1. INTRODUCTION

1.1 Project Background

M/s Sikka Developers Pvt. Ltd is one of the Sikka Group of the companies. Sikka group is well known in National Capital Region and North India for building different types of projects like residential, commercial, IT Parks, Hotels etc. M/s Sikka Developers Pvt. Ltd. is going to develop an affordable group housing project known as "Sikka Kannan Green", at Khasra NO. 321,322,324,325,329,330 VILLAGE-Sadabad KHASRA NO. 679, 679k, 68, 681, 682 &683 Village Abupur Modinagar NH-58 Ghaziabad Uttar Pradesh on land / plot area measuring 22154.99 m^2.

1.2Site Location, Other Features & Landuse

1.2.1 Locational Features & Connectivity

The proposed project site is located at Khasra NO. 321,322,324,325,329,330 Village-Sadabad KHASRA NO. 679, 679k, 68, 681, 682 &683 Village Abupur Modinagar NH-58 Ghaziabad Uttar Pradesh .The project site is well connected through service road to NH-58 which is adjacent to the project site.

The below mentioned **Table No.1** highlights the Site location, key surrounding features (with approx distance and direction) and the connectivity to the site. The site location and its surrounding features on Google map within 30m and 500 m are shown in Figure 1 and 2. Also the surrounding features within 500m radius are highlighted on the google image and are shown from **Figure 1**.

Table No. 1: Key Surrounding Features

Parameters	Features	Distance & Directions
Coordinates	28°47'39.35"N, 77°32'2.92" E	-
Nearest Railway Station	Modinagar Railway Station	Approx. 5.28 km, NW
Nearest Airport	Indira Gandhi International Airport	Approx. 50.05km, NW
Nearest Highway	NH58	Adjacent to project site
Nearest School	Maharishi Vidya Mandir	Approx.0.21 KM, SSW
Nearest Hospital,	Anand Hospital	Approx.3.75 km, SW

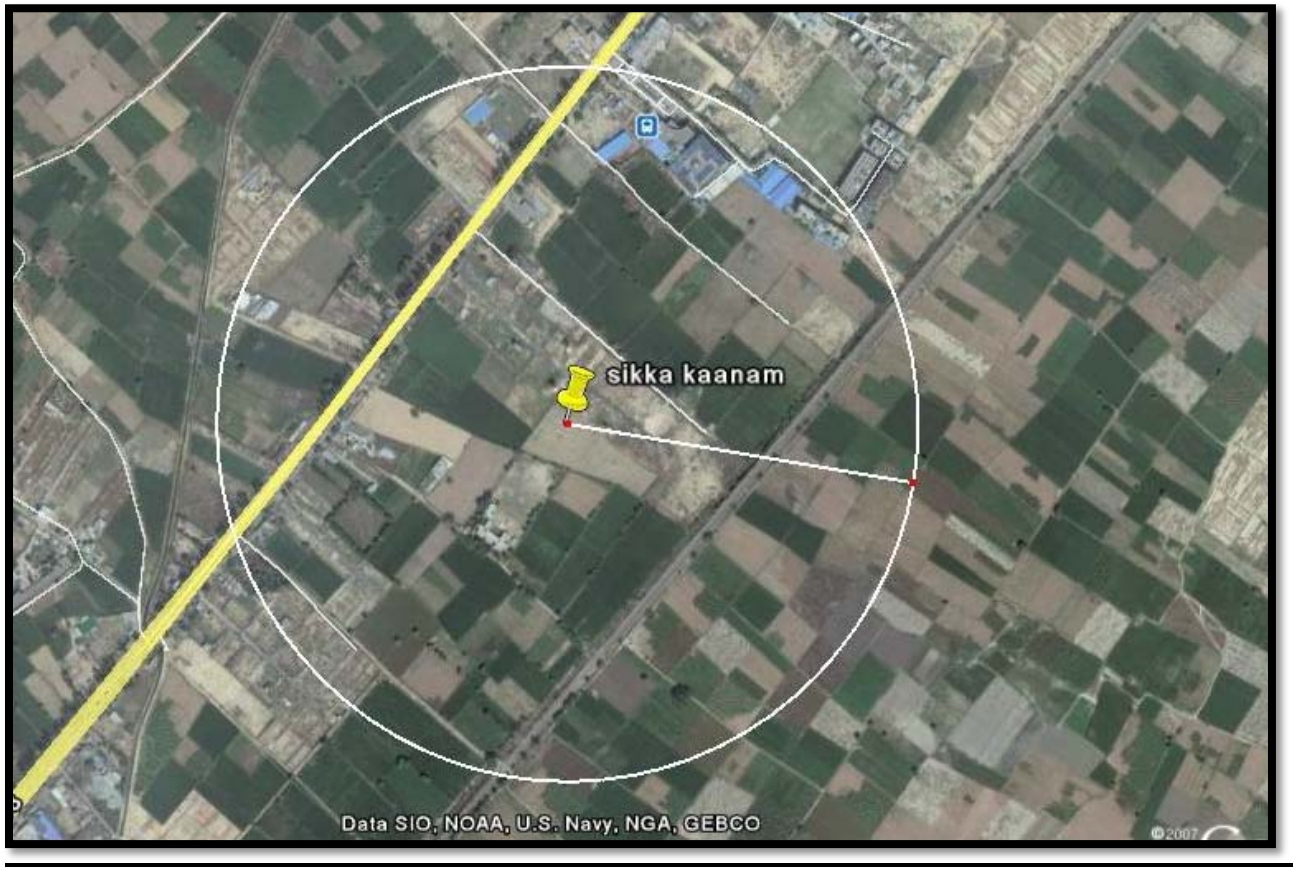


Figure no 1: Site & Surrounding on Google map (within 500m radius of the project site)

1.2.2 Landuse

The site is a vacant land. It is anticipated that the construction activities of the project will not have an adverse effect on the present land use activities in the project area. The Land has been allowed for Residential purpose.

2. AREA FEATURES & PROJECT REQUIREMENT

2.1 Area Details

The Proposed project will be developed on the total plot area of 23926.9 $m^{2.}$ i.e 5.91 Acres. The detailed Area Statement is provided below:

Table No. 2: Area Statement

S.No.	Particulars	Area (m^2)
A	Total plot area	23926.9
B	Road Widening area	308.89
C	Area of Master plan green belt	1463.02
D	Net plot Area(A-B+C)	22154.99
E	15% Green of net plot area	3323.2485
F	Permissible Stilt/ Gr Cov	11077.495
	Proposed Stilt Area	
1	BlockA	515.8
2	Block B	515.8
3	Block C	515.8
	Block D	-
4	Block E	515.8
5	Block F	514.1
6	Block G	483.58
	Block H	492.32
7	Nursury School	-
8	Block-I Commercial / 1 room unit plan	-
9	Kiosk Area	-
10	Electrica Sub Station Area	-
	Total Stilt Area	**3,553.20**
	Proposed ground Coverage	
1	BlockA	515.8

2	Block B	515.8
3	Block C	515.8
	Block D	697.7
4	Block E	515.8
5	Block F	514.1
6	Block G	483.58
	Block H	492.32
7	Nursury School	162.5
8	Block-I Commercial / 1 room unit plan	380.92
9	Kiosk Area	67.5
10	Electrica Sub Station Area	50
G	**Total Ground Coverage**	**4911.82**
H	Proposed basement area	13188.64
I	Permissible FAR	
	Permissible FAR @ 2.50	55387.475
	5% Permissible FAR of Green Building	2769.37375
	Total Permissible FAR	**58156.84875**
	Break up of Permissible FAR Area	
1	Permissible commercial/community (FAR) maximum 10%	5538.74
2	Permissible Residential FAR (90%)	49,848.73
3	Green building FAR Area (5%)	2,769.37
J	**Proposed FAR**	
1	Commercial	1139.34
2	**Community**	
a	Nursury School	487.5
b	Community Area	697.7
3	Residential FAR	
	Block A	6846.74
	Block B	6877.4
	Block C	6844.64
	Block D	6844.64
	Block E	6844.64
	Block F	6829.1
	Block G	6401.82
	Block H	6504.86
	Block I	1503.68
	5% excess area count in FAR area	37.15

	Kiosk Area in FAR	67.5
	Total proposed FAR	**57926.71**
k	**Service Area**	**185**
l	Non FAR Area of Blocks	2907.84
	Mumty area of school & commercial	71.9
	Machine room area of Commercial	12.75
	Service floor area	377.5
	Total Non FAR Area	**3369.99**
m	**Total Built-up area**	**78223.54**
n	Open Area	17243.17
a	Cycle Track	673
b	Open Parking Area	1787
c	Road Area	9615.93
d	Green Area	3323.2485

2.2 Detail of Building Materials

The details of the Building materials to be used in the project are mentioned in Table No 3 below:

Table No 3: List of Building Materials being used at site

Sl. No.	Material used	Sl. No.	Material used
i.	Coarse sand	ii.	MDS, MCBs
iii.	Fine sand	iv.	PVC overhead water tanks
v.	Stone for masonry work	vi.	PPR (ISI marked)
vii.	Cement	viii.	PVC wastewater lines
ix.	Reinforcement steel	x.	S.W. sewer line up to main sewer
xi.	Pipe scaffolding (cup lock system)	xii.	PVC rain water down take
xiii.	Bricks	xiv.	Stainless steel sink in kitchen
xv.	CLC fly ash blocks	xvi.	Joinery hardware- ISI marked
xvii.	Crazy (white marble) in grey cement	xviii.	MDS, MCBs

2.3 Detail of Machineries

The details of the Building materials to be used in the project are mentioned in Table No 4 below:

Sl. No.	Material used	Description
i.	Dumper	Will be used for mud and material handling
ii.	Excavator	Will be used for digging and earth work
iii.	Concrete Batching Plant	Will be used for concrete mixing
iv.	Road roller	For compacting the earth
v.	Cranes	Used for lifting heavy things.
vi.	Mobile transit mixer	Transport and mix concrete up to the construction site

2.4 Population

The total population for the proposed project will be counted as per the Ghaziabad Bye laws. Hence for the proposed project the Total Population calculation is mentioned below:

Table No 5: Population Calculation

S. No.	Unit Type	DU or Area	PPU	Total Population
	Residential			
1.	Group Housing	932	5	4660
a	Staff (5%)			233
b	Visitors (10%)			466
	Total			**5359**
2.	Commercial	1139.34	3person /m^2	
	Staff (10%)			**20**
3.	Kiosk			
	Staff			**9**
4.	Nursury School	487.50	3person /m^2	
	Staff			**12**
5.	Community Area	697.70	3person /m^2	
	Staff			**10**
Grand Total(1+2+3+4+5)				**5410**

2.5 Water Requirement

2.5.1 During Construction:

Water will be sourced from Common STP of Ghaziabad with proper permission from the concern Authority.

2.5.2 During Operation Phase:

During the operational phase, water supply will be provided by the Ghaziabad Development Authority. The total water requirement of Affordable Housing Project, during the operation phase will be approx. 433KLD out of which total domestic water requirement will be 433 KLD. The fresh water requirement will be approx. 303 KLD (which is 70% of the domestic water requirement). The daily water requirement and wastewater generation calculation is given below in Table 6

Table No 6: Daily Water Demand Calculations

Sl. No.	Parameters	Description	Unit Rate of water demand(lpcd)	Total Water Requirement (KLD)
1	**Domestic Water**			
a	Group Housing	4660	86	400.76
b	Staff	233	30	6.99
c	Visitor	466	15	6.99
2	Commercial			
a	Staff	20	30	0.6
3	Kiosk			
a	Staff	9	30	0.27
4	Nursury School			
a	Staff	12	30	0.36
5	Community Area			
a	Staff	10	30	0.3
Total Domestic water requirement				**416.27 KLD say 416 KLD**
2	Landscape area (Area in m^2)	3323.24	3l / m^2	9.96

3	DG Set (Capacity in KVA)	1200kVA	0.9 l /KVA/hr	6.552
Total Water Requirement (Sum of A+B+C)				**432.51 Say 433 KLD**
Total Fresh water Requirement				**303.1 say 303 KLD**

2.6 Power Details

2.6.1 Power Requirement

2.6.2 The Bulk power supply connection will be taken from Paschimanchal Vidyut Vitran Nigam Ltd. The ultimate load for the proposed Project will be approx. 2378 KVA.

2.6.3 Power Backup

There are provisions for 1 nos. of DG sets of total capacity of 1200 kVA , power back up in the proposed project. The DG sets will be equipped with acoustic enclosure to minimize noise generation and adequate stack height for proper dispersion.

2.7 Parking

Adequate provision will be made for car/vehicle parking at the project site. Internal roads of 6 m width, footpaths/pedestrian pathways have been well planned for the proposed project.
There will also be adequate parking provisions for visitors so as not to disturb the traffic and allow smooth movement at the site.

2.7.1 Parking Required

Table No. 7: Parking Requirement as per the Regulatory Norms

Sl. No.	Particulars	Norms	FAR/ No of flats	Parking Required (in ECS)
As per MoEF&CC norms:				
1.	Residential	1 ECS/100 m^2 FAR area FAR area	55602.17	556
2.	Commercial	1 ECS/50 m^2 FAR area FAR area	2324.54	47

Total Parking Required as per MoEF&CC Norms				603
As per Ghaziabad Bye-laws:				
1.	Residential	1 ECS/2 flats of area 50to 70 m^2 FAR area	928	448
2.	Commercial	2ECS for 100 Sqm of FAR area	1139.34	23
3.	Community	2ECS for 100 Sqm of FAR area	697.70	14
4.	Nursury School	1ECS for 100 Sqm of FAR area	487.50	5
5.	Block I	2 Sqm per flat	36	72Sqm or 3 ECS
	Total Parking required			**493**

2.7.2 Parking Proposed

The parking proposed for the proposed project is mentioned in the following table:

Table No.8: Parking Calculation in the Proposed Project as per MoEF & CC Norm

Particulars	Area in m^2	ECS/m^2 area as per Norms	Total ECS Provided
Basement	11200	32	350
Stilt	2660	28	95
Open Parking	1978	23	86
Total			**531**

Considering the above calculation the parking proposed will be **531 ECS**

3. ANTICIPATED IMPACTS & MITIGATIONAL MEASURES

3.1 Wastewater Generation and Recycling

It is expected that the project will generate approx 345 KLD of wastewater. The wastewater in the proposed project is comprised of 80% of Fresh water and 100% of flushed water used. The wastewater calculation is shown in the following table:

Table No 9: Wastewater Calculations

Parameters	Details (in KLD)
Domestic Water Requirement	**433 KLD**
• Potable / Fresh (70% of domestic)	303 KLD
• Flushing (30% of domestic)	130 KLD)
Wastewater Generated (80% fresh + 100% flushing)	**345.4 (say 345 KLD)**

The wastewater will be treated in the STP of capacity 415 KLD provided within the complex generating 311 KLD of recoverable water from STP which will be recycled within the project. Among the recycled/recoverable water 130 KLD will be utilized for flushing, 10 KLD for Horticulture purpose, 6KLD for D.G sets and 12 KLD will be utilized for Basement washing, floor washing. About 152 KLD during non rainy season and 162 KLD during rainy season will be send to nearby construction site or discharge to sewer line. The water balance diagrams during dry & monsoon season are given below in **Figure 2 & 3** respectively in the next pages.

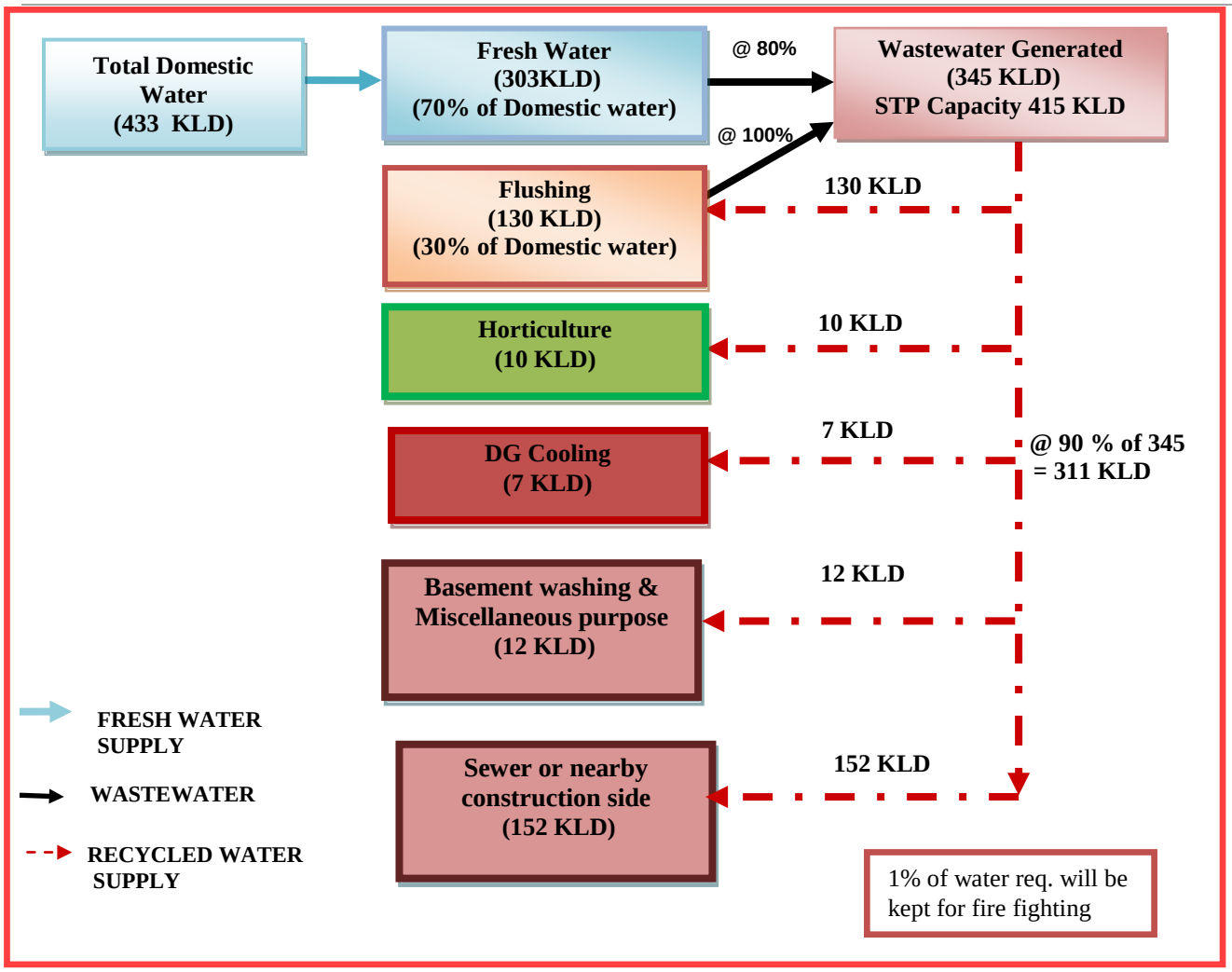


Figure 2: Water Balance Diagram during dry season

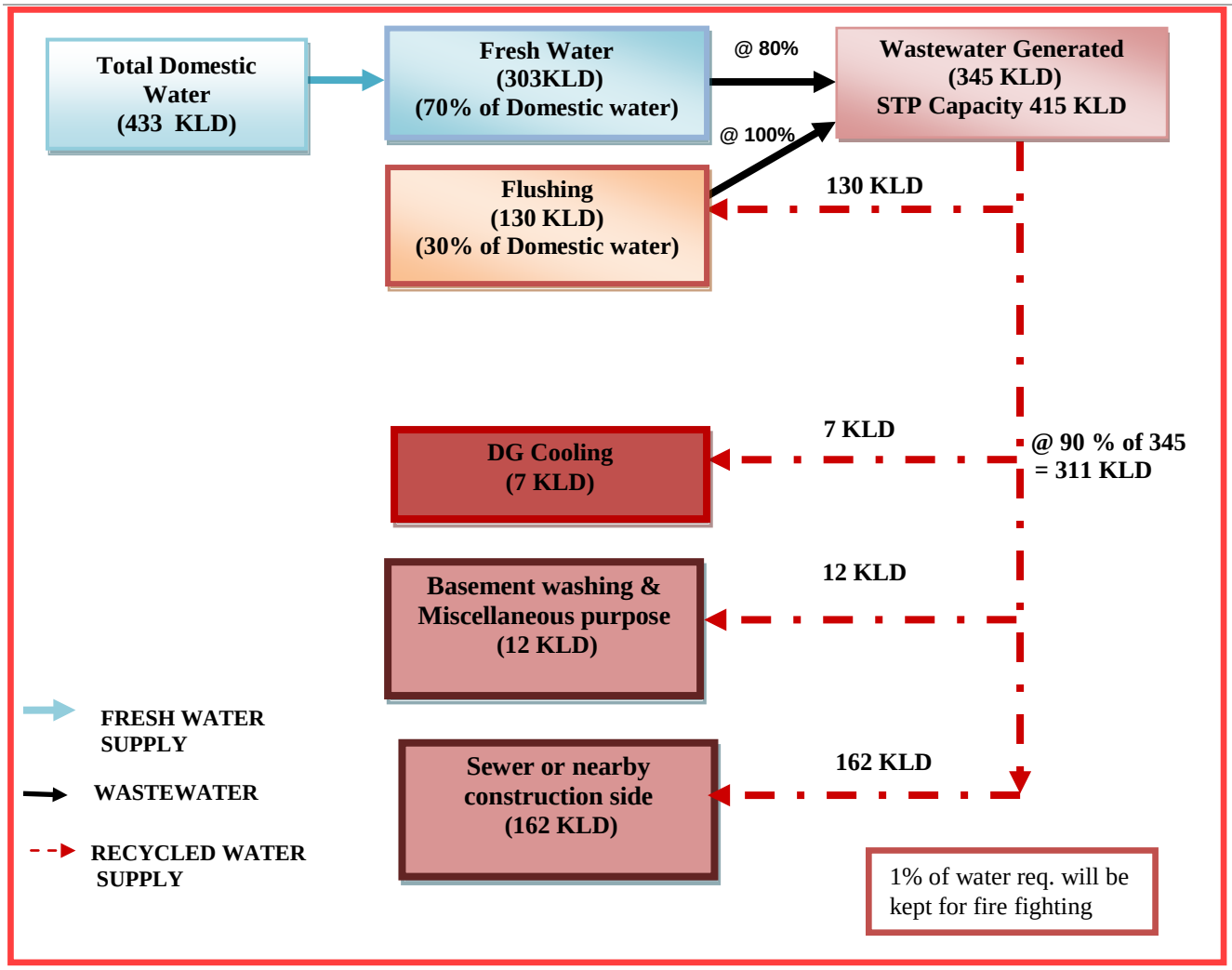


Figure 3: Water Balance Diagram during Monsoon Season

3.2 Solid waste Generation and Management

During the operation phase, waste will comprise domestic, sludge from STP and horticulture waste. The solid waste generated from the project will be mainly domestic waste (considering @ 0.45 kg per capita for residents, @0.25 kg per capita per day for staff & @ 0.15 kg per capita Visitors) which will be 2237 kg per day and estimated quantity of the total waste will be approx. 39 kg/day (including landscape waste (for green belt) @ 5 kg/acre/day). Following table shows the solid waste calculations at the site in accordance to Municipal Solid Wastes (Management and Handling) Rules, 2000 and its amendments.

Table 10: Calculation of Solid Waste Generation

Sl. No.	Category	Counts/ Occupants / area in square metre/ unit in KLD	kg per unit/capita per day	Waste generated (kg/day)
1	Residents	4660	0.45	2097
2	Staff	284	0.25	71
3	Visitors	466	0.15	69
			Total Domestic Waste Generated	**2237**
4	Landscape waste (for green belt)	3323.24 m^2	5 kg/acre	4.1
5	STP Waste			30
Total Solid Waste Generated				**2269.1 or 2269 Kg/day**

(*Source: For Waste Collection, Chapter 3, Table 3.6, Page no. 49, Central Public Health & Environment Engineering Organization, Ministry of Urban Development, (Government of India, May 2000)*

3.3 Noise Pollution Management

The major source of noise pollution in project will be the noise from DG sets and the vehicular noise. Acoustic enclosure will be provided to the DG sets for controlling noise pollution. Personal protective equipment i.e earmuff/ earplugs will be provided to workers working in the high noise area.

3.4 Soil Pollution Management

Development and construction activities involve earthwork and excavation. Soil will be dug out and moved. Most of this will be used for filling the low lying areas in the vicinity. Some amount will also be used in pots for plants. No soil pollution is thus envisaged.

3.5 Heat Island Effect

Heat Island Effect is a major issue of urbanization. Heat emissions from the proposed 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. The Environment management Plan for Heat Island Effect is mentioned in the EMP section.

4. ENVIRONMENT MANAGEMENT PLAN FOR SUSTAINABLE DEVELOPMENT

4.1 Water Management

4.1.1 Wastewater Treatment System

Appropriate provision will be made to deal with treatment of wastewater by installing proper sewage collection system and Sewage Treatment Plant of adequate capacity (at least 20% higher than the total wastewater generated).

4.1.1.1 Sewerage System

An external sewage network will collect the sewage from all units, and flow by gravity to the proposed sewage treatment plant.

Following are the benefits of providing the Sewage Treatment Plant in the present circumstances:

- Reduced net daily water requirements from tube wells, source for Horticultural purposes by utilization of the treated wastewater. This will consequently lead to a lower withdrawal from the underground aquifer water sources.
- Reduced dependence on the public utilities for water supply and sewerage systems.
- Sludge generated from the Sewage Treatment Plant will be rich in organic content and an excellent fertilizer for horticultural purposes.

4.1.1.2 Treatment Technology

The M/s Sikka Developers Pvt. Ltd. is proposing a sewage treatment plant with state-of-the-art membrane separation technology called as Moving Bed Bio-film Reactor Technology which can produce very good quality with highest possible bacterial reduction without adding any chemicals. The technology is based on attached growth aerobic treatment followed by clarification by a tube settler. Lime will be dosed in for suppression of foaming tendencies. The clarified water will be filtered in a pressure sand filter after dosing of coagulant (alum) for removal of unsettled suspended impurities. This water will be passed through an activated carbon filter for removal of organics. The filtered water from ACF is then chlorinated & stored in the flushing tank.

The attached growth Moving Bed Bio Reactor process combines the biological processes of attached & suspended growth. It combines submerged film with extended aeration for treatment of the wastewater.

The wastewater after screening is collected in an equalization tank. The equalization tank is required for preventing surges in flow & facilitating equalization of characteristics over the entire quantity of effluent in a given time. A provision for pre-aeration is made in the equalization tank in order to ensure mixing & to prevent the sewage from going septic.

The equalized sewage is then pumped into the MBBR tank for biological processing. The water enters the bottom of the reactor & flows up through the fixed film media which grossly enhances

the hydraulic retention time & provides a large surface area for growth of biological micro – organisms. The MBBR tank is aerated by fine pore sub – surface diffusers which provide the oxygen for organic removal. The synthetic media floats on the water & the air agitation ensures good water to micro-organism contact.

The MBBR treatment is an attached growth type biological treatment process where in, the majority of biological activity takes place on the surface of the PVC media. Continuous aeration ensures aerobic activity on the surface of the media. Micro – organisms attach themselves on the media & grow into dense films of a viscous jelly like nature. Wastewater passes over this film with dissolved organics passing into the bio-film due to concentration gradients within the film. Suspended particles & colloid may get retained on this sticky surface where they are decomposed into soluble products. Oxygen from the aeration process in the wastewater provides oxygen for the aerobic reactions at the bio-film surface. Waste products from the metabolic processes diffuse outward & get carried away by the wastewater or air currents through the voids of the media.

The aerated effluent passes into a tube deck settler for clarification. The theory of gravity tube settler system is that the carrier fluid maintains laminar flow in the settling media at specified maximum viscosity. These two parameters of a carrier fluid, flowing through a hydraulic configuration, will determine the velocity gradients of the flow, the height of boundary layer at the inclined surface and the residence time within the media.

The carrier fluid must be viscous Newtonian, exhibiting a Reynolds number of less than 1000 and preferably, a number under 400. The laminar flow, through the inclined tubes, will produce velocity gradients sufficiently large to form an adequate boundary layer, where the velocity of fluid approaches zero. Boundary layers are necessary in functioning tube settlers, to allow suspended solids to separate from the viscous carrier fluid. Under gravitational forces, they will settle to the hydraulic surface of the tube and subsequently from the clarifier media.

Since the tubes are inclined at 60 degrees, solids settled on the tubes are continually discharged down. This downward rolling action increases particle contact and hence further agglomeration, which increases the sludge settle ability. Studies show that these agglomerated sludge particles can have a settling rate in excess of ten times the settling rate of the individual floc particles in the influent. These heavy agglomerated masses quickly slide down the 60 degree inclined tube and settle at the bottom of the tank.

At the bottom of the Tube deck, where the sludge leaves the Tube surface, the larger agglomerated captures smaller particles in the upcoming stream. This solid contact phenomenon greatly enhances the capture efficiency.

4.1.1.3 Wastewater Details

The wastewater detail is given in the following table:

Table No 11: Wastewater Details

Parameters	Details
Daily load	358 KLD
Duration of flow to STP	24 hours
Temperature	Maximum 32^{o}C

Table No 12: Raw Sewage Characteristics

Sl. No.	Parameter	Unit	Average
	pH	-	6.0– 8.5
	Suspended Solids	Mg/l	300-450
	BOD (5 days at 20 ºC)	Mg/l	250 – 300
	COD	Mg/l	300 – 450
	Oil & Grease	Mg/l	< 50

Table No 13: Treated sewage analysis after ultra filtration system

Sl. No.	Parameter	Unit	Treated water
1	pH	-	7.0–8.0
2	Suspended solids	Mg/l	< 10
3	BOD	Mg/l	< 20
4	COD	Mg/l	< 50
5	Oil & Grease	Mg/l	< 10

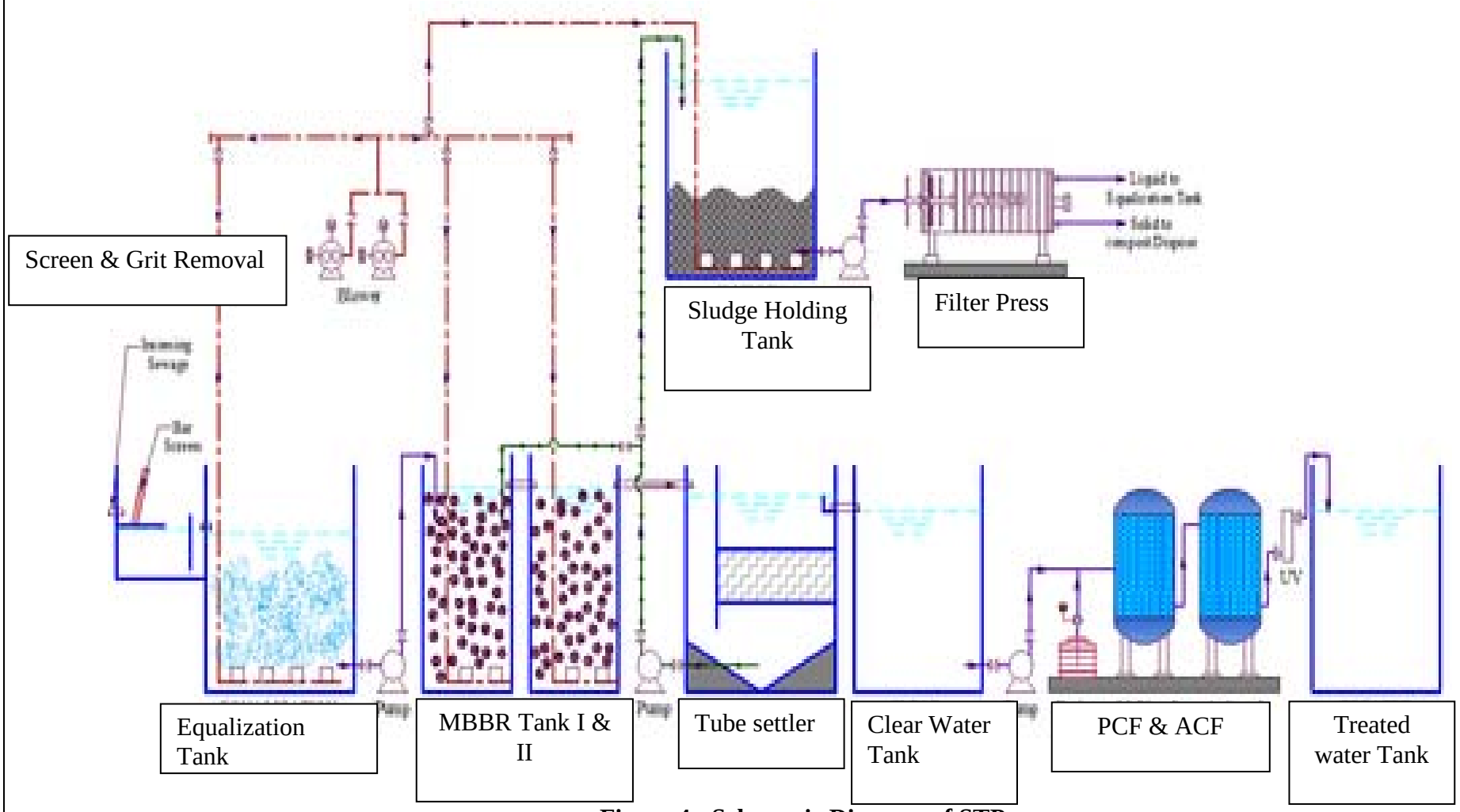


Figure 4 : Schematic Diagram of STP

4.1.1.4 Sewage Quality

The Sewage discharged from the Bio reactor system will contain sloughed biological solids, but would be relatively free of soluble organic chemicals. The quantity of biological solids in the sewage will depend substantially on the quantity of suspended solids and the concentration of soluble BOD entering system. It is therefore necessary to provide means of separating the biological mass from the sewage. Package unit contains tube settlers for sedimentation and 60 Gross fluted Rigid PVC fill media for the MBBR units to treat the wastewater for discharge into the receiving waters and/or the sanitary sewers as per the local regulations. The media thickness changes with the design parameters/depth of the unit and can vary from 0.25 to 0.40 mm thickness.

a. **Tube Settler:** Here we are providing the Tube Settler along with the PVC media which will enhance the contact period and thereby the improved performance. The Tube settler will have a determined lope in the bottom to collect the suspended solids from the wastewater. The sludge will be suited to the Sludge Drying Beds.
b. **Pressure Sand Filter:** Here the treated water coming from the TSS will be treated for the suspended impurity removal.
c. **Activated Carbon Filter**: Here the water coming from the ACF will be treated for colour removal, suspended impurity removal and the treated water will be sent to the sewer.
d. **Filter Press:** A filter comprises a set of vertical, juxtaposed recessed plates, presses against each other by hydraulic jacks at one end of the set. The pressure applied to the joint face of each filtering plate must withstand the chamber internal pressure developed by the sludge pumping system. This vertical plate layout forms watertight filtration chambers allowing easy mechanization for the discharge of cakes. Filter clothes finely or tightly meshed are applied to the two grooved surfaces in this plat.

4.1.2 Rain Water Harvesting and Ground Water Recharge

The storm water management system for the premises will be self-sufficient to avoid any collection/ stagnation and flooding of water. The amount of storm water runoff depends upon many factors such as intensity and duration of precipitation, characteristics of the tributary area and the time required for such flow to reach the drains. The drains will be located near the carriage way along either side of the roads. Taking the advantage of road camber, the rainfall run off from roads will flow towards the drains. Storm water from various plots/will be connected to adjacent drain by a pipe through catch basins.

. Details of rainwater harvesting calculation are given below:

Following are some features of Storm Water Drainage and management at the site:

i. Since the existing topography is congenial to surface disposal, a network of storm water pipe drains is planned adjacent to roads. All building roof water will be brought down through rain water pipes.

ii. Proposed storm water system consists of pipe drain, catch basins and seepage pits at regular intervals for rain water harvesting and ground water recharging.

iii. For basement parking, the rainwater from ramps will be collected in the basement storm water storage tank. This water will be pumped out to the nearest external storm water drain.

Table No. 14: Calculations for Storm Water load

Type of Area	Area (in m2)	Coefficient of run-off	Peak rainfall intensity during one hour of rainfall (in m)	Rain water harvesting potential/hour (in m3/)
Roof-top area	4911.82	0.85	0.04	167
Total storm water load on the site with per hour retention is = 167 m3/hr.				
Considering 15 minutes retention time, total storm water load				42 m3
Total Volume of a single Recharge pit along with de-silting chamber				15.02 m3
Hence No. of pits required = 42/15.02 = 2.8 SAY 3 Pits as per calculation. 5 pits along with this 1 tank of 11 KL are proposed for horticulture purpose.				

Design specifications of the rain water harvesting plan are as follows:

- Catchments/roofs would be accessible for regular cleaning.
- The roof will have smooth, hard and dense surface which is less likely to be damaged allowing release of material into the water. Roof painting has been avoided since most paints contain toxic substances and may peel off.
- All gutter ends will be fitted with a wire mesh screen and a first flush device would be installed. Most of the debris carried by the water from the rooftop like leaves, plastic bags and paper pieces will get arrested by the mesh at the terrace outlet and to prevent contamination by ensuring that the runoff from the first 10-20 minutes of rainfall is flushed off.
- No sewage or wastewater would be admitted into the system.

- No wastewater from areas likely to have oil, grease, or other pollutants has been connected to the system.

4.2 Air Environment Management

During Construction period the impact on air environment will be temporary and will be limited to the project only. During operation phase, there will be increase in atmospheric concentration of gases since operation of DG sets for back up electricity supply during power failure will cause emission of PM, SOx, NOx and CO and particulate matter. However, the D.G. Sets will be operational only during power failure and **low sulphur diesel** will be used. Adequate stack heights of D.G. Sets will be provided as per the stipulated guidelines of Central Pollution Control Board (CPCB) to facilitate natural dispersion of exhaust gases considering height of the building.

4.3 Noise Management

- Provision of silencer to modulate padding/noise isolators at equipment /machinery used for construction.
- DG Sets will be provided with acoustic enclosures to modulate the noise generation.
- Provision of protective device like ear muff/plugs to the workers, working on the noise generating machines.
- Regular maintenance of vehicles & machinery would be taken up.
- Construction activity will be limited up to Day time only.

4.4 Soil Management

- Stacking of excavated soil material in an excavated area and every care will be taken to prevent soil erosion.
- The total excavated quantity of excavated earth material will be used for internal roads and backfilling of campus & also be used in plantation & greenbelt development on site.
- Area will be properly fenced and provided with proper drainage pattern.
- Proper ventilation system will be provided to all part of the work areas.

4.5 Solid Waste Management

Solid waste would be generated both during the construction as well as during the operation phase. The solid waste management system is the combined management system of collection, segregation and disposal of solid waste during construction as well as during operation stage.

4.5.1 Construction Phase

The solid waste expected to be generated during the construction phase will comprise of excavated materials, used bags, bricks, concrete, MS rods, tiles, wood etc. The following steps are proposed to be followed for the management solid waste at construction stage:

- Construction yards are proposed for storage of construction materials.
- The excavated material such as topsoil and stones will be stacked for reuse during later stages of construction.
- Excavated top soil will be stored in temporary constructed soil bank and will be reused for landscaping of the project.
- Remaining soil will be utilized for refilling / road work / rising of site level at locations/ selling to outside agency for construction of roads etc.

Figure 5 highlights the methodology for collection and management of solid waste during construction stage.

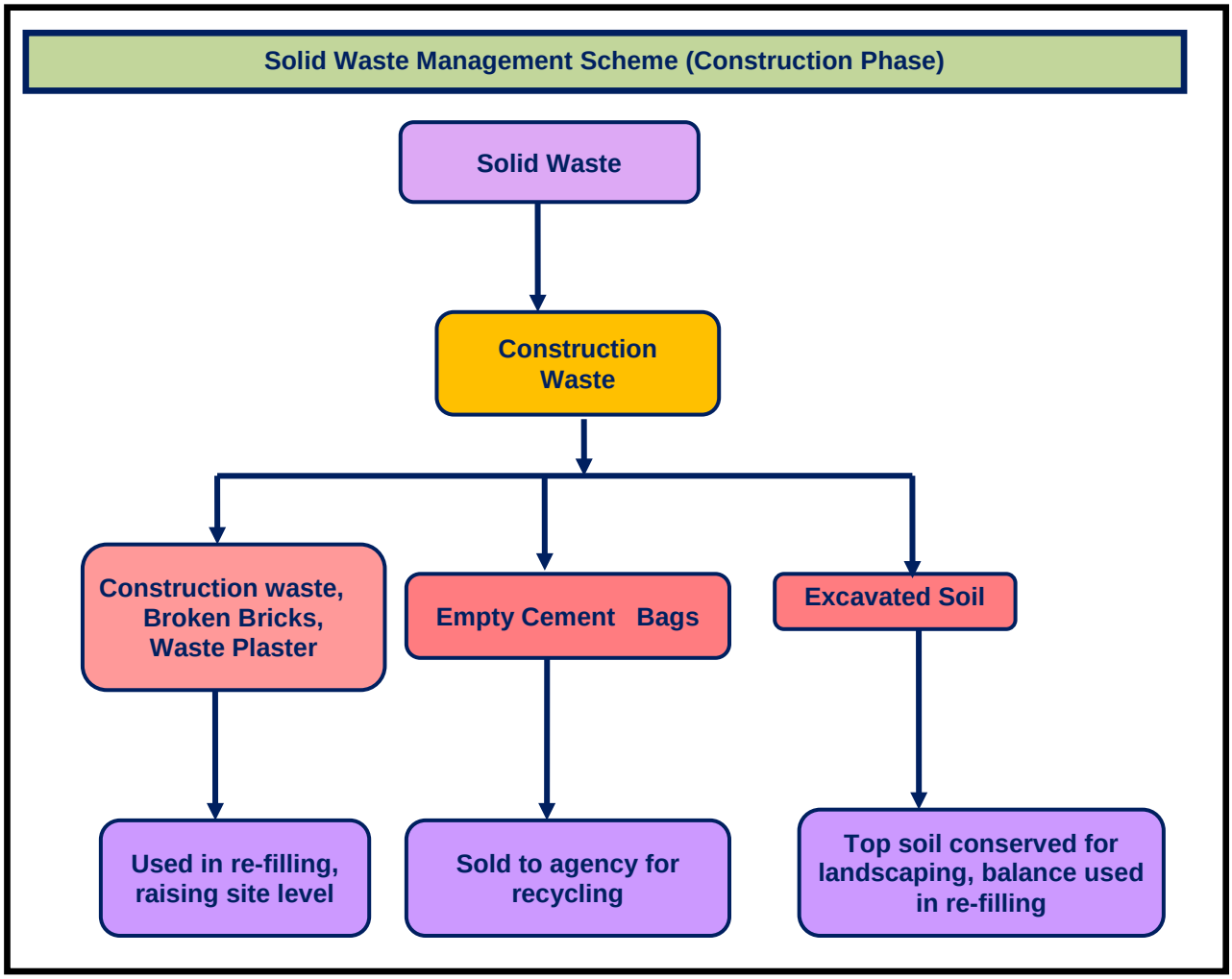


Figure 5: Solid Waste Management Scheme (Construction Phase)

4.5.2 Operation Phase

4.5.2.1 Collection and Segregation of waste

- Domestic waste will be collected from the kitchen and from each working space in colored bins from each floors/departments/units.
- The local vendors will be hired to provide separate colored bins for recyclables and Bio-Degradable waste.
- For waste collection, adequate number of colored bins (Green and Blue & dark grey bins– separate for Bio-degradable and Non Bio-degradable) are proposed to be provided at the strategic locations of the commercial area.
- Litter bin will also be provided in open areas etc.

4.5.2.2 Treatment of waste

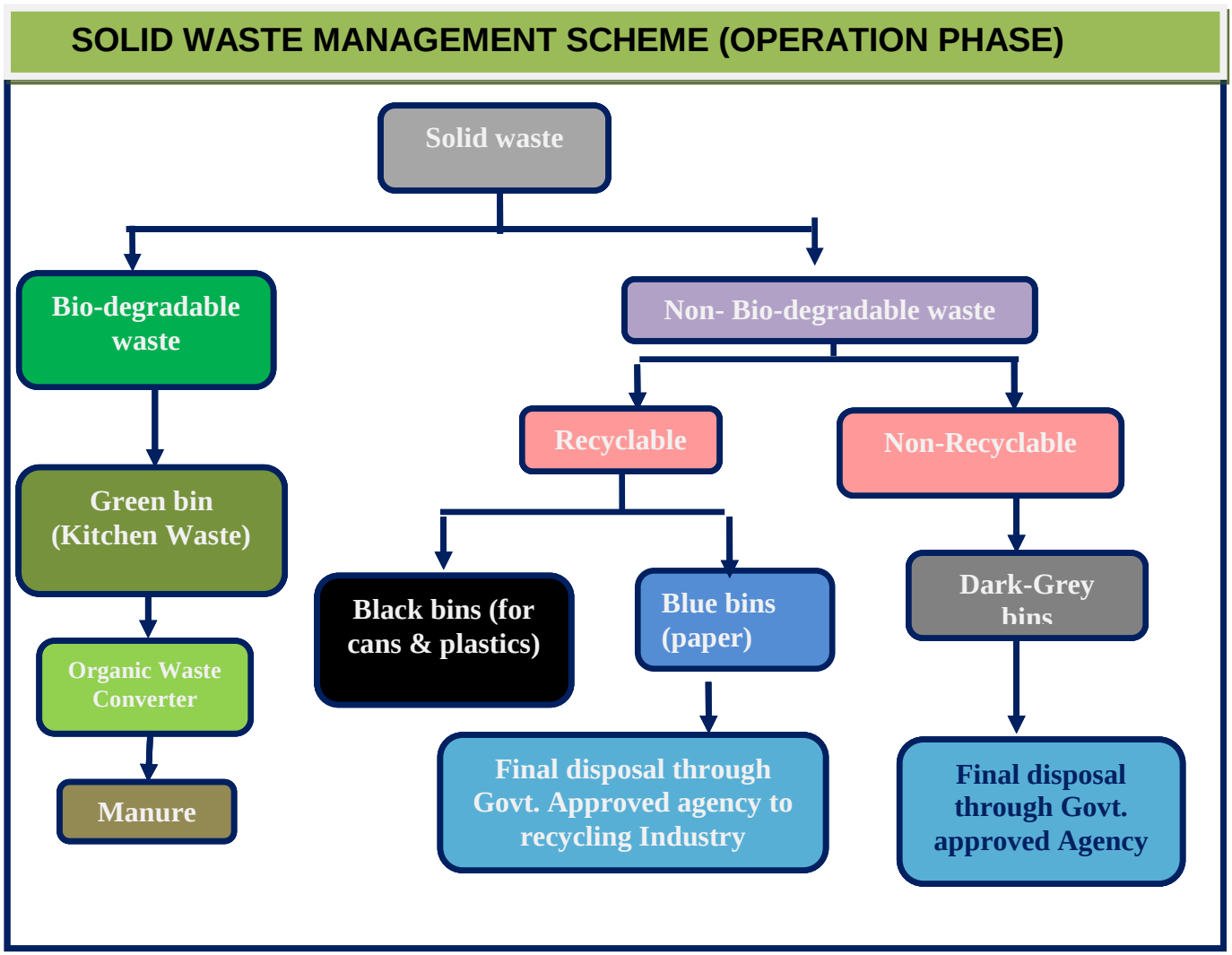
- Bio-degradable waste will be subjected to organic waste converter and the compost will be used as manure.
- STP sludge is proposed to be used for horticultural purposes as manure.
- Horticultural Waste is proposed to be composted and will be used for gardening purposes.
- Recyclable wastes
  - Grass Recycling – The cropped grass will be spread on the green area. It will act as manure after decomposition.
  - Recyclable wastes like paper, plastic, metals etc. will be sold off to recyclables.

4.5.2.3 Disposal

Recyclable and non-recyclable wastes will be disposed through Govt. approved agency. Hence, the Municipal Solid Waste Management will be conducted as per the guidelines of Municipal Solid Wastes (Management and Handling) Rules, 2000 and its amendment. A Solid waste management Scheme is depicted in the following figure for the proposed project.

Figure 6 highlights the methodology for collection and management of solid waste during operation stage (shown in the next page).

Figure 6: Solid Waste Management Scheme (Operation Phase)



(Source: EIA Guidance Manual for Construction, Townships and Area Development Projects)

Figure 7: Organic Waste Converter

4.6 Heat Island Mitigation & Management & Energy Conservation Measures

Adequate green Area is provided in the proposed site as mentioned in the section below with shaded tree species. Passive solar designs are proposed in the proposed project which refers to use the sun's energy effectively for the heating and cooling of living spaces. Pergolas, projection, façade elements, metal louvers will be provided to reduce cooling loads. Green area and open areas will be so spaced that a reduction in temperature is achieved. Well designed building structures will allow natural light to enter. The building of the proposed project is designed following all the green building features to develop it as an Ambience and Energy Efficient Structure as much as possible and the green building features will be incorporated in the design aspect of the project. Measures prescribed in Energy Conservation Building Code 2007 will be adopted to reduce the heat influx by walls, roofs and openings. Only prescribed quality of glasses will be used.

4.6.1 Energy Conservation Measures

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

i. Orientation of the Building/Shading by Plants: East and west oriented windows and walls receive more sunlight than the north and south windows. Plantation of fast growing leafy vegetation in the east and west side of the building will reduce the direct incidence of sunlight and thereby reducing the heat gain. Plantation of deciduous trees will be preferred considering the need of increased incidence of sunlight during winter season.
ii. Maximum use of daylight.
iii. Ground surface in the open areas will be made of reflective material to reflect daylight back into the buildings.
iv. Appropriate ventilation will be provided as per State Bye laws.
v. Around the Building along the Roads Post top lanterns with LED lamps are planned using Underground cables
vi. The installed interior lighting power should not exceed the LPD value as recommended by ECBC 2007.
vii. Lamps used for the general lighting scheme should comply with the following:
viii. Point light source:
    - All the point light sources installed in the building for general lighting will be CFL-based or LED-based with minimum lamp efficacy of 50 lm/W.
    - Linear light source: All the linear light sources installed in the building for general lighting will be T-5 or at least four-star BEE rated TFLs.
ix. For Landscape areas, Bollards with CFL lamps are planned using UG cables.
x. The Pole height is considered as 3 mtrs
xi. For Landscape areas, Bollards with CFL lamps are planned using UG cables.
xii. Separate cables with Time switches are planned for Street Light fixtures and Landscape light fixtures
i. Solar Panels are planned for controlling the Lighting
ii. The installed exterior lighting power density for the respective applications will be in accordance with ECBC 2007.
iii. Lighting controls will be installed as recommended by ECBC 2007 for external lighting.
iv. Lamps: External lighting sources will have luminous efficacies as per the table given below.
v. Solar street light controllers will be used for automatic dusk to dawn operation of street lights. Solar-based outdoor lighting can be used for various lighting applications, such as parking lots, landscape lighting, driveways, etc.
vi. A minimum of 20% hot water requirement will be met by solar water heating systems.
vii. Integration of automated system to operate electrical equipment as per load requirement to save energy

Table No 15 : Minimum Allowable Luminous Efficacy for Different Light Sources

Sl. No	Light source	Minimum allowable luminous (lm/w) efficacy (lm/W)
1	CFLs	50
2	LEDs	50
3	Fluorescent lamps	75
4	Metal halide lamps	75
5	High-pressure sodium vapor lamps	90

4.6.2 Building specification

4.6.2.1 Rate of infiltration

The proposed project will be centrally air conditioned.

4.6.2.2 U value of Building Material

The proposed Institutional project will involve uses of clear & tinted glass having U-value of 5.40 to 5.49. The glazing system for windows in non-air-conditioned spaces is usually single glazed units with a clear glass as the windows will be opened to allow ventilation; thus, there is no relevance to install double glazing with low SHGC and U-factor values.
The roof tops of the buildings will be planned with puffing/bricks bat coba for water proofing and thermal insulation. Roof tops will also have partly landscaped area/gardens.
External wall-external opening will have regular door windows with slightly tinted glass. Regular walls have some cladding/fixture paints.

Table No 16: Standard U Values for Different Parts of a Typical Building

Sl. No.	Component	U-value (W/m2-°C)
(a)	Roof	U-1.01
(b)	External wall	U-1.67
(c)	Fenestration	6.97

Table 17: Construction Material with U Value (in W/m2 0C)

Type of construction	U values (in w\m^2 deg C)
WALLS :	
Bricks :	

Plastered both sides - 114mm	3.24
Solid , unplastered - 228mm	2.67
Plastered both sides - 228mm	2.44
Concrete , ordinary , Dense :	
-152mm	3.58
-203mm	3.18
Concrete block, Cavity , 250mm (100+50+100) , outside rendered , inside plastered :	
Aerated concrete blocks	1.19
Hollow concrete block , 228mm , single skin , outside rendered , inside plastered	
Aerated concrete block	1.70
ROOFS PITCHED :	
Tiles or slates on boarding and felt with plaster ceiling	1.70
ROOFS FLAT :	
Reinfoced concrete slab , 100mm , screed 63-12mm , 3 layers bituminous felt	3.35
FLOORS :	
Concrete on ground or hard corefill	1.13
+ Grano , Terrazzo or tile finish	1.13
+wood block finish	0.85
WINDOWS :	
Exposure south , Sheltered :	
Single glazing	3.97
Double glazing 6 mm space	2.67

4.6.2.3 Usage of Renewable Energy

Layout of buildings has been done as per the sun path analysis so that the design cuts off direct radiations of critical hours which are specific to the orientation. Solar energy will be harnessed to meet various energy requirements of the proposed project such as:

- Solar street lights.
- A minimum of 20% hot water requirement will be met by solar water heating systems.

4.7 Green Area Development Plan

Total green area measures 2190.49m^2. Tree plantation will be done at project boundary as well as at periphery of each pocket (Towers). And organized green would be planted on land available

between pockets (like small lawns and parks and seating areas) which would enhance the aesthetic beauty of the area. . The list of trees and plants with numbers to be planted are given below.

Table 18: Name of Trees and Plants to be planted

ROADSIDE & PERIPHERAL PLANTATION			PLANTS FOR PARK
S.No.	**Botanical Name**	**Common Name**	**Botanical Name**
1.	*Ficus religiosa*	Peepal	
2.	*Casia fistula*	Amaltas	*Chorisla speciosa*
3.	*Delonix regla*	Gulmohar	*Erythrina blackie*
4.	*Callistemon lanceolatus*	Bottle brush	*Golden bottle brush*
5.	*Anthocephalus kadamba*	Kadamb	*Golden Duranta*

4.8 Disaster Management Plan

Firefighting measures will be adopted as per the guidelines of NBC. External yard hydrants installed around all buildings in the complex and galvanized steel fire hose boxes/cabinet (weather proof). All external yard hydrants will be at one meter height from finished ground level as per NBC at a distance of 45 m along the road. External fire hydrants will 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. In addition, 10 kg fire extinguishers will be provided for class A, B, and C fires. CO2 extinguishers will also be provided. Fire plan showing location of hydrant and other details are enclosed as Annexure with this proposal.

1% of total water requirement will be kept for fire fighting. Fire Alarm system is designed as follows:

Automatic Fire detection and Fire alarm system along with manual call points and Hooters has been planned as per NBC 2005 for the proposed Building:

I. Manually operated Fire Alarm System

- Manual Call Points are planned in all Fire escape areas and with travel distance not more than 30m.
- Electronic Hooters are also planned along with the same.
- Manual call system is proposed to be connected to the Addressable Fire alarm system through Monitor modules

II. Automatic Fire Detection and Alarm System

- Analogue addressable Fire alarm system is planned for the complete Building and also in Lift shafts/ lift machine rooms.
- Wiring is planned with twisted shielded 1.5sq.mm size through Fire retardant RED color conduits
- Wherever Manual call points/ Hooters are planned, the conduits will be concealed in walls
- All Flow switches are proposed to be connected to Separate annunciation panel which is intern connected to Fire alarm Panel

4.9 Corporate Social & Environmental Responsibilities

2% of the project cost (land + development) will be utilized for the upliftment of the nearby area. Project for the same will be decided on the basis of need base assessment study.