ENVIRONMENT CLEARANCE APPLICATION

[FORM I, FORM IA & CONCEPTUL PLAN]

For

REDEVELOPMENT OF STAFF COLONY

AT

MODEL TOWN, DELHI

DEVELOPED BY

M/S NEW DELHI MUNICIPALCORPORATION

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Introduction

General

- The Ministry of Environment, Forest and Climate Change has notified the Environmental Impact Assessment (EIA) Notification, 2006 under the provisions of the Environment (Protection) Act, 1986, which regulates development and their expansion/modernization of 39 sectors/activities listed in the Schedule to the EIA Notification, 2006.
- As per the EIA Notification 2006, all the building construction projects/Area Development projects and Township Projects comes under schedule 8 and projects covering an area ≥ 50 ha and/or built up area ≥1,50,000 sq .mtrs they come under schedule 8 (b). All projects under Item 8(b) shall be appraised as Category B1.
- The application for environmental clearance shall comprise submission of Form 1, Form 1A, and Conceptual Plan along with EIA/EMP Report incorporated proposed ToR in SEIAA/MoEF. The EIA/EMP shall be prepared on the basis of Approved ToR issued from SEAC/EAC and will be submitted to the SEAC/EAC for appraisal and due recommendation and suggestions. Following the appraisal of the project to the satisfaction of the SEAC/EAC and SEIAA, Environmental Clearance shall be granted.

Total Built up area of the proposed site is 3, 51,068.77 $m^{2.}$

Brief about Project Proponent

- New Delhi Municipal Council (NDMC) is the municipal council of the city of New Delhi, India, and the area under its administration is referred to as the NDMC area
- NDMC resolves to intensify its efforts in providing better civic services to the citizens and a multitude of visiting patrons from all over the country and overseas. Other objectives before NDMC are to improve quality of life provide social and community welfare amenities with public, private participation- with special emphasis on promotion of art & culture, environmental improvement, cleaning & greening campaigns to serve as a show window of "A Model Well-Planned Metropolitan City"

Brief about Project

- Model Town is situated in Alipur Road in the North West Delhi District. It is located just after crossing the Kamla Nehru Ridge and is also in close proximity to Radio Colony, Model Town is primarily a residential complex that is divided into colonies and blocks.
- Model town comes under NDMC administration having and NDMC is planning for redevelopment of existing staff colonies in Model Town. Redevelopment shall be done over an area of approx. 23.51 Acres. approx. 14,782.63 m^2 area shall be demolished
- The existing buildings were constructed and also became operational prior to the publication of EIA Notification 2006. Therefore, the existing buildings did not attract applicability of to obtain Environmental Clearance from SEIAA/MoEFCC and no environmental clearance was issued. Accordingly, the issuance of certified monitoring report by Regional Director of MoEFCC is not applicable for the existing buildings. The construction of existing buildings was done after getting approval from concerned departments of Delhi.

Site Surroundings and Connectivity

Location

- Model Town is surrounded by important areas like Adarsh Nagar, Azadpur, Badli, Delhi University, Dr. Mukherjee Nagar, Guru Tegh Bahadur Nagar, Jahangirpuri, Pitampura, Sanjay Gandhi Transport Nagar, Shalimar Bagh and Timarpur.

Geographical co-ordinates of the site and location plan are given below

Table 1 Geographical co-ordinates of the site

S. No.	*Details*	*Latitude*	*Longitude*
1.	Corner-A	28°42'55.26"N	77°11'3.39"E
2.	Corner-B	28°42'58.28"N	77°10'54.60"E
3.	Corner-C	28°42'51.55"N	77°10'50.42"E
4.	Corner-D	28°42'44.82"N	77°10'56.30"E
5.	Centre of the site	28°42'52.63"N	77°10'56.96"E

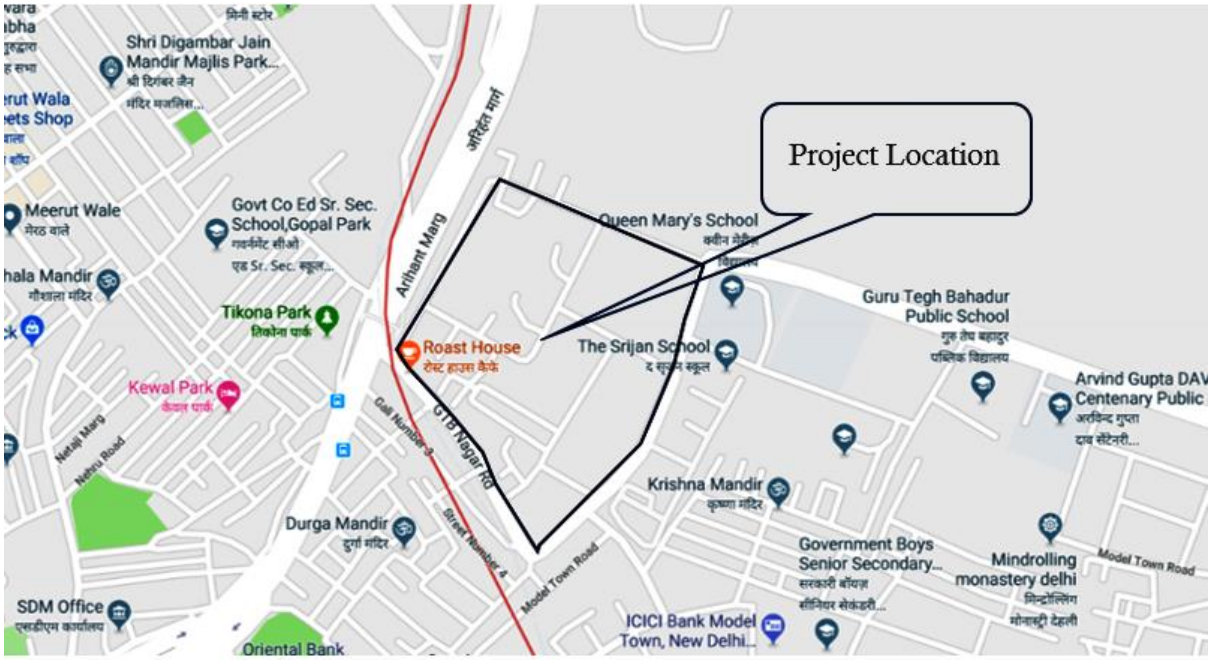


Figure 1 Location map

- Site is well connected to transport facilities as well as surrounded by densely populated areas. Site is flanked by arihant marg to its west and shri ram prasad bismil marg to its south and east side. Model Town is surrounded by important areas like Adarsh Nagar, Azadpur, Badli, Delhi University, Dr. Mukherjee Nagar, Guru Tegh Bahadur Nagar, Jahangirpuri, Pitampura, Sanjay Gandhi Transport Nagar, Shalimar Bagh and Timarpur.

Site surroundings and site connectivity within 15 km are shown in below table

S.No.	Particulars	Name	**Distance and Direction**
1.	Nearest Railway Station	Azadpur Metro Station Model Town Metro Station New Delhi Railway Station	Approx. 0.6 km, SSW Approx. 1.5 km, SSE Approx. 8.5 km, SE
2.	Nearest Airport	IGI Airport Safdurjung Airport	Approx. 19 km, SSW Approx. 14 km, S
3.	Nearest Populated Area	Phase-3 Kewal Park Inder Nagar Rishabh Park Rameshwar Nagar	Approx. 0.35 km, SW Approx. 0.3 km, W Approx. 0.5 km, W Approx. 0.2 km, E Approx. 0.1 km, S
4.	State Boundary	Delhi- UP Border Delhi-HR Border	Approx. 10 km, E Approx. 15km, N

5.	Nearest Road	Shahid Ram Prasad Bismil Marg Arihant Marg	Adjacent, E,S & SW Adjacent, W
6.	Nearest School	Queen Marry School The Srijan School GD Goenka Public School Model Town	Adjacent, E Adjacent, E Approx. 0.25 km, E
7.	Nearest Hospital	Dr. Lal PathLabs Uday ENT Hospital	Approx. 065 km, S Approx. 1.38 km, S
8.	Place of Worship	Arya Samaj Mandir Gurudwara Sri Guru Singh Sabha, D Block	Approx. 0.35 km, E Approx. 0.6 km, SE
9.	Water Bodies	Naini lake	Approx. 1.3 km, E
10.	Forest	Central Ridge Forest	Approx. 10km S

***(Source: Google Earth* Pro)**

Google map and topographical map showing site and surroundings are attached as annexures

Salient features of the site

The site is having existing 512 dwelling units for Delhi Jal Board employees, which shall be demolished first and then new residential and commercial facilities shall be developed. Approx. 14,782.63 sq. mtrs areas shall be demolished;

Table 2: Salient Features of the site

S. No.	Description	Proposed
1.	Plot Area	95,155m^2
2.	Proposed Built Up Area	3,51,068.77 m^2
3.	Maximum No. of Floors	S+25
4.	Cost of Project	1,577 Crores
5.	Expected Population	14,299
6.	Total Water Requirement Fresh water Recycled water	1,180 KLD 594 KLD 586 KLD
7.	Wastewater Generation STP Capacity and Technology`	828 KLD 995 KLD (FAB Technology)
8.	No. of RWH Proposed	39
9.	Parking Proposed	4,900 ECS
10.	Solid Waste Generation	5.4 TPD
11.	Total Power Requirement	9,543.83 kVA

	1010 kVA *7 320kVA * 2

Land Environment

- Land is allotted for the development of residential facilities. Proposed site falls in Zone –C as per DDA Zonal development Plan. Zone 'C', is also known as 'Civil Lines Zone' and it is located towards North, covering an area of 3959 hac. And consists of 21 Sub-Zones. Zone-C is identifiable with its prestigious Delhi University, Northern Ridge, ISBT (Kashmiri Gate) and Tis Hazari Courts. A significant feature of this Zone is the Old Secretariat Complex and Civil Lines Bungalow area of the Colonial period. Roshanara Bagh and Qudsia Bagh are historical gardens from the Mughal period. This Zone has posh residential areas, rehabilitation colonies and pre 1962 residential colonies. A part of Special area also falls in this zone. Other important activities in the Zone are Azadpur wholesale Fruit and Vegetable market and Sanjay Gandhi Transport Nagar. Metro Corridor is operational in this Zone. Dheerpur (Phase –I & II) is an important project in this Zone. This zone has been developing since pre independence era and through the MPD- 1962, MPD-2001 and now MPD-2021. As such the zone has heterogeneous character where the unplanned areas and planned areas developed under the norms of various plans co-exist.

Topography

- Physically the natural capital territory of Delhi can be divided into 3 segments - the Yamuna flood plain, the Ridge and the Plain. The entire area of the national capital territory of Delhi is categorized as Bangar or the plain. The land of the plain is mostly fertile
- The entire area of the site is monotonously flat. The project area possesses plain terrain. Highest elevation levels is 211 meters & the lowest levels is 213 meters.

Area Details

This is re development of existing residential staff colony to residential cum commercial facility for govt employees. Total area of the site is of 95,155 m^2 (9.5 Hectare).The proposed building is having 24 residential towers with maximum height of S+25.Total built up area of the site is 3, 51,068.77 m^2

Area details are given in table below

Table 3- Area Details

S.No.	Description	Area (m^2)
1.	Total Plot Area	95,155 (23.51 Acre)
	1. Plot area for primary and secondary school	8,000
	2. Plot area for hospital building	2,682
	3. Plot area for religious building	1,831
	4. Plot area for commercial building	11,562.64
	5. Plot area for residential buildings	71,079.36
2.	Permissible Ground Coverage (33.33% of Plot area)	31,715.16
3.	Proposed Ground Coverage (18.08 % of Plot Area)	17,208.31
4.	Permissible FAR (@3)	2,85,465
5.	Proposed FAR(@2.97)	2,82,781.21
	FAR for Commercial	28,546.50
	FAR for Social infrastructure +0.6% Free of FAR	30,259.29
	Residential FAR	2,23,975.42
6.	**Built up area**	**3,51,068.77**
7.	Landscape area (30 % plot area)	28,546.5
8.	Open Area	49,400.19

Table 4-FAR and built up area details of residential towers

	FAR	BUILT UP
	AREA IN SQ. MT.	AREA IN SQ. MT.
TOWER -T01	12,300.60	14,520.70
TOWER -T02	13,722.50	16,771.56
TOWER -T03	12,300.60	13,875.64
TOWER -T04	11,397.42	13,835.65
TOWER -T05	11,397.42	13,835.65
TOWER -T06	10,406.34	12,632.55
TOWER -T07	10,406.34	12,632.55
TOWER -T08	10,406.34	12,632.55
TOWER -T09	12,388.50	15,038.75
TOWER -T10	12,388.50	15,038.75
TOWER -T11	11,397.42	13,835.65
TOWER -T12	11,397.42	13,835.65
TOWER -T13	10,406.34	12,632.55
TOWER -T14	11,795.70	14,045.22
TOWER -T15	5,851.62	7,925.28
TOWER -T16	5,851.62	7,925.28
TOWER -T17	6,467.58	8,759.52
TOWER -T18	6,467.58	8,759.52
TOWER -T19	6,293.59	8,979.43
TOWER -T20	6,293.59	8,979.43
TOWER -T21	6,467.58	8,759.52
TOWER -T22	6,467.58	8,759.52
TOWER -T23	5,851.62	7,925.28
TOWER -T24	5,851.62	7,925.28
TOTAL	2,23,975.42	2,79,864.48

Table 5-FAR Details of social infrastructure

BUILDING	PERMISSIBLE FAR	PROVIDED FAR
	AREA IN SQ. MT.	AREA IN SQ. MT.
PRIMARY & SECONDARY SCHOOL	150%	12000.00
HOSPITAL	200%	5,364.00
RELIGIOUS BUILDING	150%	2,746.50
BANQUET HALL	-	1,910.00
MULTIPURPOSE COMMUNITY HALL	-	2,500.00
CLUB	-	2,500.00
AMENITIES	-	2,748.79
TOTAL FAR PROPOSED		**30,259.29**

Table 6-FAR and built up area details for commercial blocks

BLOCK NO.	FLOOR	BUILT UP AREA IN SQ. MT.	FAR IN SQ. MT.
C-01	G. FLOOR	3,238	2,738
	1st. FLOOR	3,238	2,738
	2nd. FLOOR	3,427	2,927
	3rd. FLOOR	3,512	1,380
	4th. FLOOR	3,512	1,380
	5th. FLOOR	3,512	1,380
	6th. FLOOR	3,512	1,380
	7th. FLOOR	2,988	923
	8th. FLOOR	1,388	1,038
	9th. FLOOR	2,988	2553
	10th. FLOOR	1,605	1,435
	11th. FLOOR	1,605	1,435
	12th. FLOOR	1,605	1,435
	13th. FLOOR	1,605	1,435
	14th. FLOOR	1,605	1,435
	15th. FLOOR	1,605	1,435
	16th. FLOOR	1,605	1,435
	TOTAL	40,945	28,482

Population Density

During Construction Phase

The total manpower requirement during construction phase of the site will be an approximate 600 person which includes workmen, labourers, supervisors, engineers, architect and Manager.

During Operational Phase

The total population of the project will be 14,299 persons that include residents, staff as well as Visitor population .The detailed population breakup including Staff members as well as visitors is given in table below

Table 7 Population break up

S.No.	*Unit Name*	*Type of Occupancy*	*Area (m^2)/DU*	*Occupant Load, Floor Area in m^2/Person*	*Total Population*
A.	***Residential Towers***	***Group-A***			
	Type-II	***Residential***	***184***	***4.5/DU***	***828***
	Type-III		***640***		***2,880***
	Type-IV		***904***		***4,068***
	Type-IV S		***84***		***378***
	Type-V		***209***		***941***
		Sub-Total (A)			***9,095***
B.	***Commercial***	***Group-F***			

Ground Floor	***Mercantile Street Floor***	***2,738***	***3 m^2/person***	***913***
1st- 16th Floor	***Mercantile Upper sales Floor***	***25,744***	***6 m^2/person***	***4,291***
	Sub-Total (B)			***5,204***
	Total (A-B)			**14,299**

Water calculation

Construction Phase

The water requirement during the construction phase comprises of (i) fresh water for labourers, (ii) construction water.

Table 8-water demand during construction phase

Description	Area in m^2 (Total)	Total Occupancy	Rate of water demand	Total water requirement
Labours	-	600	45 lpcd	27 KLD
Water curing	**3,51,068.77**	-	17.81 kl/m^2	6,252 ML

Operational Phase

Total water requirement for proposed project is 1,180 KLD. The fresh water will be obtained from water supply department of DJB. Detail of water requirements for various uses is given in below table. Efficient dual flushing fixtures will be provided for conservation of fresh water. There will be a dual plumbing system for use of water for different applications thus saving on the high quality water. Installation of dual plumbing for using recycled water will save the potable water from authorized water agency. There will be two pipe lines, one supplying freshwater for drinking, cooking etc. And other for supply of recycled water for flushing, landscape irrigation, etc. this will result in saving of fresh water demand and life of existing sewerage will be improved. Other water conservation measure shall also be adopted to conserve water.

Table 9-water conservation measure

Measures	Type
Water Conservation Fixtures	Dual plumbing cisterns, Dual flushing system, low flow taps, low flow urinals, sensor-based taps in commercial areas and facility areas, low faucet taps, low flow showers, tap aerators, auto control valves and pressure reducing devices

Monetary Measures	Metering (flow water) and pricing of water
Leakage Prevention	Timely detection of leakages in pipeline & tanks
Wastage Prevention	Alarms for filling of tank
Storm water harvesting	Storm water collection and recharging system. Recharge pits to be provided for recharging collected rain water to ground.

Storage structures in form of underground tanks will be constructed within the project site for storage of water. Storage shall be provided for one day requirement. Detailed water consumption at the site is given in table below.

Table 10-Total water demand during operational phase

S.No.	Description	Total Population/area (m^2)	Unit Water Consumption (lpcd)	Total Water Requirement (KLD)
A.	Main Uses			
	Residential population	9,095	86	782
	Visitors (residential)	182	15	27
	Staff (commercial)	520	45	23
	Visitors (commercial)	4,683	15	70
	Domestic water demand			902
B.	Other Uses			
	Landscape area	28,546.5	3l/m^2	85.64
	HVAC cooling			150
	DG cooling	7,710 kVA	0.9l/kva/hr	42
	Total water requirement (A+B)			1,180 KLD

Table 11- Wastewater Calculation with respect to STP

S.No.	Description	Quantity (KLD)
a)	**For Residential Uses**	

01	Fresh water Requirement (70% of domestic water (residential))	566
02	Flushing water requirement (30% of domestic Water (residential))	243
03	Wastewater Generation @ (80% Fresh water + 100% of Flushing)	696
b)	**For Commercial Uses**	
	Fresh water Requirement (30% of domestic water (commercial))	28
	Flushing water requirement (70% of domestic Water (commercial))	65
	Wastewater Generation @ (80% Fresh water + 100% of Flushing)	87
C)	Blow down water from HVAC cooling (@ 30%)	45
	Total wastewater generation (a +b+c)	828
04	**STP Capacity**	**995 KLD**

Table 12- Summary of Water available for Reuse and Recycle

S.No.	Description	Quantity (KLD)
A)	**Recycled Water Available *@80% of Waste Generated***	**662 KLD**
B)	**Recycled Water Required**	**586 KLD**
01	For Flushing Purposes	308 KLD
02	For Landscape	86 KLD
03	Cooling Towers (HVAC +DG Sets)	192 KLD
	Surplus recycled water remain	**76 KLD**

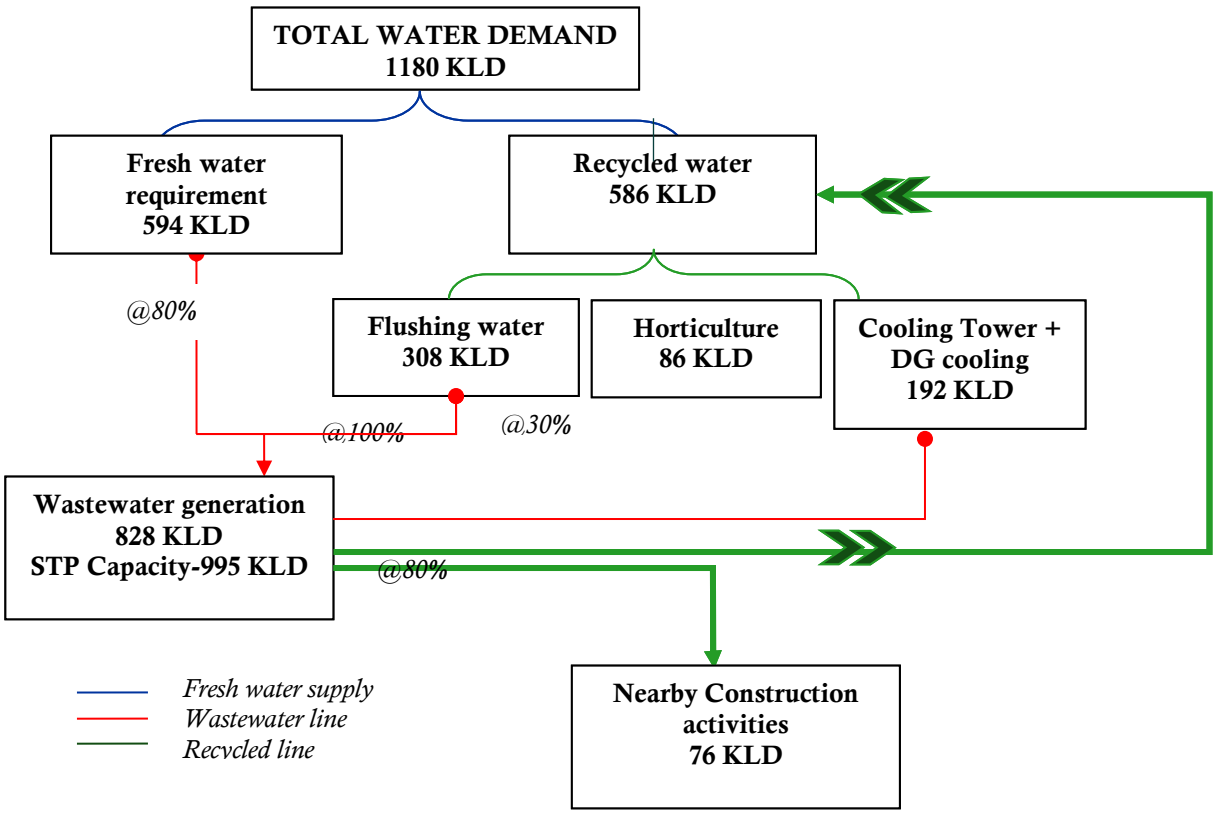
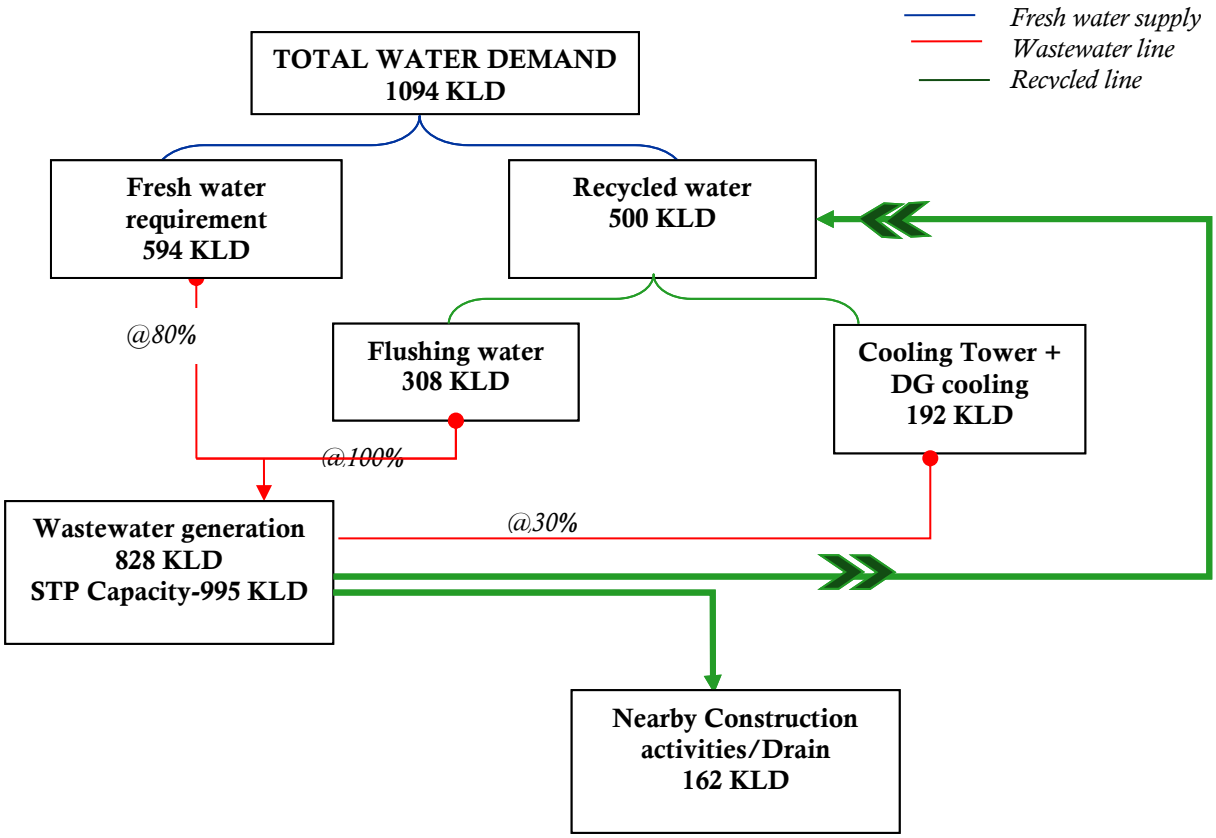


Figure 2-Water Demand during non-rainy season

Figure 3-Water balance diagram during rainy season



Wastewater generation and treatment

During Construction Phase

The quantity of sewage generation during the construction phase will be approx. 21.6 KLD. Thus, the sewage will be treated by providing small septic tanks, soak trenches and Sulabh Shauchalaya type mobile toilets.

During Operational Phase

Quantity of sewage generated during operational phase from residential facilities shall be approx. 828 KLD, The domestic sewage will be treated through sewage treatment plant of capacity 995 KLD, the treated domestic wastewater shall be recycle and re use within premises. The treated sewage will be re used for flushing (308 KLD) greenbelt development (86 KLD), HVAC and DG cooling (192 KLD), surplus treated water shall be used in nearby construction activities.

Sewage Treatment Technology

The design of sewage network shall be done in accordance with the CPHEEO guideline, NBC guidelines and reverent Indian Standards. Sewage generation is assumed to be 100% of flushing water and 80% of domestic water.

The following parameters/ site conditions shall be kept in mind when designing the sewage, Sludge and storm water drainage system.

- Natural slope of the area.
- Layout of different facility in the complex;
- Possibility of using complete or part of the existing sewage network;
- Sub-soil water table;
- Provision of Sewage lifting station; (if required)
- Provision of venting arrangement for manholes;
- Construction of manholes & laying of pipes considering ground condition;
- Termination of vent cowl at terrace level;
- Provision of adequate slope for horizontal header in the under slung pipes especially for public toilets
- Sewage flow starts with fractional capacity and builds up to full capacity in due course. An operational plan to meet this demand from a low flow to full flow will be part of the design.

An external sewage network shall 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, source for Horticultural purposes by utilization of the recoverable waste water.
- Reduced dependence on the public utilities for water supply and sewerage systems.
- Sludge generated from the Sewage Treatment Plant shall be rich in organic content and an excellent fertilizer for horticultural purposes.

Wastewater details are given in below

Table 13-Wastewater Details

Particulars	**Quantity**	
Daily load	828 KLD	
Duration of flow to STP	24 Hours	
Temperature	32^0 C	
	Inlet	Outlet (Treated Wastewater)
pH	6.0 – 8.5	6.0-8.5
S.S. (mg/l)	200-450	Less than 20 mg/l
BOD5 27^0 C (mg/l)	250-400	Less than 10 mg/l

COD (mg/l)	600-800	Less than 30 mg/l
Oil & grease ABS (mg/l)	Up to 20 mg/l	Less than 05 mg/l
E. coli	$>10^6$ MPN	$< 10^3$ MPN

Technology

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 fluidized aerobic bed reactor (FAB) process combines the biological processes of attached & suspended growth. It combines submerged fixed film with extended aeration for treatment of the waste water.

The waste water 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 FAB reactor 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 FAB reactor 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 FAB 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. Waste water 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 waste water provides oxygen for the aerobic reactions at the bio-

film surface. Waste products from the metabolic processes diffuse outward & get carried away by the waste water 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.

Excess sludge from the bottom of the Tube settler shall be transferred into an adjoining aerobic digester cum thickener tank. In this tank sludge shall be aerated. The air shall be shut off periodically and supernatant water will be led back into the Equalization Tank. This way the sludge shall be thickened and its volume shall be reduced. The thickened sludge will be further solidified using a centrifuge or a filter press and the solid cakes will be used as manure in horticulture.

The treated and disinfected water from the Chlorine Contact Tank will be passed through a Multigrade Filter, an Activated Carbon Filter and a Softener and then stored in a Treated Sewage Water Tank. Water from this tank will be used for the Cooling of DG system and for horticulture and other recreational activity within the site.

Preventive measures to Avoid Leaching

Treated sewage from Sewage Treatment Plant will be conveyed to Treated Sewage Tank through pipelines. All the joints from piping system will be checked periodically and carrying treated wastewater pipes will be laid in conduits wherever road crossings are expected. Thus no leaching of treated sewage into nearby water courses shall take place. Supervisors will be employed for overall operation & maintenance of water supply, waste water treatment and other utility services.

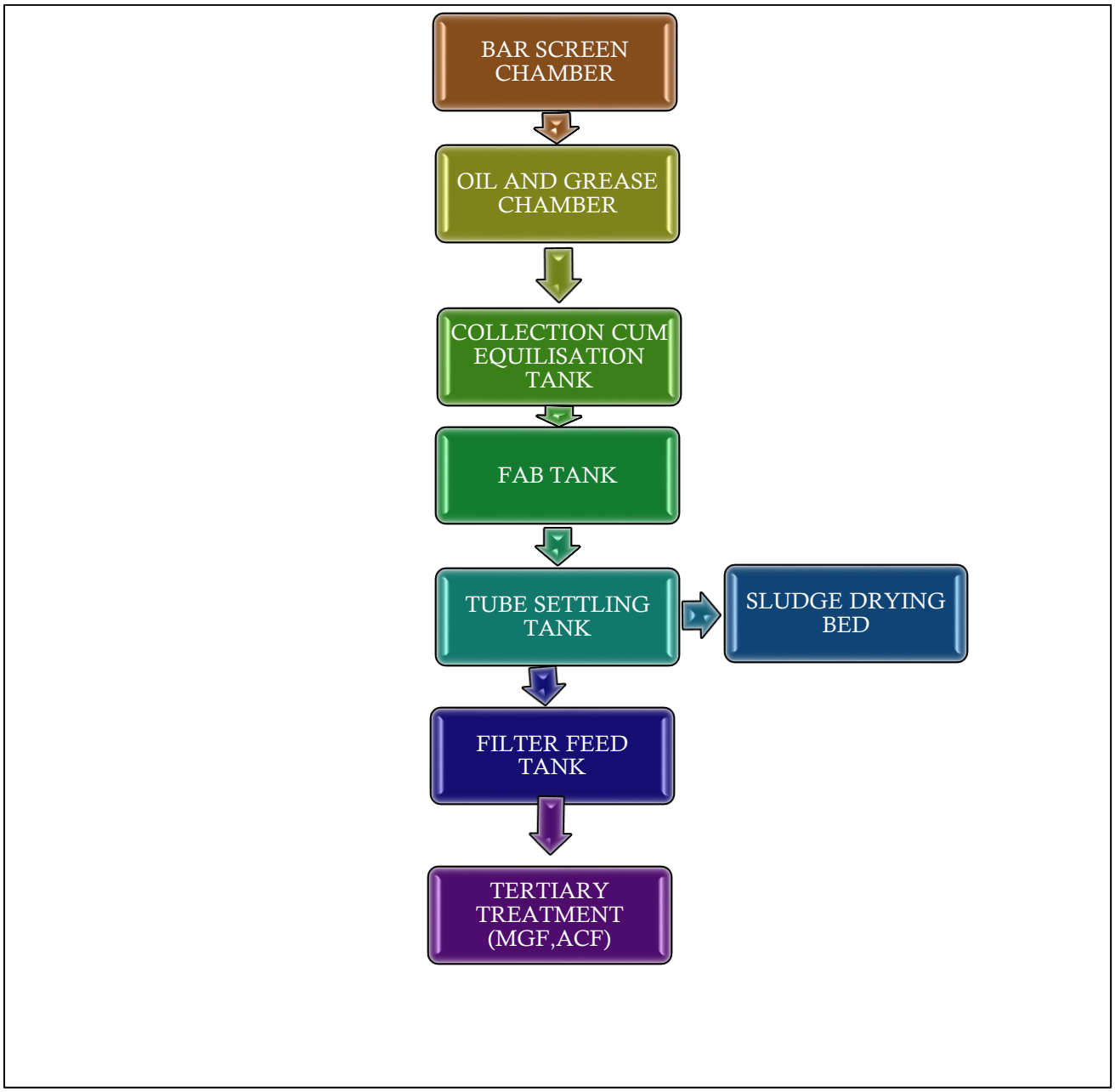


Figure 4-Process and Instrumentation of STP technology

Parking Details

Adequate provision shall provide for vehicle parking at the project site not to disturb the traffic and allow smooth movement at the site.

Proposed project will consist open parking. The parking space criteria and area requirement provided are summarized in the below tables. Parking details are as per Delhi building bye laws.

Table 14-Parking Required

(As per the EIA guidance Manual from MoEF& CC)	
Parking required (for Commercial)	1 car space for every 25 m^2 FAR area = 28,546.50/25 = 1,142 ECS
Parking required (for Residential)	1 tenement of 75 m^2 built up area = 2,79,864.48/75 = 3,732 ECS
Parking Required as per MoEF&CC	**= 4,874 ECS**
As per the Delhi Building Bye Laws	
Parking required (for Commercial)	1 ECS @ 50 Sqm of proposed FAR = 1 × 28,546.50/50 = 571 ECS
Parking required (Residential)	1 ECS@ 100 Sqm of proposed area = 1 × 2,23,975.42/100 = 2,240 ECS
Parking required	**2,811 ECS**

Table 15-Parking Proposed

Total ECS Proposed	4,900 ECS

Rainwater Harvesting and Storm Water Drain

A rainwater harvesting system comprises components of various stages -transporting rainwater through pipes or drains, filtration, and recharging the ground water through tanks. Percolation pits will be constructed for ground water recharge.

Runoff from the first spell of rain carries a relatively large amount of pollutants from the air and catchments surface so the system will be provided with a filtration pit consisting of layers of sand, gravel and pebbles of relevant sizes to remove impurities from the collected rainwater.

Need For Rainwater Harvesting

Surface water is inadequate to meet the daily demand and we have to depend on ground water.

- Due to rapid urbanization, infiltration of rain water into the sub-soil has decreased drastically and recharging of ground water has diminished.
- Rainwater harvesting prevents the flooding of low-lying areas in the site.

Rainwater Harvesting Network

Rain water harvesting pits will be constructed all around the compound wall to collect rain water. Excess storm water will be allowed to drain into the external storm drain.
Rain water harvesting has been catered to and designed as per the guideline of CGWA. Peak hourly rainfall has been considered as 25 mm/hr. The recharge well various dia and depth will be constructed for recharging the water. The bottom of the recharge structure will be kept 5 m above the existing level. At the bottom of the recharge pit, a filter media is provided to avoid choking of the recharge bore.

The pit will be filled with rounded gravel 5 to 10 mm size. The sectional detail of the proposed rain water recharge pit is provided in figure below

The path ways around the harvesting lines will be graded to facilitate drainage into trenches proposed around the compound. Recharge wells/pits are envisaged along the path of the storm water drains for rain water recharging & surplus water from the recharge wells/pits shall be diverted to the storm water drainage network.

The collected storm water will be allowed to percolate to the sub-soil by suitably designed percolation pits. The pits will be designed based on the soils percolation capability. The subsoil water table is high in these areas and however harvesting pits with bores will be provided.
Percolation pits of suitable numbers will be provided for recharge of ground water potential. A total of 39 rain water harvesting pits will be constructed. The quantity of storm water load for the proposed construction project is given below.

Table 16-Calculation for Strom Water Load

S. No.	Type of Surface	Catchment's Area		Run off Coff. [C]	Intensity of Rainfall (m/hr)	Discharge (Run Off) [Q=10CIA] m^3/hr	Total (m^3/hr) [Q]
		sq. m	Ha.				
	Building						
1.	Roof top area	17,208.31	1.72	0.8	25	10 ×0.8×25×1.72	344
2.	Paved area	14,273.25	1.42	0.7	25	10 ×0.7×25×1.42	248.5
3.	Green area	28,546.7	2.8	0.1	25	10 ×0.1×25×2.8	70
		Total Storm water load calculated					662.5

	Considering 15 mins (0.25) retention period	165.63
	Taking the effective volumes of rainwater harvesting pits (1.5mtrs depth, 3.5mtrs dia.)	25 m^3
	Rainwater harvesting pits required	7
	However, total no. of rainwater harvesting Proposed	**39**

Rainwater harvesting pits shall be of 15 KL and 10 KL.

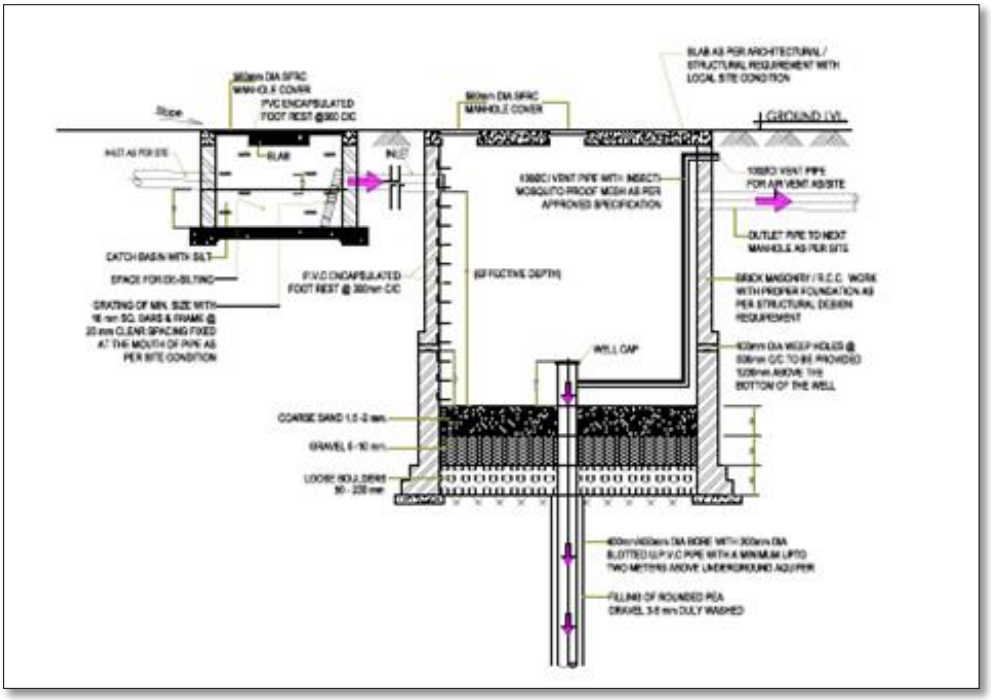


Figure 5: Typical Section-Rainwater Harvesting Well and Desilting Chamber

Power Requirement

The electrical load requirement has been calculated on the basis of covered area of various buildings/ blocks as per NBC 2016. State electricity board shall provide electric supply on 11 kV for meeting electrical load requirements of proposed project.

Table 17-Electrical Load Details

Power Requirement	Details

Transformer Selection	Demand load estimated for project is approx. 9543.83 kVA
Source of Power Supply	To meet the load, the HT supply will be received at 11 kV from the BSES.
Backup power supply arrangement	DG Sets will be of 1010 kVA × 7 Nos. 320 kVA × 2 Nos.
Location of DG Sets	DG sets shall be placed in open
Stack Height	As per CPCB norms and Local Authority

Solid Waste Generation

Solid waste would be generated both during the construction as well as during the operation 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 will be followed for the management solid waste:

- 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**.**
- Remaining soil shall be utilized for refilling / road work / rising of site level at locations/ selling to outside agency for construction of roads etc.

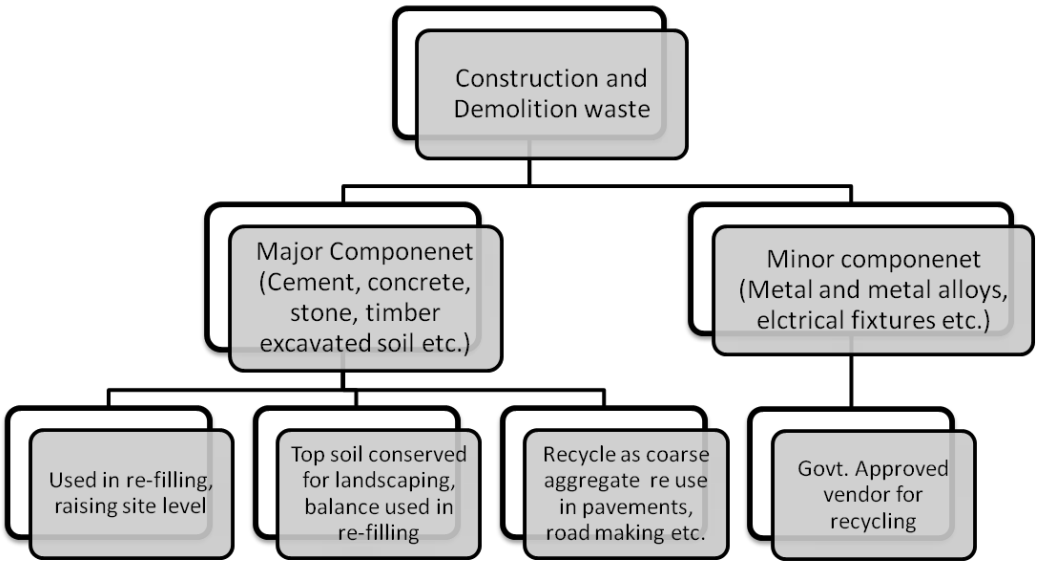


Figure 6-Waste Management-Construction Phase

During Operational Phase

The project will adopt a systematic approach for solid waste collection and disposal. Solid waste generated from the project will be collected properly and will be managed as per MSW Rules, 2016.

- Municipal waste shall be mainly categories in two classes. 1. Bio degradable Waste 2 Non- biodegradable Waste. The biodegradable portion dominates the bulk of MSW. This is mainly due to food and paper waste.
- These solid wastes will be collected separately by putting three types of separate bins at the source of generation.
- It is estimated that maximum solid waste generation would be about 5,407 kg/day; Following are the solid waste generation rate has been considered as is given table.

Table 18: Calculation of Solid Waste Generation

Category	Counts (heads)	Waste Generated (kg/day)
Residents	9,095 @0.5kg/day	4,547.5
Staff	520@0.25kg/day	130

Visitors	4,865 @0.15kg/day	729.75
Landscape Waste (0.7 Acre)	@ 0.2 kg/acre/day	0.14
Total Waste Generated		**5,407.39 kg/day**

Total Solid Waste generation	**Approx. 5,407 kg/day**
Biodegradable waste	approx. 3,244.2 kg/day
Non-Bio degradable waste	approx. 1,622.1 kg/day
Inert waste	approx. 541 kg/day

Collection and Segregation of waste

For Domestic Waste

- A door to door collection system will be provided for collection of domestic waste in colored bins from every unit.
- The local vendors will be hired to provide separate colored bins for dry 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 area.
- Litter bin will also be provided in open areas like parks etc.

Treatment of Waste

Domestic Waste

Bio degradable Waste

- Bio-degradable waste will be subjected to the compost/resultant 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 Waste

- 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.

Organic Waste Converter

The garbage will be collected and stored in garbage collection room and segregated as Biodegradable waste, Non-Biodegradable waste and Recyclable waste using different color coded bins

- Bio degradable waste will be treated by OWC and used as a manure for gardening area
- Recyclable wastes are inert waste which will be disposed through authorized recyclers.
- The total excavated earth material will be used for refilling in the low lying area.

Technique for disposal of biodegradable waste

Organic Waste Converter

The Mechanical Composter involves a biomechanical process which decomposes bacteria and produces odorless pre-organic compost in 15 minutes. The machine occupies small area and provides a cleaner and better environment.

Working Principle

Mechanical Composter converts the organic waste into odorless, pre-compost manure in 15-20 minutes. The organic waste, free from foreign particles is fed into MC. The shredder reduces the organic waste into the optimum particle size for composting. Then it is mixed with moisture absorbing materials and Useful microorganisms. This mixture is then blended for a homogeneous mixture and is converted into pre-compost manure in 20 minutes. The pre-compost manure is then fed into aerated compost blocks or 12 - 15 days. The compost blocks or piles are specially designed for the pre-compost manure to have proper aeration and suitable environment to mature. The final manure will be rich in nutrients and used for the development of green belt.

Salient Features of Organic Waste Converter (OWC)

- Quick, easy to operate, less space requirement and odor free manure compared to other waste conversion process
- Immediate and hygienic disposal of food waste
- Waste minimization strategy followed by 3R Technique (Reduce, Reuse, Recycle)

- Savings on Purchase of Manure for landscape
- Savings on Waste Disposal Expenses
- Elimination on the usage of chemical fertilizers
- Carbon credit revenue in the future

Optimum Conditions for Composting

During Composting process, optimum conditions shall be maintained to achieve better compost value. The parameters mentioned below shall be maintained accordingly during operation.

Table 19-Optimum condition for composting

S.No.	Parameters	Values
1.	C/N ratio	30 : 1
2.	Particle Size	1/8 to 2 inches
3.	Oxygen	15 % - 20 %
4.	Temperature	55 - 65.5 ^{0} C
5.	Moisture	40 % - 60 %
6.	pH	6.5 - 7.5

Table 20-Characterstic of Final Compost

S.No.	Parameters	Concentration (% except pH)
1.	Total Nitrogen	1.3
2.	Total Phosphorus	0.2-0.5
3.	Total Potassium	0.5
4.	Organic phosphorus	0.054
5.	pH	8.6
6.	Moisture	45-50
7.	Organic Matter	30-70

Figure 7-Organic Waste Convertor

Benefits of organic waste converter:

- Large quantity of solid waste is converted to fertilizer in a very short period
- This fertilizer can be sold as compost to farmers, or used for gardening
- Machine requires less space and the efficiency is high
- Manpower and maintenance is very less
- This is one of the latest techniques of managing solid waste.

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 amended Rules, 2016. Solid waste management Scheme is depicted in the following figure.

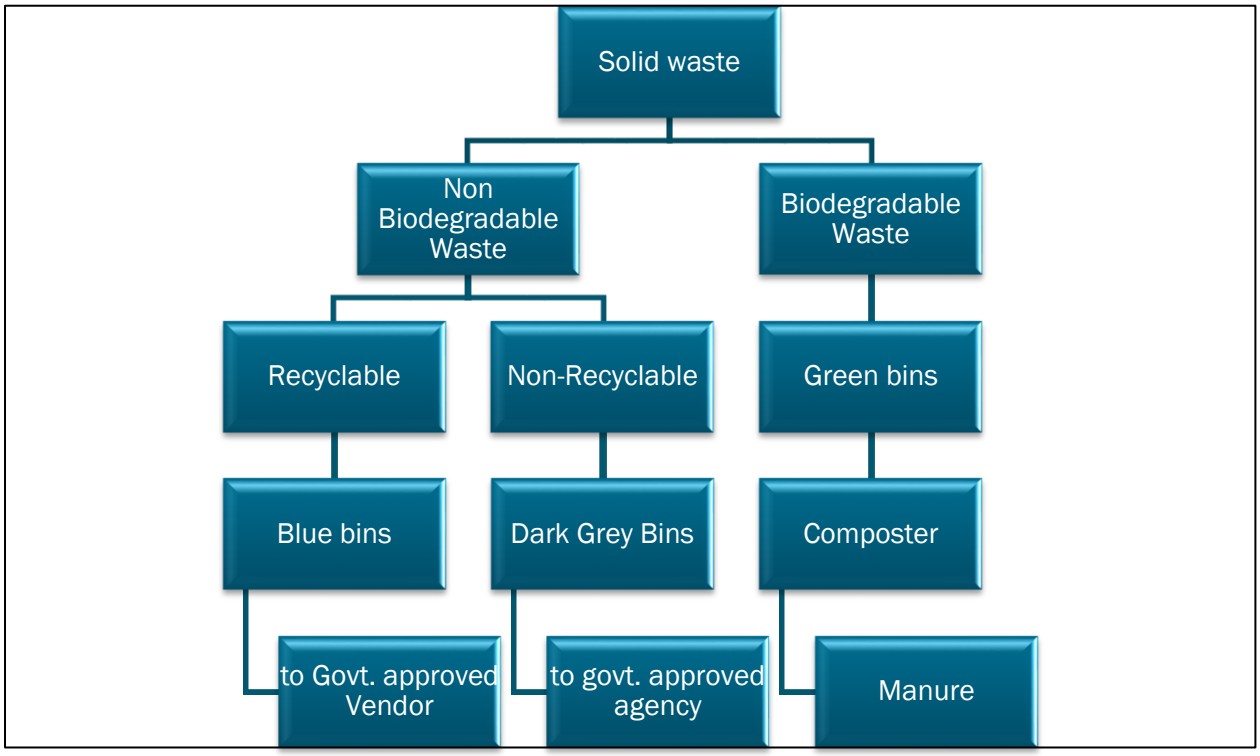


Figure 8: Solid Waste Management Scheme -Domestic Waste

Landscape Details

Total green area proposed for project is 28,546.5 m^2 (30 % plot area). A combination of evergreen and ornamental, palms, shrubs and ground covers planted along the sides of the road and in open space and set back area within the complex layout. Landscaping is an important element in altering the microclimate of the place. Proper landscaping reduces direct sun from striking the buildings and heating up building surfaces, prevents reflected light carrying heat into a building from the ground or surfaces, creates different air flow patterns and can be used to direct or divert the wind advantageously by causing a pressure difference. Shade created by tress & the effects of grass & shrubs reduce air temperature adjoining the building and provide evaporative cooling.

Table 21-Landscape area details

Plot area	**95,155 m^2**

Landscape area Proposed	28,546.5 m^2 (30 % plot area)
As Per MoEF Guidelines	One tree per 80 m^2 of total area out of which minimum 50 % to be in the category of evergreen trees.
Trees Required	95,155/80 = 1,189
Nos. of trees proposed	1,190
Shelter belt (@ 70% of green area)	19,982.55 m^2
Shrubs, herbs, lawns, parks & climber plants, avenue plantation (@ 30% of green area)	8,563.95 m^2

Table 22-List of Trees Proposed

S.No.	Botanical name	Local name
1.	*Azadirachta indica*	Neem
2.	*Cassia fistula*	Amaltas
3.	*Delonix regia*	Gulmohar
4.	*Bauhinia purpurea*	Kachnar
5.	*B. Variegata*	Kachnar
6.	*Lagerstroemia flosreginae*	Pride of India
7.	*Grevillea robusta*	Silk oak
8.	*Callistemon lanceolatum*	Bottle Brush
9.	*Anthocephalus cadamba*	Kadam
10.	*Polyalthia longifolia*	Ashok
11.	*Putranjiva roxburghii*	Putrajiv
12.	*Sterculea alata*	Coconut Buddha
13.	*Bassia Latifolia*	Mahua
14.	*Alstonia scholaris*	Devil Tree
15.	*Michelia champaca*	Champak
16.	*Terminalia arjuna*	Arjun
17.	*Ficus retusa*	Ficus
18.	*Saraca indica*	Ashoka

19.	*Dalbergia sissoo*	Shisham
20.	*Maduca latifolia*	Madhu
21.	*Ficus infectoria*	Pilkhan
22.	*Cassia nodosa*	Roheda
23.	*ORNAMENTAL SHRUBS*	
24.	*Delonix pulcherima*	Chhota gulmohar
25.	*Plumeria alba*	Champa
26.	*Lagerstroemia indica*	Dhayti
27.	*Ervatamia divaricata*	Chandni
28.	*Nyctanthes arbor-tristis*	Harsinghar
29.	*Yellow Duranta*	Skyflower
30.	*Hibiscus hirusta*	Costa Flores
31.	*Cassia biflora*	Twin-flowered cassia
32.	*Nerium indicum*	Kaner
33.	*Cassia aungustifolia*	Senna
34.	*Cassia glauca*	Kalamona

(Source: Guidelines for developing Green Belts by CPCB, 2000)

List of building materials being used at site:

1. Coarse sand
2. Fine sand
3. Stone aggregate
4. Stone for masonry work
5. Cement
6. Reinforcement steel
7. Pipe scaffolding (cup lock system)
8. Bricks
9. CLC fly ash blocks
10. Crazy (white marble) in grey cement
11. P.V.C. conduit

12. MDS, MCBs
13. PVC overhead water tanks
14. 2 1/2" thick red colour paver tiles
15. PPR (ISI marked)
16. PVC waste water lines
17. S.W. sewer line up to main sewer
18. PVC rain water down take
19. Stainless steel sink in kitchen
20. Joinery hardware- ISI marked

List of Machinery Used During Construction

- Dumper
- Concrete mixer with hopper
- Excavator
- Concrete Batching Plant
- Cranes
- Road roller
- Bulldozer
- RMC Plant
- Tower Cranes
- Hoist
- Labor Lifts
- Pile Boring Machines
- Concrete pressure pumps
- Mobile transit mixer