handling area has been drained through impervious drains and treated appropriately before disposal.
- Removal of as little vegetation as possible during the development and re-vegetation 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 people 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 solid waste of the project will be segregated into biodegradable waste and non-biodegradable. Biodegradable waste and non biodegradable waste will be collected in separate bins. Biodegradable waste will be treated in organic waste converterThe recyclable wastes will be sent off to recyclabers. Proper guidelines for segregation, collection and storage will be prepared as per MSW Rules, 2000.
- To minimize littering and odour, 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.
Disposal
With regards to the disposal/treatment of waste, the management will take the services of the authorized agency for waste management and disposal of the same on the project site during its operational phase.

EMP FOR ECOLOGICAL ENVIRONMENT
Construction activity changes the natural environment. But residential Project 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 labor 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 labors has been 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.

**Green Belt Development Plan**

The plantation matrix adopted for the green belt development includes pit of $0.3 \times 0.3$ m size with a spacing of $2 \times 2$ m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration.

Plantation comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt. In addition creepers will be planted along the boundary wall to enhance its insulation capacity.

**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 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 $SO_2$ and $NO_2$ 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

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 residential Project 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 labor 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

**EMP FOR ENERGY CONSERVATION**

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

- Utilize energy-efficient diesel generators
- Exploring the possibilities of introducing renewable energy
- Reduce consumption
- Use energy efficient appliances
- Create Guest Awareness

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

- **Architectural design**
  - Maximum utilization of solar light has been done.
  - Maximize the use of natural lighting through design.
  - The orientation of the buildings has been done in such a way that maximum daylight is available.
The green areas has been spaced, so that a significant reduction in the temperature can take place.

**Energy Saving Practices**

- Energy efficient lamps has been 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 people awareness on energy conservation
- Training staff on methods of energy conservation and to be vigilant to such opportunities.

**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.

**ENVIRONMENTAL MANAGEMENT CELL**

Apart from having an Environmental Management Plan, it is also proposed 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 Project. The hierarchical structure of suggested Environmental Management Cell is given in following Figure 7.

Figure 7: Environment Management Cell Structure
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.

Table 11: Suggested Monitoring Program for Residential Project

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Type</th>
<th>Locations</th>
<th>Parameters</th>
<th>Period and Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ambient Air Quality</td>
<td>Project Site</td>
<td>Criteria Pollutants: SO₂, NO₂, PM10, PM2.5, CO</td>
<td>Half yearly (24 hr average samples) during construction phase and annual during operation phase.</td>
</tr>
<tr>
<td>2.</td>
<td>Groundwater (Portability testing)</td>
<td>Project site</td>
<td>Drinking water parameters as per IS 10500.</td>
<td>Half yearly</td>
</tr>
<tr>
<td>3.</td>
<td>Ambient Noise</td>
<td>Project site</td>
<td>dB (A) levels</td>
<td>Half yearly (Hourly day and night time L₉₀ levels) during construction phase and every year during operation phase.</td>
</tr>
<tr>
<td>4.</td>
<td>Potable water quality</td>
<td>Municipal supply</td>
<td>As per IS 10500 potable water standards</td>
<td>Half yearly</td>
</tr>
<tr>
<td>6.</td>
<td>Waste Characterization</td>
<td>Educational</td>
<td>Physical and Chemical composition</td>
<td>Daily</td>
</tr>
<tr>
<td>7.</td>
<td>Treated water</td>
<td>Outlet of STP</td>
<td>BOD, MPN, coliform count, etc.</td>
<td>Daily</td>
</tr>
</tbody>
</table>

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:

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

**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.