ENVIRONMENT MANAGEMENT PLAN

Introduction

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 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.

Objectives

- Actions/ activities required to comply with rules and requirements of the environmental clearance, consent to establish, consent to operate and other NOC from Govt. Departments.
- Ensure that the Project meets all contractual, legal and other environmental requirements including best practices of construction for the hospital project.
- To ensure that the proposed hospital project is operated in accordance with the approved design.
- Provide personnel with systems, procedures and documentation necessary to undertake the construction meeting with environmental requirements and to minimize the impact on the natural environment.
- A system that addresses public complaints during construction and operation of the facilities.
- A plan that ensures remedial measures is implemented effectively in a planned way.
- Building and securing an unblemished reputation for environment management within the market place.

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 developers, 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.

Activities:

The following table is a detailed list of activities that will be carried out during each phase of construction of the project and which phases require environmental management monitoring and reporting, **Table 1**.

Table 1. Activities and requirement of EMP

Phases	Activities	Required environmental management monitoring and reporting
Construction Phase		
Site Establishment	• Fences & hoardings to site compound. • Temporary services and site amenities. • Temporary access roads. • Labour hutments	Required throughout the duration of this phase.
Foundations & Ground works	• Bored piers. • Detailed excavation. • Lift Pit; • Formwork. • Sand blinding & plastic membrane. • Steel reinforcement. • Place concrete • In ground hydraulic services. • In ground electrical services. • In ground Fire Sprinkler services. • Termite barriers.	Required throughout the duration of this phase.
Structure	1. Footings; • Formwork edge boards. • Sand blinding & plastic membrane. • Steel reinforcement. • Place concrete. 2. Slab on ground; • Formwork edgeboards. • Sand blinding & plastic	Required throughout the duration of this phase.

Phases	Activities	Required environmental management monitoring and reporting
	membrane. • Steel reinforcement. • Place concrete. 3. Suspended Slabs • Formwork decks & columns. • Electrical conduits & penetrations. • Hydraulic pipework & penetrations. • Steel reinforcement. • Place concrete. 4. Structural Steel framing. 5. Roofing. 6. External wall cladding.	
Fit Out & Finishes	• Masonry Walls • Steel Stud wall & ceiling framing • Windows & glazed doors • Electrical services • Hydraulic services • Mechanical services • Fire sprinklers • Plasterboard wall & ceiling linings • Cement Rendering • Carpentry & joinery fitout • Tiling • Painting • Carpet • Vinyl	Required throughout the duration of this phase.
External Works	• Concrete Footpaths • Formwork edgeboards. • Sand blinding & plastic membrane. • Steel reinforcement. • Place concrete.	Required throughout the duration of this phase.
Transportable Building Site Establishment	• Fences & hoardings to site compound. • Confirm location of services	Required throughout the duration of this phase.

Phases	Activities	Required environmental management monitoring and reporting
	installed by others.	
Transportable Building Foundations	• Bored Piers • Detailed excavation. • Footings; • Fix Steel reinforcement. • Place concrete	Required throughout the duration of this phase
Transportable Building Delivery & Installation	• Deliver to site on trucks • Crane into position • Connect Services to buildings.	Required throughout the duration of this phase

An Environmental Management Plan (EMP) is required to mitigate the adverse environmental impacts during construction and operation phase of the project and these are discussed as follows.

EMP for Air

Construction Phase

To mitigate the impacts of PM_{10} & $PM_{2.5}$ during the construction phase of the project, the following measures are recommended for implementation:

- The most cost-effective dust suppressant is water because water is easily available on construction site and it can be applied using water trucks, handled sprayers and automatic sprinkler systems.
- Incoming loads could be covered to avoid loss of material in transport, especially if material is transported off-site.
- The whole site is covered with GI sheets in order to contain the dust within project site.
- 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.
- 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.
- 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 hospital project; following measures are recommended for implementation:

- 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.
- During construction, vehicles will be properly maintained to reduce emission. As it is an education institution, vehicles will be generally having "PUC" certificate.
- Adequate footpaths and pedestrian ways would be provided at the site to encourage non-polluting methods of transportation.
- 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 at large extent.

EMP FOR NOISE

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.

- Noisy construction equipment would not be allowed to use at night time.
- Workers employed in high noise areas will be 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:

- DG set will be housed in a suitable acoustic enclosure so that noise level at a distance of 1 m does not exceed 25 dB(A) 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 set. 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 patients and staff of the project and surrounding receptors.

EMP FOR WATER: Construction Phase

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

- Avoiding 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
- Any area with loose debris within the site shall be planted

- 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 imperious drains
- All stacking and loading area will be 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. Following measures will be adopted:

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

Water Conservation

The water conservation is the need of the hour and 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 patients and staff. The following section discusses the specific measures, which shall be implemented:

Domestic and institutional Usage

- Use of water efficient plumbing fixtures (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 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.

Storm Water Management

Most of the storm water produced on site will be harvested reuse by storing in an underground water tank of suitable size. Thus, proper management of water 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

Storm water management 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

EMP FOR WASTE: Construction Phase

The waste generated from construction activity includes construction debris, biomass from land clearing activities, waste from the temporary make shift labour hutments 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 composting 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 and Other Wastes (Management and Transboundary Movement) Rules, 2016.

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 Labour Hutments

Wastes generated from temporary make shift labor hutments 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, leak 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 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 Hospital Project will be to encouraging the four R's of waste i.e. **R**eduction, **R**euse, **R**ecycling and **R**ecovery (materials & energy). Regular public awareness meetings will be conducted to involve the staff 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 recyclable waste. Biodegradable waste and recyclable waste will be collected in separate bins. Biodegradable waste will be treated in the project premises by organic waste converter. The recyclable wastes will be sent off to recyclers. Proper guidelines for segregation, collection and storage will be prepared as per Solid Waste Management Rules, 2016. 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.

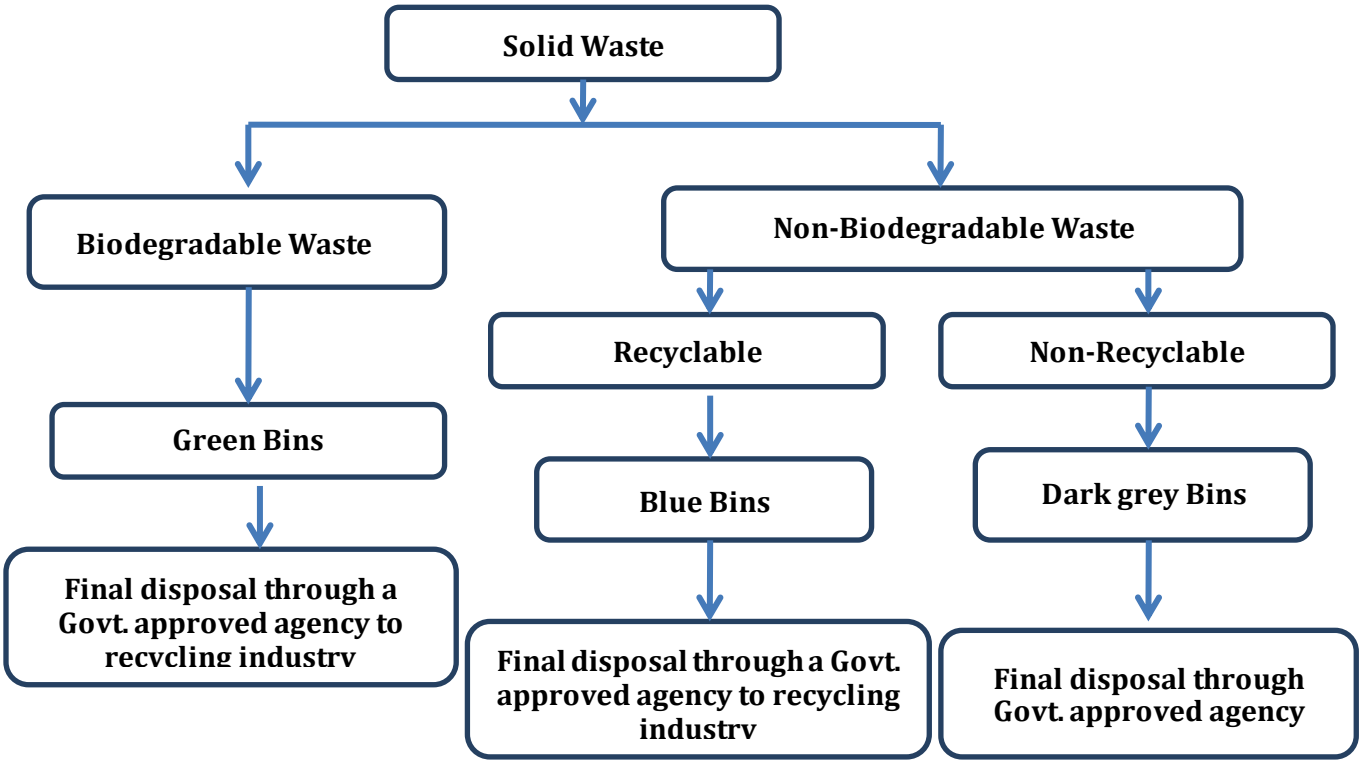

Figure 1: Waste Management Flow Diagram

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 ECOLOGY & BIODIVERSITY

Construction activity changes the natural environment.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 hutments 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 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
- 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 green belt will be developed as per the guidelines for developing green belt by CPCB, 2007. The plantation matrix adopted for the green belt development includes pit of 0.3 m × 0.3 m size with a spacing of 2 m x 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.

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.

Avenue Plantation

- 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
    - Trees with colonial canopy with attractive flowering.
    - Trees with branching at 7 feet and above.
    - Trees with medium spreading branches to avoid obstruction to the traffic.
    - Fruit trees to be avoided because children may obstruct traffic and general movement of public.

EMP for Socio-Economic conditions

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 area. The Social Management Plan for the hospital project focuses on the following components:

Income Generation Opportunity during Construction and Operation Phase

The hospital 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 hospital project. 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

Lok Nayak Hospital will provide safe and improved working conditions for the workers employed at the facility during construction and operation phase. With the proposed ambience and facilities provided, Lok Nayak Hospital will provide a new experience in living, work environment, seem less data transfer, edge cutting technologies etc. 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.

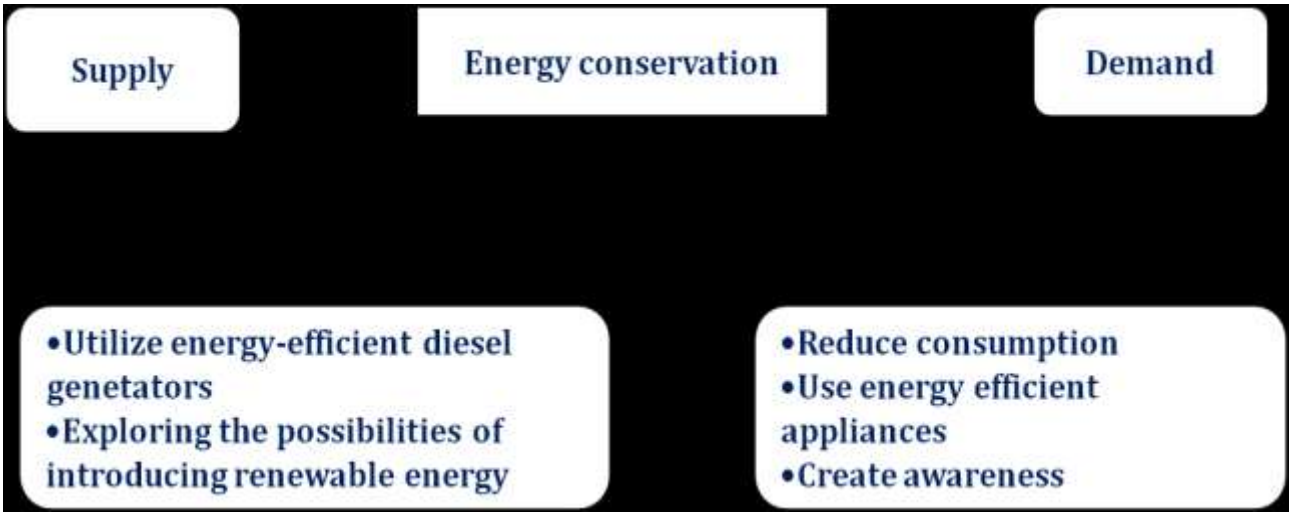

Figure 2: Energy Conservation measures

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

❖ **Architectural design**

- Maximum utilization of solar light will be done.
- 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 green areas will be spaced, so that a significant reduction in the temperature can take place.

❖ **Energy Saving Practices**

- Use of LED instead of GLS lamps for Common Areas.
- Solar water heater arrangements for hostels.
- Achievement of U value of external envelope for air conditioned building as per perspective requirement of ECBC.
- Energy efficient motors in pumps and energy efficient chillers for HVAC with VFD control

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:

- 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.

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 hospital project. The hierarchical structure of suggested Environmental Management Cell is given in following Figure 3.

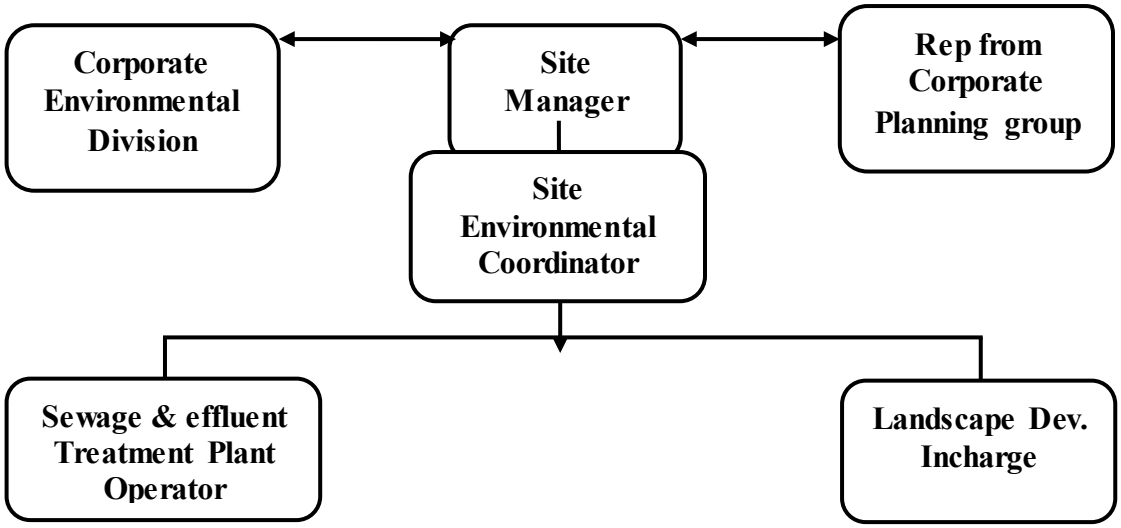

Figure 3: Environnent Management Cell Structure

Table 4: SUMMARY OF MANAGEMENT MEASURES AND RESPONSIBILITY

S. No.	Environmental Issues	Potential Impacts (Direct/ Indirect)	Potential Source of Impact	Management Measures	Responsibility	
					Execution/ Civil Work	Supervision
1.	Ground Water Quality	Ground Water Contamination	Construction Phase • Waste water generated from temporary labor hutments.	• No surface accumulation will be allowed.	Contractor	Project Proponent (SHE division)
			Operation Phase • Discharge from the project	• All the treated sewage will be reused within the project site	Contractor	Project Proponent (SHE division)
2.	Ground Water Quantity	Ground Water Depletion	Construction Phase • Ground water will not use during construction phase.	• Not Applicable	None	Not applicable
			Operation Phase • The source of water during operation phase is	• Black and Grey water treatment and reuse. • Awareness Campaign to reduce	Management	Project Proponent (SHE division)

			Municipal Supply and ground water recharge is not proposed.	the water consumption.		
3.	Surface Water Quality	Surface water contamination	<u>Construction Phase</u> • Surface runoff from site during construction activity.	• Silt traps and other measures such as additional onsite diversion ditches will be constructed to control surface run-off during site development	Contractor	Project Proponent (SHE division)
			<u>Operation Phase</u> • Discharge of domestic wastewater STP & ETP of capacity 650 x 275 KLD	• Domestic water will be treated into STP & ETP of capacity 650 x 275 KLD	Management	Project Proponent (SHE division)
4.	Air Quality	Dust Emissions	<u>Construction Phase</u> • All heavy construction activities	• Regular sprinkling • Covered transportation of construction material • Covered storage of	Contractor	Project Proponent (SHE division)

				loose material • Arrangement of wheel wash • Covering of project site with GI sheets		
		Emissions of PM, SO_2, NO_2 and CO	<u>Construction Phase</u> • Operation of construction equipment and vehicles during site development. • Running D.G. set (back up)	• Rapid on-site construction and improved maintenance of equipment.	Contractor	Project Proponent (SHE division)
			<u>Operation Phase</u> • Power generation by DG Set during power failure • Emission from vehicular traffic in use	• Use of low sulphur diesel if available • Providing Footpath and pedestrian ways within the site for the patient and staff. • Green belt will be developed with specific species to help to reduce	Management	Project Proponent (SHE division)

				pollution level • Use of equipment fitted with silencers • Proper maintenance of equipment.		
5.	Noise Environment					
			<u>Operation Phase</u> • 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 is limited to day time hours only • DG set room will be equipped with acoustic	Management	Project Proponent (SHE division)

				enclosures		
6.	Land Environment	Soil contamination	<u>Construction Phase</u> • Disposal of construction debris	• Construction debris will be collected and suitably used on site as per the solid waste management plan for construction phase.	Contractor	Project Proponent (SHE division)
			<u>Operation Phase</u> • 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 Solid Waste Management Rules, 2016. • Collection, segregation, transportation and disposal will be done as per Solid Waste Management Rules, 2016 by the authorized agency and Bio Medical	Management	Project Proponent (SHE division)

				Waste Management Rules, 2016. • Used oil generated will be sold to authorized recyclers		
7.	Biological Environment (Flora and Fauna)	Displacement of Flora and Fauna on site	<u>Construction Phase</u> • Site Development during construction	• Important species of trees, if any, will be identified and marked and will be merged with landscape plan.	Contractor	Project Proponent (SHE division)
			<u>Operation Phase</u> • Increase in green covered area	• Suitable green belts will be developed as per landscaping plan in and around the site using local flora	Management	Project Proponent (SHE division)
8.	Socio-Economic Environment	Population displacement and loss of income	<u>Construction Phase</u> • Construction activities leading to relocation	• The project site falls under the land use plan of MCD 2021	Contractor	Project Proponent (SHE division)

			<u>Operation Phase</u> • Site operation	• Project Proponent 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.	Managament	Project Proponent (SHE division)
9.	Traffic Pattern	Increase of vehicular traffic	<u>Construction Phase</u> • Heavy Vehicular movement during construction	• Heavy Vehicular movement will be restricted to daytime only and adequate parking facility will be provided.	Contractor	Project Proponent (SHE division)
			<u>Operation Phase</u> • Traffic once the project is operational	• Vehicular movement will be regulated inside the project with	Management	Project Proponent (SHE division)

				adequate roads and parking lots in the project.		

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 effects 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 5: Environmental Monitoring Plan – Construction Phase

Source	Monitoring Location	Parameters to be Monitored	Frequency
Ambient Air Quality	At 1 location at boundary of the project site.	$PM_{2.5}$, PM_{10}, SO_2,NO_2, CO	Once in a season April to September and once in the season October to March.
Ambient Noise	At 1 location at boundary of the project site.	Day and night equivalent noise level	Once in a season April to September and once in the season October to March.
Ground water	At 1 location nearest to the project site.	As per standards	Once in a season April to September and once in the season October to March.
Soil	At 1 location outside the project site.	As per standards	Once in a season April to September and once in the season October to March.

Table 6: Environmental Monitoring Plan – Operation Phase

Source	Monitoring Location	Parameters to be Monitored	Frequency
DG set emissions	DG stacks	PM, SO_2, NO_2	Twice in a year or as per requirement of DPCC
DG set noise	At 0.5 m distance from enclosure	Noise level	Twice in a year or as per requirement of DPCC
STP/ ETP	Inlet and Outlet	pH, BOD, Suspended Solid, Oil & Grease	Twice in a year or as per requirement of DPCC
Ambient Air Quality	At 3 locations	$PM_{2.5}$, PM_{10}, SO_2,NO_2, CO	Once in each non-monsoon season or as per requirement of DPCC
Ambient Noise	At 3 locations	Day and night equivalent noise level	Once in a season or as per requirement of DPCC

Ground water	At 1 location nearest to the project site.	As per standards	Once in a season or as per requirement of DPCC

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:

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.

Fire & Safety Management

Reference Standards

The design and planning of Fire Protection System shall be done keeping in view the following criteria:

- National Building Codes of India – Part IV
- National Fire Protection Association (NFPA)
- Rules of Insurance Company & TAC Manual (for reference and guideline).

System Description

Fire water storage

Static fire water storage tank for Fire Protection System will be provided

Fire pumping system

The fire pumping system shall comprise of independent electrical pumps for hydrant and sprinkler system, diesel engine driven pump & jockey pump for hydrant & sprinkler system.

Fire hydrant system

Internal and external standpipe fire hydrant system shall be provided with landing valve, hose reel, first aid hose reels, complete with instantaneous pattern short gunmetal pipe in the project. The outlet shall be of instant spring lock type gunmetal ferrule coupling for connecting to hose pipe. Provision of flow switch on riser shall be made for effective zone monitoring. External hydrant shall be located within 2 m to 15 m from the building to be protected such that they are accessible and may not be damaged by vehicle movement.

Sprinkler system

The sprinkler system shall be provided with control valves, flow and tamper switches at suitable location and shall be connected to control module of the fire alarm system for its monitoring and

annunciation in case of activation. Wet pipe sprinkler shall be provided for all habitable spaces such as guest rooms, guest room corridors, restaurants, ball rooms/ meeting rooms and other public areas. Sprinkler shall also be provided in all public toilets.

Clean agent fire protection system

Clean agent suppression system shall be provided for EPABX & Server Rooms. The system shall comprise of the FM 200 / NAF S III gas module containing required quantity of gas which shall be released when the actuator output is enabled by the fire alarm panel. As per the design concentration, release of the gas shall be within 15 seconds time elapsed from the actuation to put out the fire. The room shall be ventilated completely after the release of FM 200 gas/ NAF S III gas, before personnel can enter and work in the area.

CO_2 Extinguishing system

Trolley mounted carbon-di-oxide extinguishing system shall be provided in accordance with local Bye-Laws for transformer room, LT panel room and other critical areas.

Hand held fire extinguishers

Portable fire extinguishers of water (gas pressure), Carbon-di-oxide and foam type shall be provided as first aid fire extinguishing appliances. These extinguishers shall be suitably distributed in the entire public as well as service areas.

DETAILS OF ENERGY CONSERVATION MEASURES

Energy Conservation Measures & Management Plan:

- Passive Solar designs refer to the use of Sun's energy for the heating and cooling of living spaces.
- The orientation of the building will be done in such a way that maximum daylight is available.
- The orientation of the building would be done in such a manner that most of glazed areas in north and east.
- Lesser opening will be provided on the west facing walls.
- Landscape and greens areas will be so spaced so as to cool the surrounding environment, which will reduce energy consumption.
- Green belt in the site will be maintained by the project proponents, which would have an overall cooling effect on the surroundings.

Following measures have been proposed to reduce energy consumption for Electrical installations:

In the operational phase, appropriate energy conservation measures and management plan will be adopted in order to minimize the consumptions of non-renewable fuel. The following measures are suggested to be adopted:

- Use of LED instead of GLS lamps for Common Areas.
- Solar water heater arrangements for hostels.
- Achievement of U value of external envelope for air conditioned building as per perspective requirement of ECBC.
- Energy efficient motors in pumps and energy efficient chillers for HVAC with VFD control.