

FORM IA

w.r.t.

INTEGRATED COMPLEX “SOBHA CITY” PROJECT

At

**PUZHAKKAL, GURUVAYYUR ROAD,
DISTRICT –THRISSUR, KERALA**

For

Client-M/s SOBHA LIMITED

May, 2018

Schedule: 8 (b), Category: B
Built Up Area – 2, 56,017 sqm



QCI Certificate no. NABET/EIA/1619/RA 0064



PREPARED BY

GRASS ROOTS RESEARCH & CREATION INDIA (P) LTD.

(Accredited by QCI/NABET, Approved by MoEFCC, GoI, ISO 9001:2008 Certified Co.)

F-374-375, Sector-63, Noida, U.P.

Ph.: 0120- 4044630, Telefax: 0120- 2406519

Email: md@grc-india.com, eia@grc-india.com

Website: <http://www.grc-india.com>

GRC INDIA TRAINING & ANALYTICAL LABORATORY

(Accredited by NABL, Recognized by MoEFCC, GoI)

A unit of GRC India

CONTENTS

S.NO	DESCRIPTION	PAGE NO.
1.	Land Environment	25-30
2.	Water Environment	30-37
3.	Vegetation	37-38
4.	Fauna	38
5.	Air Environment	38-42
6.	Aesthetics	42-43
7.	Socio-Economic Aspects	43-44
8.	Building Materials	44-45
9.	Energy Conservation	45-50
10.	Environment Management Plan	50-79

FORM IA
CHECK LIST OF ENVIRONMENTAL IMPACTS

SECTION 1- LAND ENVIRONMENT

1.1 Will the existing land use get significantly altered from the project that is consistent with the surroundings? (Proposed land use must conform to the approved Master Plan/Development Plan of the area. Change of land use, if any and the statutory approval from the competent authority are submitted). Attach Maps of (i) site location, (ii) surrounding features of the proposed site (within 500 meters) and (iii) the site (indicating levels & contours) to appropriate scales. If not available attach only conceptual plans.

➤ **No**

The site is earmarked for residential development. It is anticipated that the construction activities of the project will not have an adverse effect on the land use activities in the project area. The development of green belt and other landscaping will enhance the visual aesthetics of the area.

The area has good infrastructure facilities. The nearest railway station is Amala Nagar Railway Station at a distance of approx 1.5 km towards NW direction. The nearest Airport Cochin International Airport is about 49 km towards SE direction away from the site. The national highway, NH - 544 is about 9.0 km towards ESE direction from the project site.

The project site is located at Sy. No- 217, 218, 534 to 544, 546 to 556, Puzhakkal, Guruvayyur Road, District: Thrissur, Kerala. The geographical co-ordinates of project site are 10°33'0.00"N & 76° 10'55.0"E

Google earth image & Toposheet showing project site & surroundings within 500 m, 10 km & 15 km respectively is attached as *Annexure II (a) & II (b)*.

1.2 List out all the major project requirements in terms of the land area, built up area, water consumption, power requirement, connectivity, community facilities, parking needs etc.

➤ **LAND REQUIREMENT**

The project is being developed on total plot area measuring 2, 22,593.838 m² (or 55.01 acres).
 The detailed area statement is provided below:

Table 1: Detailed Area Statement

S. No.	Particulars	As per EC (m²)	Total Proposed (m²)
1.	Total Plot Area	2,29,535.91	2,22,593.838
2.	Permissible Ground Coverage (@65 % of plot area)	1,49,198.3	1,49,965.8
3.	Proposed Ground Coverage	(@68 % of plot area) 97,971.27	(@30.48 % of plot area) 70,339.457
4.	Proposed FAR	2,44,564.448	1,92,852.965
a.	<i>Malachite (Lake Front Villas)</i>	8605.425	8605.425
b.	<i>Sobha Topaz (Lake Front Apartment)</i>	44,270.03	44,270.03
c.	<i>Sobha Sapphire (Lake Front Apartment)</i>	43,970.40	43,970.40
d.	<i>Sobha Jade (Lake Front Apartment)</i>	42,260.38	42,260.38
e.	<i>Club House</i>	3,318.37	3,318.37
f.	<i>Commercial</i>	38320.42	30,217.83
g.	<i>Lake Edge (Hotel)</i>	25,629.77	20,210.53
h.	<i>Lake Side Apartment (Life Style Plots)</i>	38,189.685	--
5.	Non FAR	80,100.8	63,164.035
6.	Built-up Area (5+6)	3,24,665.28	2,56,017.00
7.	Green Area Proposed	80,440.71	70,514.25
8.	Maximum Building Height (m)	83.1	84.05

BUILT-UP AREA BREAK-UP

Table 2: Built-up area break-up

S. No.	Particulars	As per EC (m ²)	Total Proposed (m ²)
1.	Proposed FAR	2,44,564.448	1,92,852.965
a.	<i>Malachite (Lake Front Villas)</i>	8605.425	8605.425
b.	<i>Sobha Topaz (Lake Front Apartment)</i>	44,270.03	44,270.03
c.	<i>Sobha Sapphire (Lake Front Apartment)</i>	43,970.40	43,970.40
d.	<i>Sobha Jade (Lake Front Apartment)</i>	42,260.38	42,260.38
e.	<i>Club House</i>	3,318.37	3,318.37
f.	<i>Commercial</i>	38320.42	30,217.83
g.	<i>Lake Edge (Hotel)</i>	25,629.77	20,210.53
h.	<i>Lake Side Apartment (Life Style Plots)</i>	38,189.685	--
2.	Non FAR	80,100.8	63,164.035
Total Built-up Area		3,24,665.28	2,56,017.00

➤ **WATER REQUIREMENT**

The water supply will be provided through the Artificial Lake/Reservoir within the project site with prior treatment. Total water requirement is approx. 858 KLD, out of which total domestic water requirement is 646.5 KLD while the one time fresh water demand for the project will be 858 KLD.

➤ **POWER REQUIREMENT**

The power supply shall be supplied by Kerala PTCL (Kerala Power Transmission Corporation Limited). The maximum load demand for the Project will be approx. 9MVA

➤ **POWER BACK UP**

There is provision of DG sets power back up during the project failure. The DG sets capacities provided are 1 x 50 kVA +1 x 125 kVA + 2 x 180 kVA +1 x 320 KVA +4 x 380 kVA +8x 500

kVA +3 x 1010 kVA. The DG sets will be equipped with acoustic enclosure to minimize noise generation and adequate stack height for proper dispersion.

➤ **CONNECTIVITY**

The area has good infrastructure facilities. The nearest railway station is Amala Nagar Railway Station at a distance of approx 1.5 km towards NW direction. The nearest Airport Cochin International Airport is about 49 km towards SE direction away from the site. The national highway, NH - 544 is about 9.0 km towards ESE direction from the project site.

➤ **PARKING FACILITIES**

Adequate parking 2027 ECS provision will be kept for vehicles parking in the project. Besides this, internal road of sufficient width within the project will facilitate smooth traffic movement.

1.3 What are the likely impacts of the proposed activity on the existing facilities adjacent to the proposed site? (Such as open spaces, community facilities, details of the existing land use and disturbance to the local ecology).

The project being a well-planned activity will result in organized open spaces and green areas. About 70,514.25 m² of the area is earmarked for landscaping. The biodiversity in the area will increase due to the proposed green areas. The project will have an overall positive impact on the existing land use and will not cause any disturbance to the local ecology. Proposed activity shall have no impact on surroundings.

1.4 Will there be any significant land disturbance resulting in erosion, subsidence & instability? (Detail of soil type slope analysis, vulnerability to subsidence, seismicity etc may be given).

There will be no land disturbance resulting in erosion, subsidence and instability as it is a flat land. The site falls under the zone III as per the seismic zone map of India and indicating Moderate damage risk zone. The project will be earthquake resistant taking into account the latest provisions of Indian Standards Codes.

1.5 Will the proposal involve alteration of natural drainage system? (Give details on a contour map showing the natural drainage near the project site).

The project will not intersect any natural drainage route. Urbanized stretch and well planned storm water drainage will be designed for internal storm water drainage. Thus, no impact on the natural drainage system is anticipated.

1.6 What are the quantities of earthwork involved in the construction activity-cutting, filling, reclamation etc. (Give details of the quantities of earthwork involved, transport of fill materials from outside the site etc?)

The earthwork included soil excavation and cutting of the earth will be moved. The cut and fill material in the project site is nearly at par and hence the need for movement of soil to and from the site will not be anticipated.

1.7 Give details regarding water supply, waste handling etc. during the construction period.

Water requirement during construction phase will be met from State Water Supply Board. Sullage generated during the construction phase from the labor camp will be treated in mobile STP. All construction wastes generated during construction will be used within the site itself for filling the floors, roads, aggregate for mortar etc. to the extent feasible. Remaining will be sent to the agency for proper disposal.

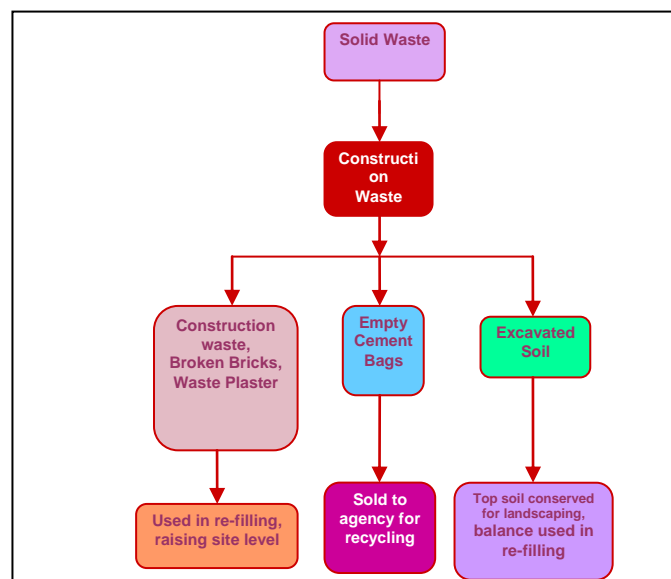


Figure 1: Solid Waste Management Scheme (Construction Phase)

1.8 Will the low lying areas & wetlands get altered? (Provide details of how low lying and wetlands are getting modified from the proposed activity).

No. The site area is a flat land and the surroundings are characterized by an urbanized stretch. No low lying areas or wetlands are found in the region.

1.9 Whether construction debris & waste during construction cause health hazard? (Give quantities of various types of wastes generated during construction including the construction labor and the means of disposal).

No health hazards are expected during the construction phase. The laborers will be provided with face masks to minimize dust inhalation.

A significant portion of the construction waste and wood scrap generated will be used on the site. The quantity of domestic waste generated will be treated in mobile STP.

SECTION 2- WATER ENVIRONMENT

2.1 Give the total quantity of water requirement for the project with the breakup of requirements for various uses. How will the water requirement be met? State the sources & quantities and furnish a water balance statement.

During operation phase, the source of water supply will be artificial Lake/Reservoir. The total water requirement is approx. 858KLD, out of which total domestic water requirement is 646KLD. The fresh water requirement is approx. 452 KLD and the one time fresh water requirement will be 858 KLD. The daily water requirement calculation is given below in Table 3- 5:

Table 3: Comparative water requirement details

S. No.	Particulars	As per EC (KLD)	Total Proposed (KLD)
1	Total Water	1301.5	858
2	Fresh water	940	452
3	STP	2000 KL	790KL

Table 4: Calculations for Daily Water Demand

S. No	Description	Occupancy	Rate of water demand (lpcd)	Water Requirement (KLD)
A.	Domestic Water			
1)	Residential apartments	3600	135	486
2)	Villas	125	135	17
3)	Plots	155	135	21
4)	Staff (Maintenance, Commercial)	698	45	31.41
5)	Club House	388	45	17.5
6)	Visitors (residential , Commercial)	4920	15	74
Total Domestic Water				646 KLD
B.	Horticulture (70,514.25 m²)		3 l/sqm/day	211.5
Grand Total Water (A+B) = 858 KLD				

TABLE 5: WASTE WATER CALCULATIONS

DOMESTIC WATER REQUIREMENT	646 KLD
• Fresh (70% of Domestic water)	452 KLD
• Flushing (30% of Domestic water)	194 KLD
Waste water generated [@80% fresh + 100% flushing]	362+ 194 = 556 KLD
STP Capacity	790 KL

The water balance diagram for non-rainy and rainy season is shown below in Figure 1&2 respectively.

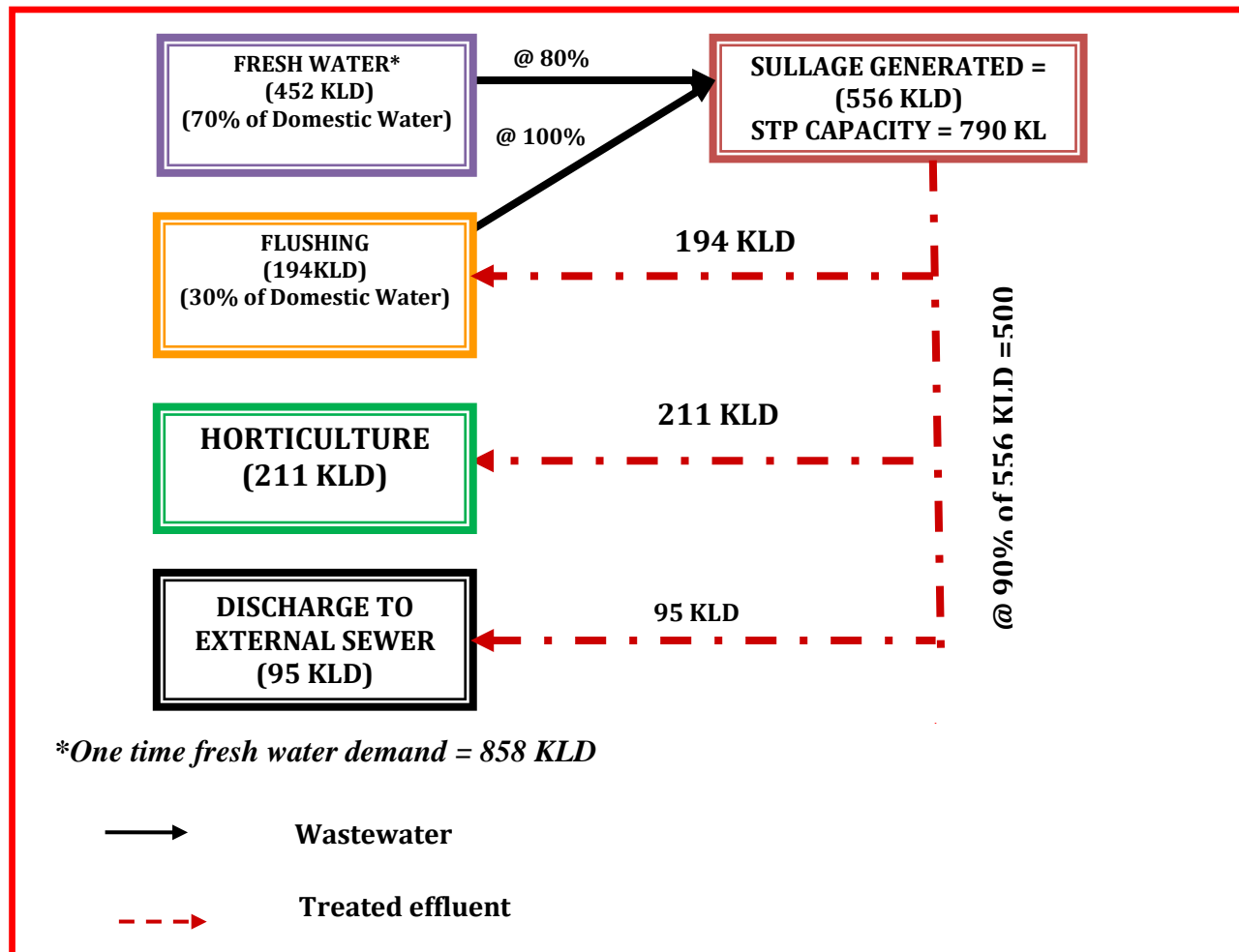


Figure 2: Water balance diagram for Non-Rainy Season

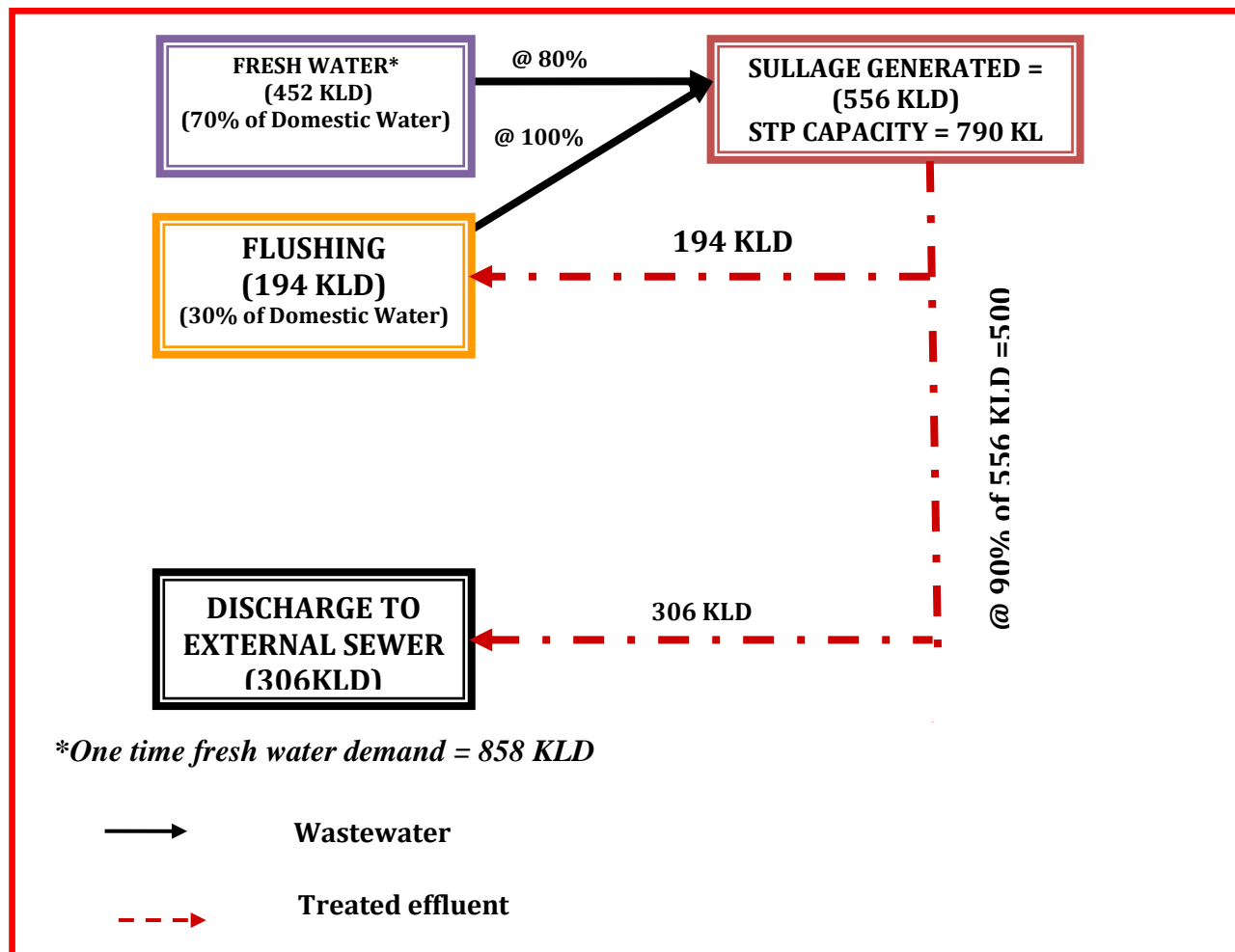


Figure 3: Water balance diagram for Rainy Season

Sullage Generation & Treatment

It is expected that the project will generate approx. 556 KLD of wastewater. The wastewater will be treated in onsite 4 No's of STP of capacities 1 X 160 KLD, 2 X 190 KLD and 1 X 250 KLD. The treated effluent will be reused for flushing & horticulture. Surplus treated effluent will be discharged to external sewer.

2.2 What is the quality of water required, in case, the supply is not from a municipal source? (Provide physical, chemical, Biological characteristics with class of water quality).

Not Applicable. The water requirement is being met from artificial lake with prior treatment conforming to IS 10500: 2012 Drinking Water Quality Standards.

2.3 How much of water requirement can be met from the recycling of treated wastewater? (Give the details of quantities, sources and usage)

It is expected that the project will generate approx. 556 KLD of wastewater. The wastewater will be treated in onsite STP of capacities 1 X 160 KLD, 2 X 190 KLD and 1 X 250 KLD. The treated effluent will be reused for flushing & horticulture. Surplus treated effluent will be discharged to external sewer.

2.4 Will there be diversion of water from other users? (Please assess the impacts of the project on other existing uses and quantities of consumption).

No. There will not be any diversion of water from other users. Rise in water demand is a local phenomenon but the project would only involve spatial shifting of water demand within a region.

2.5 What is the incremental pollution load from wastewater generated from the proposed activity? (Give details of the quantities and composition of wastewater generated from the proposed activity)

556 KLD of sewage generated which will be treated through STP

2.6 Give details of the water requirements met from water harvesting? Furnish details of the facilities created.

The rain water is harvested through an artificial lake provided within the project site. The harvested water is used to meet the domestic water demand post treatment.

Lake volume calculations are shown below:

LAKE VOLUME CALCULATION				I year		III Year ONWARDS				
SI No	MONTHS	AVG. RAINFALL INTENSITY (mm)	VOL FROM AVG.RAINFALL*	DEMAND **	VOL IN LAKE	VOL INTO LAKE	VOL AFTER OVERFLOW	OVERFLOW	vol to be maintained	DEFICIT
1	JUN	714.2	106.54	26.0	80.57	156.28	189.0	39.28	189.0	0.0
2	JUL	665.2	99.23	26.0	153.83	262.29	189.0	73.26	189.0	0.0
3	AUG	412.3	61.50	26.0	189.03	224.56	189.0	35.53	189.0	0.0
4	SEPT	226.5	33.79	26.0	189.03	196.85	189.0	7.82	189.0	0.0
5	OCT	318.8	47.56	26.0	189.03	210.62	189.0	21.59	189.0	0.0
6	NOV	99.5	14.84	26.0	189.03	177.90	189.0	0.00	189.0	0.0
7	DEC	18.9	2.82	26.0	165.88	165.88	165.9	0.00	165.9	0.0
8	JAN	2.3	0	26.0	139.91	139.91	139.9	0.00	160.0	20.1
9	FEB	4.5	0	26.0	113.94	113.94	113.9	0.00	160.0	26.0
10	MAR	8.5	0	26.0	87.97	87.97	88.0	0.00	160.0	26.0
11	APR	76.7	11.44	26.0	73.44	73.44	73.4	0.00	145.5	0.0
12	MAY	189.3	28.24	26.0	75.71	75.71	75.7	0.00	147.7	0.0
			405.96	311.64				177.48		

Note :

* Volume from avg. rainfall = avg.rainfall intensity X Site Area(56.72 acres) X constant of 0.65

**Demand after considering STP water recovery and evaporation losses.

All volumes are in Million liters (ML).

The calculation at start of June (1ST YR) theoretically assumes the lake volume to be nil.

Water seepage factor not considered.

Max volume of Lake is 189.03 million liters (i.e) 1 m freeboard = 97.31

Min volume of Lake is 160.00 ML (i.e) 2.2 m aprox. from top = 96.00

2.7 What would be the impact of the land use changes occurring due to the project on the runoff characteristics (quantitative as well as qualitative) of the area in the post construction phase on a long term basis? Would it aggravate the problems of flooding or water logging in any way?

The project will include paved areas and thus the runoff from the plot is expected to increase due to reduced infiltration. However, the increased runoff will not cause flooding or water logging as a well designed storm water drainage will be provided. The runoff will finally be collected into rainwater harvesting pits for groundwater recharging. The quality of the runoff is expected to improve due to paved areas.

2.8 What are the impacts of the proposal on the ground water? (will there be tapping of ground water; give the details of ground water table, recharging capacity and approvals obtained from competent authority, if any).

Project will not use ground water during construction and operation phase; Water demand during the construction will be met through State water supply board and during the operational phase through artificial lake. No adverse impact is expected, as efforts have been made to recharge the aquifers using rain water harvesting

2.9 What precautions/ measures have been proposed to check the surface run-off, as well as uncontrolled flow of water into any water body?

The following management measures are suggested to protect the water quality during construction phase.

- Care would be taken to avoid soil erosion.
- Community toilets shall be constructed on the site during construction phase and the wastewater will be treated in mobile STP.
- Any area with loose debris within the site shall be planted.
- To prevent surface and ground water contamination by oil/grease, leak proof containers would be used for storage and transportation of oil/grease. The floors of oil/grease handling area would be kept effectively impervious.
- Collection and settling of storm water, prohibition of equipment wash downs, and prevention of soil loss and toxic release from the construction site will be adhered to minimize water pollution.

2.10 How is the storm water from within the site managed? (State the provisions made to avoid flooding of the area, details of the drainage facilities provided along with a site layout indication contour levels).

Most of the storm water produced on site will be harvested in artificial lake. Thus proper management of this resource is a must to ensure that it is free of contamination. A detailed Storm Water Management Plan has been developed which will consider the sources of storm water. The plan will incorporate best management practices which will include the following:

- Regular inspection and cleaning of storm drains.
- Installation of clarifiers or Oil/Water separators system of adequate capacity around parking areas and garages as per requirement.
- Cover waste storage areas.

- Avoid application of pesticides and herbicides before wet season.
- Conducting routine inspections to ensure cleanliness.
- Preparation of spill response plans, particularly for fuel and oil storage areas.
- Good housekeeping in the above areas.

2.11 Will the deployment of construction laborers particularly in the peak period lead to unsanitary conditions around the project site (Justify with proper explanation).

No, sufficient no. of toilets will be provided and the wastewater will be scientifically managed.

2.12 What on-site facilities are provided for the collection, treatment & safe disposal of sewage? (Give details of the quantities of wastewater generation, treatment capacities with technology & facilities for recycling and disposal).

It is expected that the project will generate approx. 556 KLD of wastewater. The wastewater will be treated in onsite STP of capacities 1 X 160 KLD, 2 X 190 KLD and 1 X 250 KLD. The treated effluent will be reused for flushing & horticulture. Surplus treated effluent will be discharged to external sewer.

2.13 Give details of dual plumbing system if treated waste used for flushing of toilets or any other use.

Dual plumbing system that utilizes separate piping systems for freshwater and recycled sullage is adopted and the same is planned for the proposed block also. The recycled water system shall utilize this treated sullage and serve for non-contact uses such as flushing and horticulture.

3. VEGETATION

3.1 Is there any threat of the project to the biodiversity? (Give a description of the local ecosystem with its unique features, if any).

No ecologically sensitive area falls within the project site. Hence, no ecological/ biological threat will be anticipated.

3.2 Will the construction involve extensive clearing or modification of vegetation? (Provide a detailed account of the trees & vegetation affected by the project)

The project does not support any significant vegetation. It is to develop a peripheral greenbelt of native plant species to enhance the aesthetic value of the region and also provide an excellent habitat for various faunal groups. Evergreen tall and ornamental trees have been proposed to be planted inside the premises.

3.3 What are the measures proposed to be taken to minimize the likely impacts on important site – features (Give details of proposal for tree plantation, landscaping creation of water bodies etc along with a layout plan to an appropriate scale?)

Green belt will be developed along the periphery of the project premises along with the internal parks and lawns. Total green area measures 70,514.25 m².

4. FAUNA

4.1 Is there likely to be any displacement of fauna both terrestrial and aquatic or creation of barriers for their movement? Provide the details.

No. The existing land use around the site is urban and does not provide a habitat for wild species. A few species of butterfly, avifauna and reptiles were recorded during the course of survey, which are common and found abundantly in this region. The proposed peripheral greenbelt will provide an excellent habitat for the native fauna.

4.2 Any direct or indirect impacts on the avifauna of the area? Provide details.

The project will not have any direct or indirect impacts on the avifauna of the area. However, planting of fruit bearing trees in the proposed greenbelt will be an attraction to the local bird population.

4.3 Prescribe measures such as corridors, fish ladders etc. to mitigate adverse impacts on fauna.

Not applicable

5. AIR ENVIRONMENT

5.1 Will the project increase atmospheric concentration of gases & result in heat islands? (Give details of background air quality levels with predicted values based on

dispersion models taking into account the increased traffic generation as a result of the proposed construction).

Ambient air monitoring will be carried out at the project site during the environmental assessment.

During the post construction phase, cars, scooter/motorcycle will be owned by the residents of group housing Project. Vehicular emissions will be major source of air pollution in addition to DG set. Quantum and dispersion of pollutants from vehicular emission will depend upon the following:

- Volume of traffic on the roads,
- Meteorological conditions.
- Emission sources from D.G. Sets.

From vehicular emissions, PM, NOx and CO are pollutants of primary concern. The dispersion of vehicular emissions would be confined within 100 m from the road and concentration will decrease with the increase in distance from road. It is anticipated that the contribution of vehicular emissions in ambient air quality will be marginal but well within the stipulated National Ambient. At higher wind speed dispersion will be faster.

Air Quality Modeling:

The only source of emissions from the project is the operation of backup generator during grid power failure. Detailed air quality modeling has been carried out for predicting the concentration of different pollutants contributed by the project during operation of the backup generators.

Air Environment

Impact: During the post construction phase, cars, scooter/motorcycle will be owned by the Affordable Housing residents. Vehicular emissions will be major source of air pollution in addition to DG set. Quantum and dispersion of pollutants from vehicular emission will depend upon the following:

- Volume of traffic on the roads,
- Meteorological conditions.
- Emission sources from D.G. Sets.

From vehicular emissions, PM, NO_x and CO are pollutants of primary concern. The dispersion of vehicular emissions would be confined within 100 m from the road and concentration will decrease with the increase in distance from road. It is anticipated that the contribution of vehicular emissions in ambient air quality will be marginal but well within the stipulated National Ambient. At higher wind speed dispersion will be faster.

There is provision of DG sets power back up during the project failure. The DG sets capacities provided are 1 x 50 kVA +1 x 125 kVA + 2 x 180 kVA +1 x 320 KVA +4 x 380 kVA +8x 500 kVA +3 x 1010 kVA. The DG sets will be equipped with acoustic enclosure to minimize noise generation and adequate stack height for proper dispersion.

This will cause emission of PM, SO₂, NO₂ and CO. However, since the D.G. sets will be operational only during power failure and low sulphur diesel will be used; therefore, pollutants incremental load in the ambient air environment will be expected to be minimal. However, an adequate stack height of D.G. Sets will be provided as per the stipulated guidelines of Central Pollution Control Board (CPCB) to facilitate proper dispersion of exhaust gases as given below considering height of the building.

Mitigation Measures: It is proposed to develop a green belt inside the premises of the project site and along the internal roads, which will work as barrier for the movement of pollutants and help in pollution control.

5.2 What are the impacts on generation of dust, smoke, odorous fumes or other hazardous gases? Give details in relation to all the meteorological parameters.

Source of pollution:-

As per dispersion modeling of pollutants from DG set using ISCST3 software, predicted resultant GLC for various air pollutants are found insignificant within the NAAQS norms.

5.3 Will the proposal create shortage of parking space for vehicles? Furnish details of the present level of transport infrastructure and measures proposed for improvement including the traffic management at the entry and exit to the project site.

Adequate provision will be made for car/vehicle parking at the project site. Parking details are provided below:

PARKING PROPOSED:

S. No	Particulars	(As per accorded EC)	As per Revision.
1	Cars	3631	1417
2	Two wheelers	780	550
3	Visitor car parking	84	60
Total parking Proposed			2027

5.4 Provide details of the movement patterns with internal roads, bicycle tracks, pedestrian pathways, footpaths etc, with areas under each category.

Internal roads of adequate width, footpaths/pedestrian pathways have been well planned for the project.

5.5 Will there be significant increase in traffic noise & vibrations? Give details of the sources and the measures proposed for mitigation of the above.

Significant impact of noise has been carried out within and outside of the project site. Noise, due to the traffic, within site, will result in a marginal increase in the noise levels because noise control measures shall be provided in vehicles & DG sets as mentioned below, which will cause slight increase in noise level.

5.6 What will be the impact of D.G. set and other equipment on noise levels and vibration in ambient air quality around the project site? Provide details.

During operation, vehicular movement and operation of DG set are the major sources of noise pollution. But both these activities- DG set and vehicular movement will not have any significant impact on the people residing in the area. Since DG set will not be operational continuously and moreover it will be placed away from residential settlements and will be enclosed with suitable enclosures, hence no or minimal impact will be anticipated. It is envisaged that the movement of the motor vehicles will be restricted to designated carriageways only.

Impacts on Air Quality due to DG Set:

- Impacts on ambient air during operation phase would be due to emissions from the stacks attached to backup DG set only during grid power failure.

Mitigation Measures for Impacts of DG Set on Ambient Air Quality:

- Back up DG set will comply with the applicable emission norms.
- Adequate stack height for DG set will be provided as per norms.
- Back up DG set will be used only during power failure.
- Monitoring of emissions from DG set and ambient air quality will be carried out as per norms.

Noise Control Measures for DG set:

- DG room will be provided to insure 75 dB (A) insertion loss as per the regulations.
- Adequate exhaust mufflers will be provided as per norms to limit the noise.

6. AESTHETICS

6.1 Will the proposed construction in any way result in the obstruction of a view, scenic amenity or landscapes? Are these considerations taken into account by the proponents?

The site lies in an urbanized settlement and is well planned. Thus, no obstruction of view or scenic beauty or landscape is anticipated. Furthermore, the construction will be planned in such a way that the organized open spaces and landscaped areas will render the plot aesthetically appealing.

6.2 Will there be any adverse impacts from new constructions on the existing structures? What are the considerations taken into account?

No impacts anticipated.

6.3. Whether there are any local considerations of urban form & urban design influencing the design criteria? They may be explicitly spelt out.

The project will strictly follow the Area Building Regulation of NBC. All norms on Ground Coverage, FAR, Height, Setbacks, Fire Safety Requirements, Structural Design and other parameters will be strictly adhered to.

6.4 Are there any anthropological or archaeological sites or artifacts nearby? State if any other significant features in the vicinity of the proposed site have been considered?

No anthropological or archaeological sites or artifacts will be found near the site area.

7. SOCIO-ECONOMIC ASPECTS

7.1 Will the proposal result in any changes to the demographic structure of local population? Provide the details.

No such changes anticipated.

Construction phase: Since local labourers will be engaged during construction phase, alteration to the existing demographic profile of the area is not anticipated.

Operation phase: The changing demography in the area is another impact that needs attention. The project will mainly lead to spatial redistribution of local population and hence no considerable influx of population is envisaged owing to the project.

7.2 Give details of the existing social infrastructure around the project.

Education:

The project area is having adequate infrastructure facilities for education. Number of Educational institutions exists in the area. A number of pre-primary, high schools, International schools viz., Delhi Public School, Cambridge English High School, NITTE International School, Canadian international school, Kristu Jayanti school, KNN college of Nursing exist in the vicinity.

Health:

Different types of health facilities including hospitals, dispensaries, polyclinics, nursing homes etc. are available in closed vicinity of the project area. The project area is in advantageous position in terms of healthcare infrastructure because of its proximity to various hospitals like Manasa hospital, Dr. Agarwal's Eye Hospital, etc

Economic Aspects:

The project area is witnessing a fast growth in the economic activities. The surrounding areas to the project site comprise of various social, commercial, Industrial and educational infrastructures which have already come up in the area. This will enhance the economic status of the project area. Well-positioned infrastructure of the proposed project is one of the dictating factors for the promoters to set this project in the area.

7.3 Will the project cause adverse effects on local communities, disturbance to sacred sites or other cultural values? What are the safeguards proposed?

Construction phase: There are no religious sites or archeological monuments of historical significance on the project site. Hence, no adverse impact in this regard is anticipated. Rather, this phase will generate jobs that relate to unskilled, semi skilled as well as skilled labour category. Few supervisory positions will also open up, for which local candidates will be considered based on merit.

Operation phase: The project will provide goods storage facility in the area, thereby provide the jobs opportunity. A project of such scale will also boost the local economy.

8. BUILDING MATERIALS

8.1 May involve the use of building materials with high embodied energy. Are the construction materials produced with energy efficient processes? (Give details of energy conservation measures in the selection of building materials and their energy efficiency)

Embodied energy is the energy consumed by all of the processes associated with the production of a building, from the acquisition of natural resources to product delivery. The building materials used will be of high-embodied energy.

- Also, the materials used for construction of the building are of non-combustible in nature.
 - Non-combustible material are only used for the construction/ erection of false ceiling including all fixtures and used for its suspension/ erection etc. and of low flame rating.

8.2 Transport and handling of materials during construction may results in pollution, noise and public nuisance. What measures are taken to minimize the impacts?

Mitigation Measures for Air Pollution during Construction Stage:

- Construction materials will be suitably covered with tarpaulin cover etc during transportation.

- Water sprinkling shall be done on haul roads where dust generation is anticipated.
- Raw material storage and handling yard will be enclosed from all sides.
- To minimize the occupational health hazard, proper personal protective gears i.e. mask shall be provided to the workers working in the dust prone areas.

Mitigation Measures for Noise Pollution during Construction Stage:

- Administrative as well as engineering control of noise will be implemented.
- Isolation of noise generation sources and temporal differentiation of noise generating activities will ensure minimum noise at receiver's end.
- To prevent any occupational hazard, earmuff / earplug shall be given to the workers working around construction plant & machinery emitting high noise levels.
- Use of such plant or machinery shall not be allowed during night time. Careful planning of machinery operation and scheduling of operations shall be done to minimise such impact.

8.3 Are recycled materials used in roads and structures? State the extent of savings achieved?

Any construction waste generated on-site like topsoil, sand and gravel will be reused as filler. Moreover, broken bricks will be used as the filling material for the construction of internal roads. Quantity of construction debris will be reused /recycled for back filling /sub base work for roads & pavements within the project site.

8.4 Give detail of the methods of collection, segregation & disposal of the garbage generated during the operation phases of the project.

The solid waste of the project will be segregated into biodegradable waste and non-biodegradable. The organic waste will be treated in organic waste converter and used as manure for greenery development in same land. Inorganic waste are handed over to authorized recyclers.

9. ENERGY CONSERVATION

9.1 Give details of the power requirements, source and supply, backup source etc. What is the energy consumption assumed per square foot of built-up area? How have you tried to minimize energy consumption?

The power is being supplied by Kerala PTCL (Kerala Power Transmission Corporation Limited). The total revision and electrical load for the project will be approx. 9 MVA for the project.

Details of D.G Set

There is provision of DG sets power back up during the project failure. The DG sets capacities provided are 1 x 50 kVA +1 x 125 kVA + 2 x 180 kVA +1 x 320 KVA +4 x 380 kVA +8x 500 kVA +3 x 1010 kVA. The DG sets will be equipped with acoustic enclosure to minimize noise generation and adequate stack height for proper dispersion.

Effective measures have been incorporated to minimize the energy consumption in following manners:

- Solar street lights.
- Solar power packs/inverters.
- All external lighting shall be BEE star rated.
- All internal lighting shall be BEE star rated.
- All common spaces including street lights (where there is no use of light for reading purposes), shall be of "LED".
- Solar street light controllers will be used for automatic dusk to dawn operation of street lights.
- Traffic light, blinkers, direction signage, based on LEDs shall be powered by solar.
- Integration of automated system to operate electrical equipment as per load requirement to save energy.
- ECBC norms will be followed for use of solar energy.

9.2 What type and capacity of power backup do you plan to provide?

Backup power units will be provided by 20 DG set of 9405 kVA (1 x 50 kVA +1 x 125 kVA + 2 x 180 kVA +1 x 320 KVA +4 x 380 kVA +8x 500 kVA +3 x 1010 kVA each) capacities for power back up in the proposed Project. The DG set will be operated only during power failure.

9.3 What are the characteristics of the glass you plan to use? Provide specifications of its characteristics related to both short wave and long wave radiation?

The project, being an Integrated Complex "Sobha City" will involve limited use of clear & tinted glass having U-value less than $3.11\text{w/m}^2\text{-}^\circ\text{C}$.

9.4 What passive solar architectural features are being used in the building? Illustrate the applications made in the project.

Passive solar design refers to use of the sun's energy for the heating and cooling of living spaces. Pergolas, projections, façade elements, metal louvers will be provided for sun shading to reduce the heat influx into the building and thus reduce the air conditioning loads.

9.5 Does the layout of street & building maximize the potential for solar energy devices? Have you considered the use of street lighting, emergency lighting and solar hot water systems for use in the building complex? Substantiate with details.

Solar light applications have been provided for Street Lighting, Common Area and External Lighting within the project site.

9.6 Is the shading effectively used to reduce cooling/heating loads? What principles have been used to maximize the shading of walls on the East and the West and the Roof? How much energy saving has been effected?

Green area and open areas are so spaced that a reduction in temperature is achieved.

9.7 Do the structures use energy-efficient space conditioning, lightening and mechanical systems? Provide technical details. Provide details of the transformers and motor efficiencies, lightening intensity and air conditioning load assumption? Are you using CFC and HCFC free chillers? Provide specifications.

HVAC system is not proposed hence there is no involvement of chillers.

Following measures are proposed for lightening efficiency in accordance with ECBC norms:

- Timer based on/off control shall be provided for landscape area lighting.
- 100% external lighting shall meet efficacy value of 60lm/W.

- The internal lighting inside the flats is not in the developer's scope. However, the tenant and occupant guideline shall be provided by the developer specifying the maximum permissible LPD of 7.5 W/sqm as per ECBC.

9.8 What are the likely effects of the building activity in altering the micro-climates? Provide a self assessment on likely impacts of the proposed construction on creation of heat island & inversion effects?

Heat emissions from the construction may be from the following sources:

- Heat absorbed from the paved and concrete structures
- Heat generated from equipment/appliances
- Heat increase due to population increase in the project.

However, the heat generated will not be significant and will be dissipated in the greens and open areas provided within the project area.

9.9 What are the thermal characteristics of the building envelope? (a) Roof (b) external walls and (c) fenestration? Give details of the material used and the U value or the R values of the individual components.

The roof tops of the buildings will be planned with puffing/bricks bat coba for water proofing and reflective tiles.

External wall-external opening will have regular door windows with slightly tinted glass. Regular walls have some cladding/fixture paints.

S. No.	Component	U-value (W/m ² -°C)	R-value (m ² -°C/W)
(a)	Roof	< 0.409	R-2.1
(b)	External wall	< 0.352	R-2.35

9.10 What precautions & safety measures are proposed against fire hazards? Furnish details of emergency plans.

Firefighting measures will be adopted as per the guidelines of NBC. External yard hydrants will be installed around all buildings in the complex in galvanized steel fire house cabinet (weather

proof). All external yard hydrants shall be at one meter height from finished ground level as per NBC at a distance of 60 m along the road. External fire hydrants shall be located such that no portion of any building is more than 45 m from a hydrant and the external hydrants are not vulnerable to mechanical or vehicular damage.

Fire hydrant system will be provided within the buildings, fire escape staircases and refuge areas will be provided and the building structures will be planned as per NBC, 2016. In addition, 10 kg fire extinguishers will be provided for class A, B, and C fires. CO₂ extinguishers will also be provided

Disaster Management Plan

PRECAUTION & MITIGATORY METHODS TO PREVENT DISASTERS:

- Complex is planned to reduce the impact of disasters and to encourage recovery.
- A disaster management cell would be established which will take care of post disaster scenario.
- It would be a volunteer kind of set-up and professionals can also be hired in case of eventuality.
- Complex management and maintenance agency will prepare an integrated, comprehensive management plan.

PRECAUTION & MITIGATORY METHODS TO PREVENT DISASTERS:

(Earthquake Management)

- At the time of designing and constructing the building due care would be taken to have earthquake resistant structures which will conform to IS 1983.
- New systems and devices using non-conventional civil engineering materials would be developed to reduce the earthquake forces acting on structure.

PRECAUTION & MITIGATORY METHODS TO PREVENT DISASTERS:

(Fire Hazard)

- Fire safety would be taken into account and would follow all the safety norms and regulations as per the NBC and other related Indian Standards.

- All electrical cables would be underground and sophisticated modern electrical distribution system to reduce risk of fire.
- Special firefighting equipment’s like Automatic Fire Detection and alarm system, automatic Sprinkler System etc. would be installed as per the NBC standards.
- Risk assessment with onsite disaster management plan will be specified to fire, smoke and other emergency conditions.

9.11 If you are using glass as wall materials, provide details and specifications including emissivity and thermal characteristics.

The project being an Integrated Complex “Sobha City” will not involve use of much glass as wall material. All fenestration with U-factors, SHGC, or visible light transmittance determined, certified and labeled in accordance ISO 15099 shall be adopted.

9.12 What is the rate of air infiltration in to the building? Provide details of how you are mitigating the effects of infiltration.

There will be provisions for ample natural ventilation.

9.13 To what extent the non-conventional energy technologies are utilized in the overall energy consumption? Provide details of the renewable energy technologies used.

Solar energy will be variedly used as:

- Solar street lights.
- CFLs will be used to minimize the energy consumption.
- Green area is provided along with tree plantation which will result in natural air cooling and will reduce the load on conventional energy sources.

10. 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.

10.1 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.

10.1.1 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 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.

It is suggested that as part of the EMP, a monitoring committee would be formed by M/s Sobha Limited., 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 4**

TABLE 6: SUMMARY OF POTENTIAL IMPACTS AND REMEDIAL MEASURES

S. No.	Environmental components	Potential Impacts	Potential Source of Impact	Controls Through EMP & Design	Impact Evaluation	Remedial Measures
1.	Ground Water Quality	Ground Water Contamination	<u>Construction Phase</u> <ul style="list-style-type: none"> Wastewater generated from temporary labor tents. 	<ul style="list-style-type: none"> No surface accumulation will be allowed. 	No significant impact as majority of labors would be locally deployed	
			<u>Operation Phase</u> <ul style="list-style-type: none"> Discharge from the project 	<ul style="list-style-type: none"> Sewage will be disposed through soak pits. 	No negative impact on ground water quality envisaged. Not significant.	
2.	Ground Water Quantity	Ground Water Depletion	<u>Construction Phase</u> <ul style="list-style-type: none"> Ground water will not be used for construction activity. 	<ul style="list-style-type: none"> No impact 	No significant impact on ground water quantity envisaged.	
			<u>Operation Phase</u> <ul style="list-style-type: none"> The source of 	<ul style="list-style-type: none"> Rain water harvesting scheme. 	No significant impact on	In an unlikely event of non-availability of

			<p>water during operation phase is Municipal Corporation water supply.</p>	<ul style="list-style-type: none"> Storm water collection for water harvesting. Percolation well to be introduced in landscape plan. Awareness Campaign to reduce the water consumption 	<p>surface/ground water quantity envisaged.</p>	<p>water supply, water will be brought using tankers.</p>
3.	Surface Water Quality	Surface water contamination	<p><u>Construction Phase</u></p> <ul style="list-style-type: none"> Surface runoff from site during construction activity. 	<ul style="list-style-type: none"> Silt traps and other measures such as additional on-site diversion ditches will be constructed to control surface run-off during site development 	<p>No off-site impact envisaged as no surface water receiving body is present in the core zone.</p>	
			<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> Discharge of domestic 	<ul style="list-style-type: none"> Sewage will be disposed through septic tanks and soak pits. 	<p>No off-site impact envisaged</p>	<p>CPCB guidelines will be followed for disposal of sewage.</p>

			wastewater to Septic tank & Soak pits.			
4.	Air Quality	Dust Emissions	<u>Construction Phase</u> <ul style="list-style-type: none"> All heavy construction activities 	<ul style="list-style-type: none"> Suitable control measures will be adopted for mitigating the PM_{2.5} & PM₁₀ level in the air as per air pollution control plan. 	Not significant because dust generation will be temporary and will settle fast due to dust suppression techniques.	During construction phase the contractors are advised to facilitate masks for the labors. Water sprinklers will be used for suppression of dust during construction phase.
		Emissions of PM _{2.5} & PM ₁₀ , SO ₂ , NO _x and CO	<u>Construction Phase</u> <ul style="list-style-type: none"> Operation of construction equipment and vehicles during site development. Running D.G. set (back up) 	<ul style="list-style-type: none"> Rapid on-site construction and improved maintenance of equipment 	Not significant.	Regular monitoring of emissions and control measures will be taken to reduce the emission levels.

			<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> • Power generation by DG Set during power failure • Emission from vehicular traffic in use 	<ul style="list-style-type: none"> • Use of low sulphur diesel if available • Providing Footpath and pedestrian ways within the site Green belt will be developed with specific species to help to reduce PM_{2.5} & PM₁₀ level • Use of equipment fitted with silencers • Proper maintenance of equipment 	<p>Not significant.</p> <p>DG set would be used as power back-up (approx 4 hours)</p> <p>No significant increase in ambient air quality level is expected from the project's activities.</p> <p>There are no sensitive receptors located within the vicinity of site.</p>	<ul style="list-style-type: none"> • Use of Personal Protective Equipment (PPE) like earmuffs and earplugs during construction activities. • Stack height of DG set above the tallest building as per CPCB standards
5.	Noise Environment					

			<p><u>Operation Phase</u></p> <ul style="list-style-type: none"> Noise from vehicular movement Noise from DG set operation 	<p>Green Belt Development</p> <ul style="list-style-type: none"> 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 will be limited to day time hours only DG set room will be equipped with acoustic enclosures 	<p>No significant impact due to suitable width of Greenbelt.</p>	
--	--	--	--	--	--	--

6.	Land Environment	Soil contamination	<u>Construction Phase</u> <ul style="list-style-type: none"> • Disposal of construction debris 	Construction debris will be collected and suitably used on site as per the solid waste management plan for construction phase	No significant impact. Impact will be local, as waste generated will be reused for filling of low lying areas etc.	
			<u>Operation Phase</u> <ul style="list-style-type: none"> • Generation of municipal solid waste • Used oil generated from D.G. set 	<ul style="list-style-type: none"> • It is proposed that the solid waste generated will be managed as per MSW Rules, 2016. • Collection, segregation, transportation and disposal will be done as per MSW Management Rules, 2016 by the authorized agency • Used oil generated 	Since solid waste is handled by the authorized agency, waste dumping is not going to be allowed. Not significant. Negligible impact.	

				will be sold to authorized recyclers		
7.	Biological Environment (Flora and Fauna)	Displacement of Flora and Fauna on site	<u>Construction Phase</u> <ul style="list-style-type: none"> Site Development during construction 	<ul style="list-style-type: none"> Important species of trees, if any, will be identified and marked and will be merged with landscape plan 	The proposed site has shrubs as vegetation	
			<u>Operation Phase</u> <ul style="list-style-type: none"> Increase in green covered area 	<ul style="list-style-type: none"> Suitable green belts will be developed as per landscaping plan in and around the site using local flora 	Beneficial impact.	
8.	Socio-Economic Environment	Population displacement and loss of income	<u>Construction Phase</u> <ul style="list-style-type: none"> Construction activities leading to relocation 	<ul style="list-style-type: none"> The project will be developed as per the license obtained from Directorate of Town & Country Planning, 	No negative impact.	

				Haryana (DTCP).		
			<u>Operation Phase</u> <ul style="list-style-type: none"> • Site operation 	<ul style="list-style-type: none"> • 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	
9.	Traffic Pattern	Increase of vehicular traffic	<u>Construction Phase</u> <ul style="list-style-type: none"> • Heavy Vehicular movement during construction 	<ul style="list-style-type: none"> • Heavy Vehicular movement will be restricted to daytime only and adequate parking facility will be provided 	No negative impact	
			<u>Operation Phase</u>	<ul style="list-style-type: none"> • Vehicular movement will be regulated inside 	No major significant impact	

			<ul style="list-style-type: none">Traffic due to vehicles once the project is operational	the project with adequate roads and parking lots in the project.	as green belt will be developed which will help in minimizing the impact on environment.	
--	--	--	---	--	--	--

10.2 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.

10.2.1 EMP for Air Environment

Construction Phase

To mitigate the impacts of PM₁₀ & PM_{2.5} 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. 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 cool 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 a Integrated Complex 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.

10.2.2 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 use at night time.

Job Rotation and Hearing Protection: 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:

- Adoption of Noise emission control technologies
- Greenbelt development

Greenbelt Development

The following species can be used, as in a greenbelt, to serve as noise breakers:

- *Cassia Fistula*,
- *Delonix Regia*
- *Bauhinia purpurea*
- *B. Variegata*
- *Polyalthia longifolia*

10.2.3 EMP FOR WATER ENVIRONMENT

Construction Phase

To prevent degradation and to maintain the quality of the water source, adequate control measures have been 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 would be taken to avoid soil erosion
- Common toilets will be constructed on site during construction phase and the wastewater would be channelized to the septic tanks in order to prevent wastewater 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.
- 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
- 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, including all possible potential for rain water harvesting. Following measures will be adopted:

- Water source development.
- Minimizing water consumption.

Water Source Development

Water source development is practiced by installation of scientifically designed Rain Water Harvesting system/Artificial Lake. 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. 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 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 for ground water recharge in future. 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

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

10.2.4 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 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, 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 Wastes (Management, Handling & Trans boundary 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.

Waste from Temporary Makes Shift Tents for Labors

Wastes generated from temporary make shift labor tents which will be managed scientifically.

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 proposed 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 public 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 the project premises by Organic waste convertor. The recyclable wastes will be sent off to recyclabers. Proper guidelines for segregation, collection and storage will be prepared as per MSW 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.

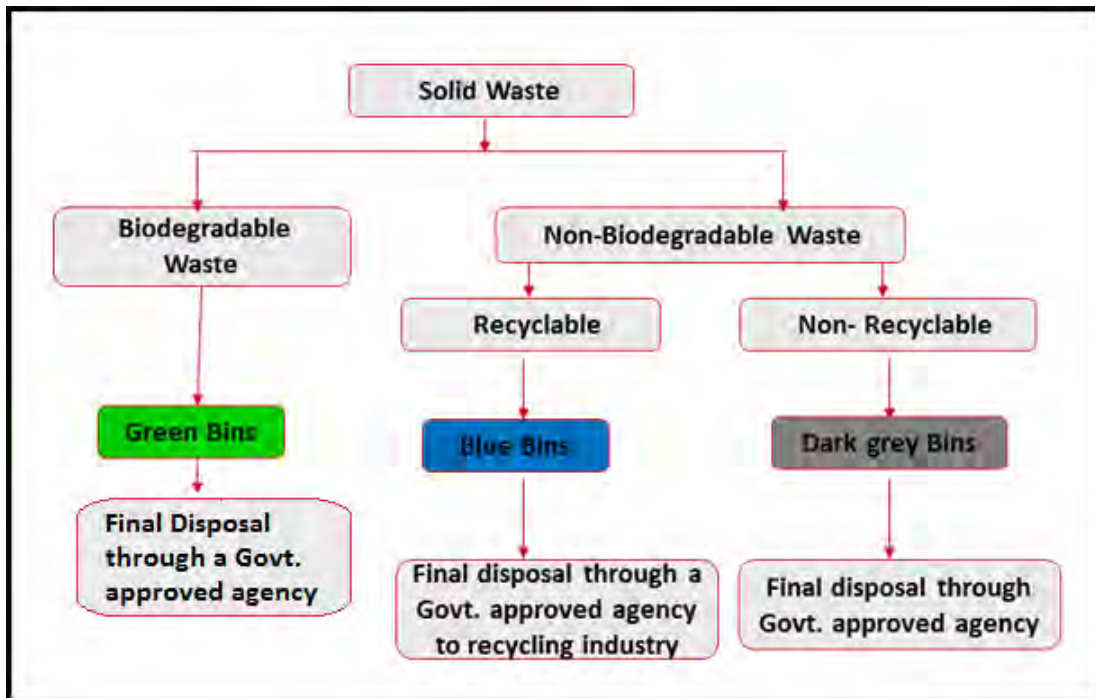


Figure 4: Waste Management Flow Diagram

10.2.5 EMP FOR ECOLOGICAL ENVIRONMENT

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 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 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.

Green Belt Development Plan

The plantation matrix adopted for the green belt development includes pit and asequate spacing.. 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.

Peripheral 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 SO₂ and NO₂ 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.

10.2.6 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 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 outlined 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.

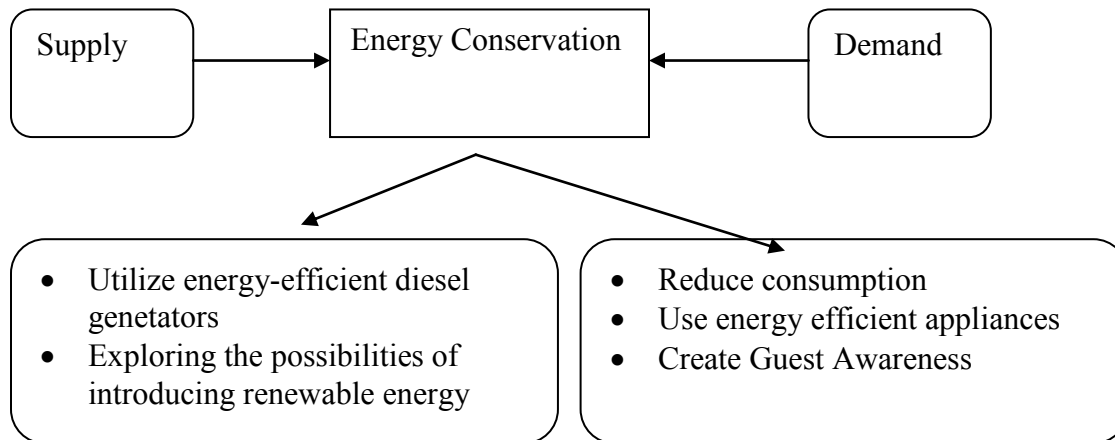
- **Improved Working Environment for Employees**

The project would provide safe and improved working conditions for the workers employed at the facility during construction and operation phase. With the proposed 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

10.2.7 EMP FOR ENERGY CONSERVATION

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



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

❖ **Architectural design**

- 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**

- 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 public awareness on energy conservation
- Training staff on methods of energy conservation and to be vigilant to such opportunities.

10.3 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.

10.3.1 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:

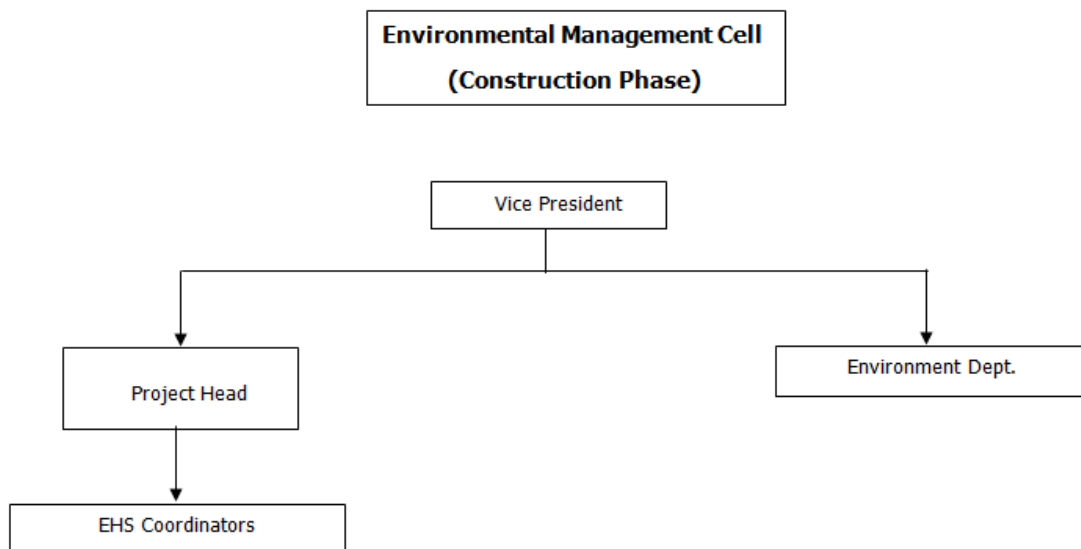
- To implement the environmental management plan.
- To assure regulatory compliance with all relevant rules and regulations.
- To ensure regular operation and maintenance of pollution control devices.
- To minimize environmental impact of operations as by strict adherence to the EMP.
- To initiate environmental 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 Affordable Group Housing Project. The hierarchical structure of suggested Environmental Management Cell is given in following **Figure 7.**

Figure 5: Environment Management Cell Structure



10.3.2 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.

Table 7 : Suggested Monitoring Program for Project

S. No.	Type	Locations	Parameters	Period and Frequency
1.	Ambient Air Quality	Project Site	Criteria Pollutants: SO ₂ , NO ₂ , PM ₁₀ , PM _{2.5} , CO	Twice in a Year as per EIA Notification 2006.
2.	Groundwater (Portability testing)	Project site	Drinking water parameters as per IS 10500.	Twice in a Year as per EIA Notification 2006
3.	Ambient Noise	Project site	dB (A) levels	Twice in a Year as per EIA Notification 2006
4.	Soil quality	Project site	Organic matter, C.H., N, Alkalinity, Acidity, heavy metals and trace metal, Alkalinity, Acidity.	Twice in a Year as per EIA Notification 2006
5.	Waste Characterization	Commercial	Physical and Chemical composition	Twice in a Year as per EIA Notification 2006

10.3.3 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:

Contractors

Contractors 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.

10.3.4 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.