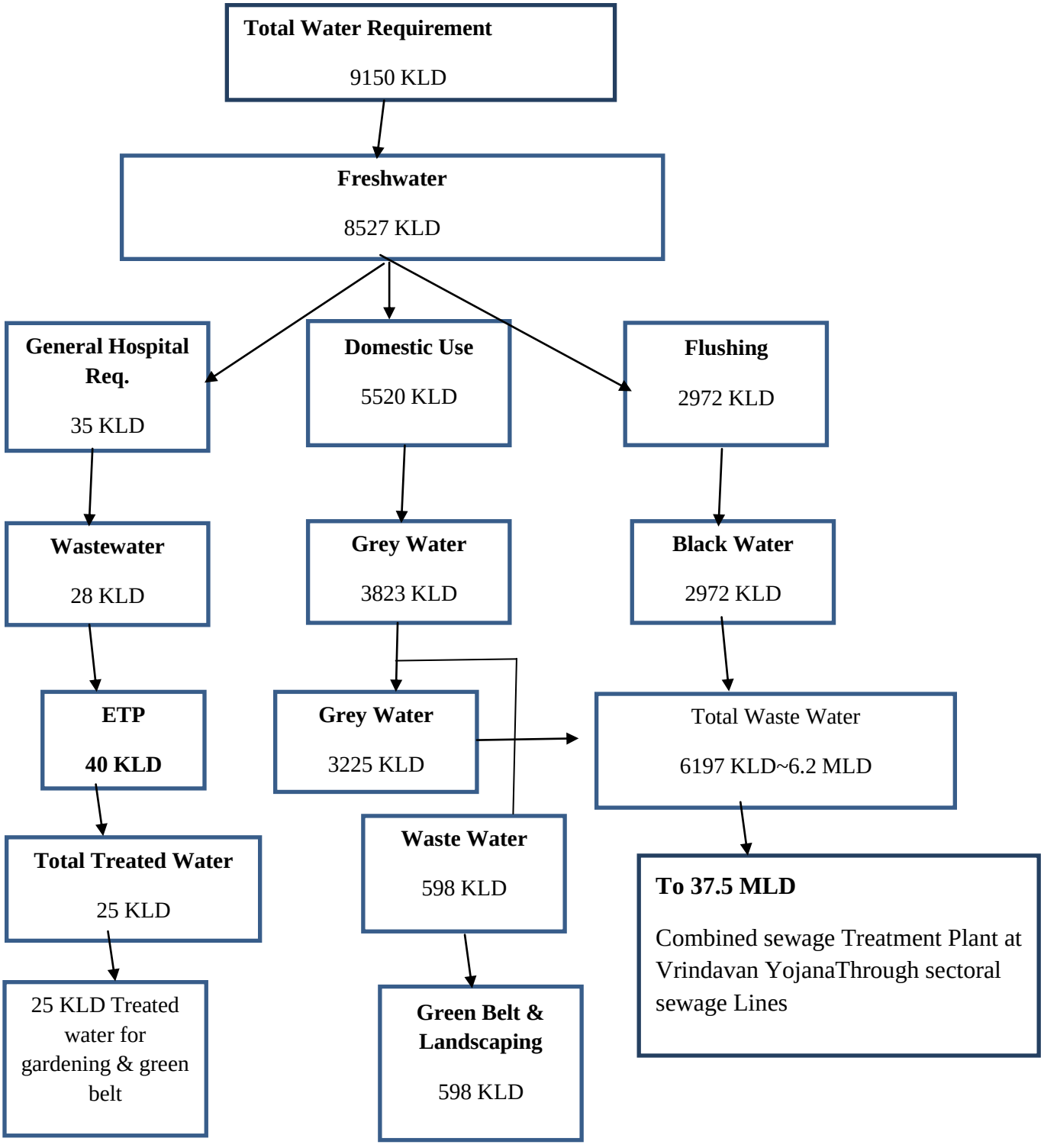
Table 13: Water Use Calculation

S. No.	Land use	Per Capita Water Demand (LPCD)	Total Pop. (Sq.m.)	Total Water Requirement (KLD)	Waste Discharge (KLD)
1	Residential	86	61646	5302	4242
2	Group Housing	86	31312	2693	2154
3	Institutional	45	500	23	18
4	Commercial	45	500	23	18
5	Community centers & social gatherings	45	100	5	4
		Total Township Pop.	**94058**	**8044**	**6437**
6	Floating Pop.	15	29887	448	358
6	**Total Domestic**			**8492**	**6795**

7	**Hospital**	**100 bed**		**350L/bed**	**35**	**28**
8	**Landscape**	**430542 m^2**		**@1 L/m^2**	**430**	**0**
9	**Green Belt Development**	**430542.1 m^2**		**@4.5 L/m^2**	**193**	**0**
	TOTAL WATER REQUIREMENT				**9150**	**6823**

Water Balance Diagram



The grey water is the waste water generated from sinks,showers, washing machines, dish washers etc.Black water is any waste from a toilet or urinal.In the proposed residential houses black water is generated for flushing purposes only. It contains disease causing organisms that can result in human illness by direct contact so is disposed in the Sewage Treatment Plant.

6.1.3 Sewerage

The Township of Vrindavan Yojana Pocket No-4,3823.0 KLD Grey water and 2972 MLD Black water shall be generated from the domestic requirements, which will be treated in a 37.5 MLD STP located at sector 10 Telibagh Vrindavan Yojana-04 Lucknow.

About 200 KLD of water shall be reused for street washing and drain cleaning works whenever required and 598 KLD used for landscape and green belt purpose as proposed at Vrindavan Yojana -04 at Lucknow City. The system shall be designed as a separated system for sewage and sullage based on conventional water carriage method. The drainage system shall be a 2 pipe system in which the soil and waste pipes shall be distinct and separate with independent vents. The disposal from individual buildings will connect locally and they will be carried through a battery of manholes and finally discharged into the Sewage Treatment Plant (STP).The sewer lines have been designed for three times Average weather Dry Flow (AWDF) in relation to the water supply demand .It has been assumed 80% of the domestic water supply shall find its way into the proposed sewer. All the sewers have been designed to run hall full. Necessary provisions for carrying R.C.C sewer lines and manholes have been made in the scheme.

The 37.5 MLD sewage treatment plant is based on the Sequential Batch Reactor (S.B.R) technology

STP Capacity with Population Budgeting

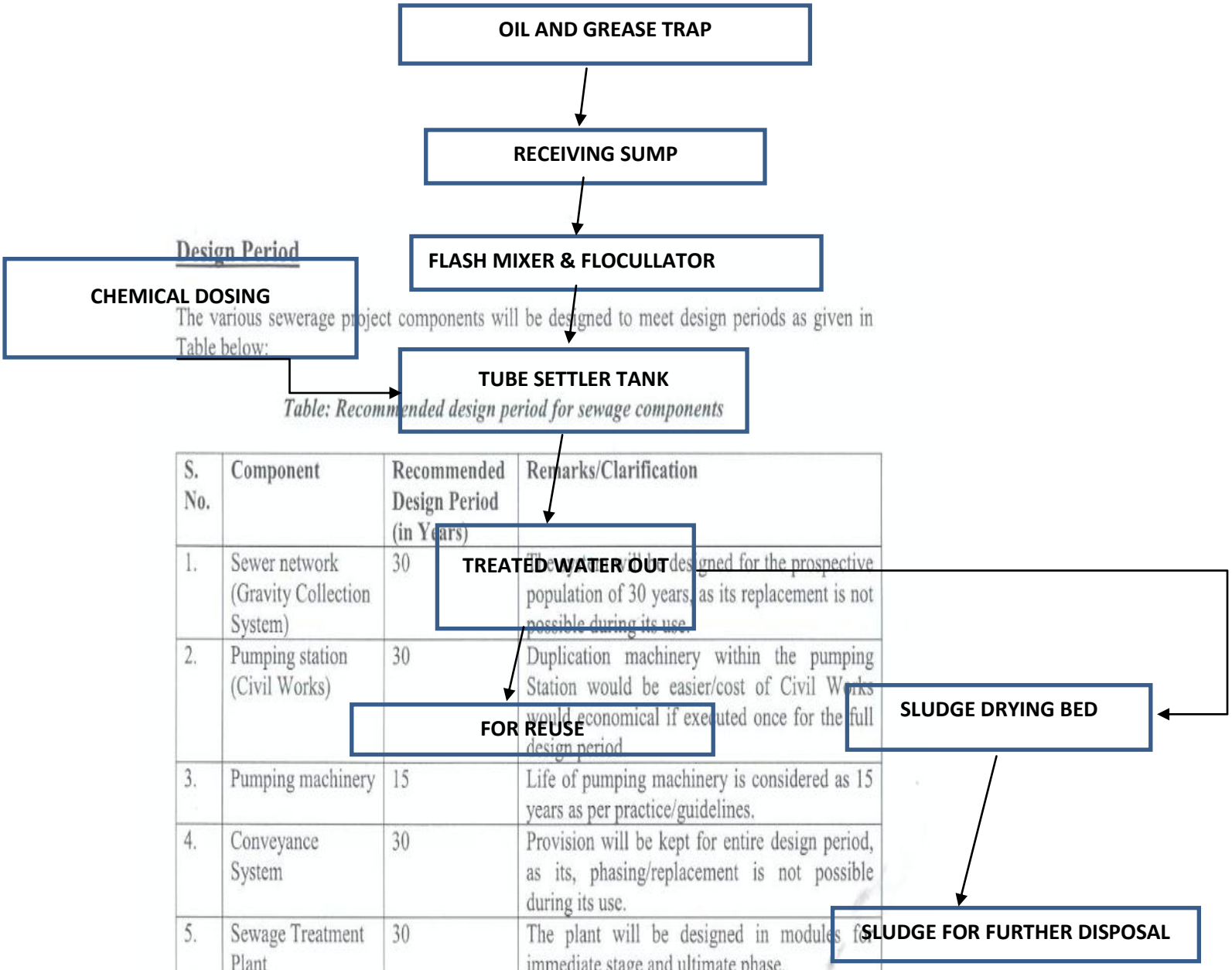
S.no	**Scheme**	**STP at sector 10**
1	Area in hectare	961.15
2	Pop. Density (Person/Hectare)	600.00
3	Population (No. of Persons)	576690
4	Water supply (LPCD)	172.50
5	Total Water Supply(MLD)	99.48
6	Sewage Generated	0.75
7	Sewage Generated	74.61

Proposed Ultimate Capacity	**75 MLD**
Expected Flow 0-15 years	**37.5 MLD**
Expected flow 15-30 years	**37.5+37.5 =75 MLD**

EFFLUENT TREATMENT

At the project site 40 KLD generated waste water from the general hospital building will be treated at proposed 50 KLD ETP and the treated water shall be totally reused in green belt and landscaping purposes within the proposed institutional building.

SCHEME OF EFFLUENT TREATMENT PLANT:



Design Period

The various sewerage project components will be designed to meet design periods as given in Table below:

Table: Recommended design period for sewage components

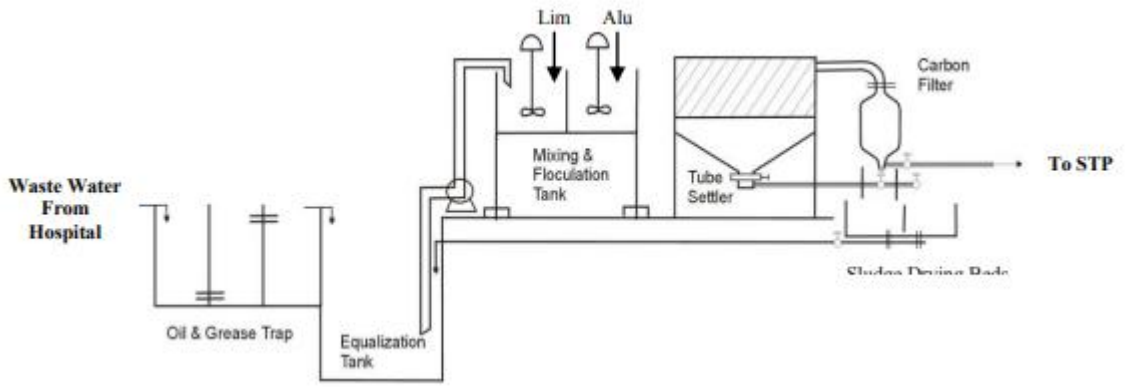
S. No.	Component	Recommended Design Period (in Years)	Remarks/Clarification
1.	Sewer network (Gravity Collection System)	30	[illegible] designed for the prospective population of 30 years, as its replacement is not possible during its use.
2.	Pumping station (Civil Works)	30	Duplication machinery within the pumping Station would be easier/cost of Civil Works would economical if executed once for the full design period
3.	Pumping machinery	15	Life of pumping machinery is considered as 15 years as per practice/guidelines.
4.	Conveyance System	30	Provision will be kept for entire design period, as its, phasing/replacement is not possible during its use.
5.	Sewage Treatment Plant	30	The plant will be designed in modules for immediate stage and ultimate phase.
6.	Effluent Disposal System	30	Provision of design capacities in the initial stage is economical.

For the present project, the best construction materials and practices shall be adopted. Therefore, the design should be done to last a lifetime.

During operation phase, in the proposed Township generation of waste water will be treated in STP of **37.5 MLD** capacity.

PROCESS DESCRIPTION FOR EFFLUENT TREATMENT PLANT

The effluent will be first passed through a Bar Screen Chamber and an oil and Grease Trap Where any extraneous / floating matter would get trapped.
The effluent would then be collected in a receiving Sump where the variations in flow and characteristics are dampened, whichotherwise can lead to operational troubles and moreover it allows a constant flow rate downstream.
The equalized effluent will then be pumped to the MIXER & FLOCULLATOR where BOD/COD reduction is achieved by virtue of CHEMICAL DOSING.
The treated suspended matter formed in the process will be separated in the downstream Tube Settler Tank and the treated water will be reused and existing green belts within the township.



STORM WATER MANAGEMENT SYSTEM
Drainage has been planned based on watershed areas and on the principle of distribution of percolation of areas rather than consolidation in order to minimize changes of flooding, reduce capacity of storm water collection and the transport system and maximize percolation of rain water.
Rainwater is available as runoff from the paved surfaces like pathways, plazas, cycle tracks and streets.A substantial amount is available from the soft unpaved areas like the central green ,peripheral green and open spaces of various sizes and functions spread all over the site.
Materials that are predominantly low in embodied energy will be used for pathways, parking and streets. There is a Nala namely Usar Barauli Nala running already at the periphery of Vrindavan -04 Townships, the Drainage is planned in such a way so as to ensure that maximum site storm water is being fed to the Nala.
And the existing Nala is being re-routed as per the requirements and finally, all the storm water from the site is being thrown away to the existing river Gomti adjacent to the site Boundary.

EXTERNAL DRAINAGE
Drainage system for soil and waste is proposed to be based on the most efficient, functional design, minimum maintenance after installation and available site topography to minimise the excavation work in laying the pipe. The system shall be designed keeping in view the following.

- Natural Grading of the site.
- Layout of different facilities in the building
- Levels of Road and other services in the vicinity

- Sub soil water table
- Soil conditions

The system shall be designed as per the following design criteria stipulated in the "Manual for Sewerage & Treatment " published by the Central Public Health and Environment Engineering Organization ,Ministry of Urban Development ,Govt. of India ,ISSP /35(S&T)1987 and National and international practices on the subject.

STORM WATER QUANTITY

Calculation of Storm Water Quantity;

The Storm water quantity is determined by the rational formula

Q=CIA/360

Where Q=Quantity of storm water in cum/sec

C=Coefficient of runoff

I= intensity of rainfall in mm/hr.

A=Drainage area in hectare's

Considering runoff coefficient as 0.60 for macadam roads /inferior's stone, brick or black pavement with open joints.

I=25 mm/hr.

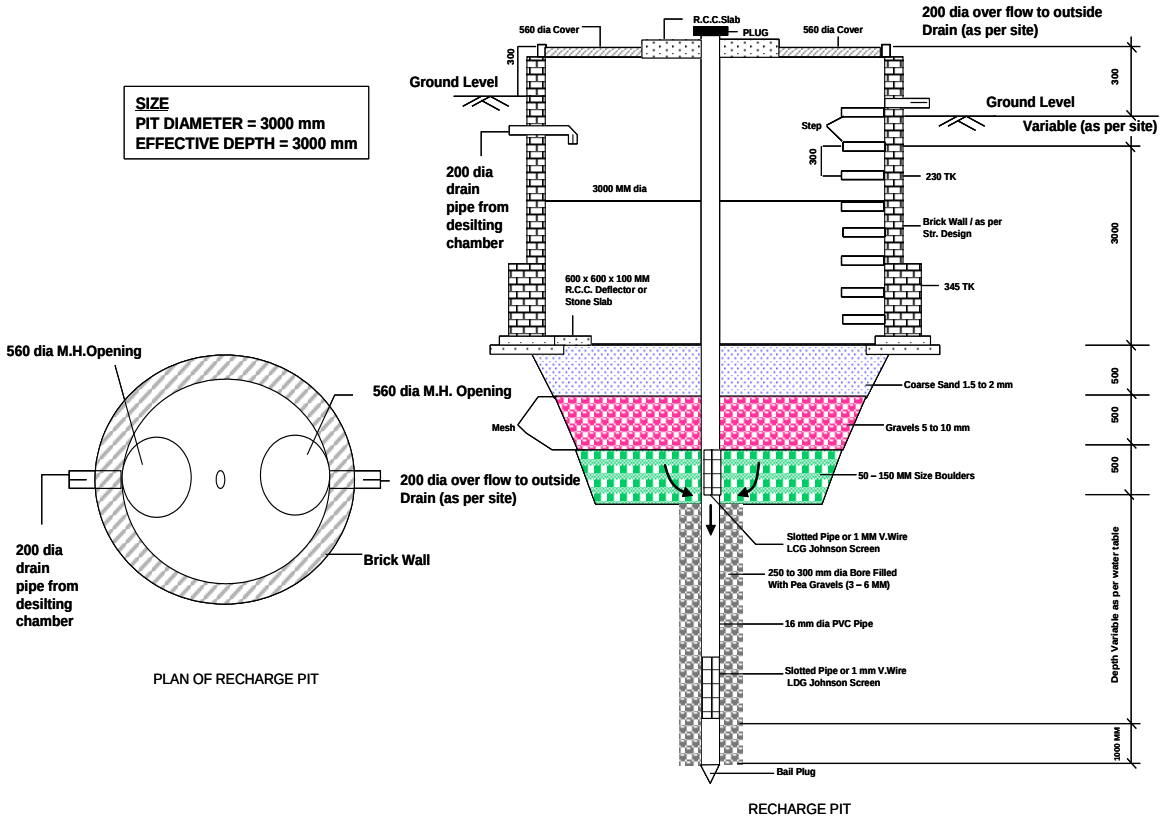
Q= (0.60×25×391.40)/360

=16.30 cum/sec

- Storm water runoff for roads has been considered as the same shall be collected via road gully chamber to drain channel .The storm water drains shall be covered.
- Run off coefficient for internal building roof shall be considered at the time of further development of project.
- Drain channel and chamber has been proposed near roads, median and under developed pedestrian to collect storm drain from building to covered storm water drains via drain channel /chamber.
- Only roof top rain water will be harvested through recharge pits.

6.2 RAINWATER HARVESTING

Fig 6: Rain Water Harvesting



As the district receives 25 mm of peak hourly rainfall rainwater harvesting in existing ponds by rejuvenating these and even constructing new pond in the low lying areas with enough catchments is feasible. Construction of Percolation tanks and recharge shafts may be an economical option in areas with deeper water levels on community basis. Suitable arrangements are being made by allotters to tap rainwater via roof by channelizing the clean water to rainwater recharging pits provided depending on the size of plots. In affordable housing & bigger plots industrial, commercial complexes, institutional, group housing etc also rain water harvesting has been made mandatory in Building Regulations.

Rain water from the various roofs will be drained through rain water vertical down take UPVC / MS pipes. These vertical down take pipes will be located at suitable locations inside the shafts or

embedded inside the wall. All the terraces will be sloped in a slope of 1:50 or 1:75slopingtowards down vertical pipes. Rain water disposal shall be designed as per NBC i.e. 200 mm dia and 15 m depth of bore for rainfall @ of 25 mm/hour rainfall as per NBC.

Table 15: Quantum of Rainwater Available for Harvest

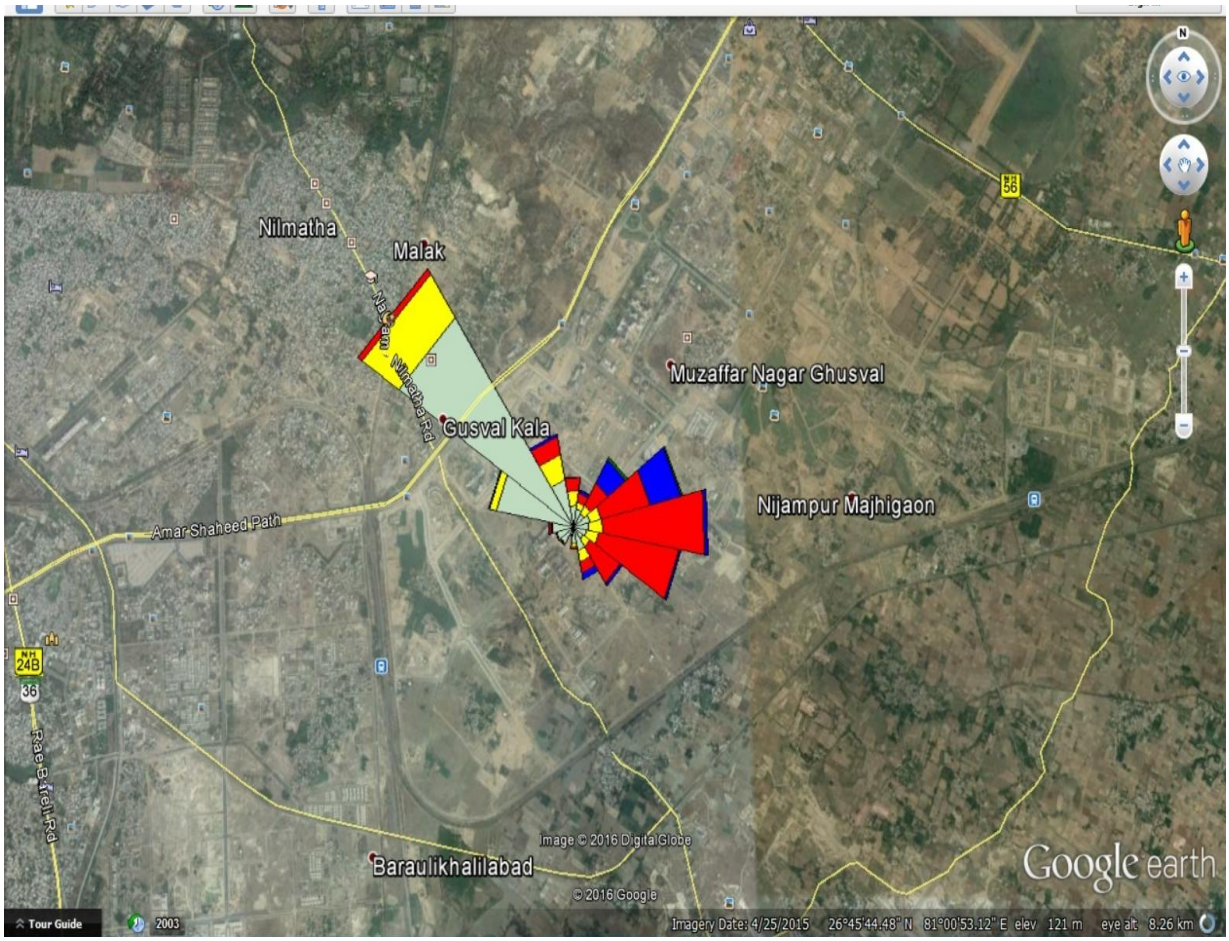
S. No.	Description of Area	Area considered (Sqm.)	Harvesting Factor or Collection Efficiency	Hourly Rainfall intensity (mm/hr)	Total Volume of Water available for Rain Water Harvesting (Cubic mtrs/hr)
1	Roof-top Surfaces	1053849.62	0.8	25	21077
Grand Total					**21077 cum/hr**

Total Quantum of Rainwater for 0.25 hr=21077/4=5269 m^2

6.3 AIR POLLUTION CONTROL

In order to reduce impact of dust during construction period, enclosure walls with a height of 2 meters or above will be built around the construction site; on-site mixing will be done at enclosed space, cement, lime powder and other construction materials shall be stored at storage yard or tightly covered, discrete materials such as sand and soil will be covered, the building materials to be loaded, unloaded and/or handled shall be covered, closed or sprinkled, and none of them shall be thrown or spread into the air; a water ditch with its width at 3.5 meter, length at 10 meters and depth at 0.2 meter shall be made at the exit to and from the construction site, in which crushed stones with a diameter at 50 millimeters will be laid, so as to reduce the amount of earth on tires of vehicle to and from the construction site; covers will be made on materials to be transported or they will be transported by enclosed vehicles, routes of transportation vehicles shall avoid residential quarters and other environmentally sensitive areas, and vehicle speed shall also be limited.

Adequate height of DG sets as per CPCB standards shall be followed.



During transportation of raw / construction material, a water ditch with its width at 3.5 meter, length at 10 meters and depth at 0.2 meter shall be made at the exit to and from the construction site, in which crushed stones with a diameter at 50 millimeters will be laid, so as to reduce the amount of earth on tires of vehicle to and from the construction site; covers will be made on materials to be transported or they will be transported by enclosed vehicles, routes of transportation vehicles shall avoid residential quarters and other environmentally sensitive areas, and vehicle speed shall also be limited.

6.4 SOLID WASTE MANAGEMENT

6.4.1 MUNICIPAL SOLID WASTE

It is estimated that for 511854 persons of township, around 318885.042Kg/ Day of municipal solid waste @ 0.623 Kg/day/ person shall be generated.

Table 16: Municipal Solid Waste				
Type of Waste	**Colour of Bins**	**Category**	**Disposal**	**Total Waste (kg/day)**
Organics	Green	Bio Degradable	Municipal Solid Waste Site	32230
Paper	Blue	Recyclable	Approved Recycler	7617
Metals				
Glass				
Textiles				
Plastic				
Stones, Ash & Dust	Red	Non-Bio degradable	Municipal Solid waste Site	18751

Therefore, total expected MSW waste = 58598MTPD.

The solid waste shall be segregated and collected as per the above scheme. These bins will be emptied into the main bin of the floor. From bins of each floor, service provider from housing society will collect the garbage and waste shall be discharged to main bin of the Group Housing. The red and green bins shall be picked up on the instructions of LNN for disposal. The Group Housing Society management shall engage a vendor, which carries this waste for recycling and rest to the municipal solid waste site. The management shall engage a vendor & they will dispose the waste at the proposed site identified by the Lucknow Municipal Corporation.

6.4.3 Hazardous & Electronic Waste

Hazardous waste is a waste with properties that make it dangerous or potentially harmful to human health or the environment. Hazardous wastes can be liquids, solids, contained gases, or sludges and even from proposed Township scheme. They can be the by-products of manufacturing processes or simply discarded commercial products, like cleaning fluids or pesticides. All hazardous wastes are required to be treated and disposed of in the prescribed manner. The main objective is to promote safe management and use of hazardous substances including hazardous chemicals and hazardous wastes, in order to avoid damage to health and environment.

Table 18: Hazardous & Electronic Waste				
Type of Waste	**Colors of Bins**	**Category**	**Disposal Method**	**Total Waste**

Used Oil	Black With Label	Hazardous Waste	Approved Service Provider as per HWM 2010	5.0 Kg/day
Electronic Waste	Black With Label	Hazardous Waste	Approved Service Provider as per HWM 2010	210.0 Kg/day
Total Hazardous & E-waste expected to be generated				**215.0 Kg/day**

6.5 NOISE ENVIRONMENT MANAGEMENT

The main source of the noise pollution would be two wheelers within premises.

6.6 TRAFFIC MANAGEMENT

Traffic management is the planning implementation and control of transportation services for achieving the desired objectives and also to reduce the noise level in the residential scheme.

Project proponent shall be responsible for managing all parking and safety issues regarding the use of vehicles inside premises of proposed residential scheme. To reduce the noise level, it will be ensured that the traffic movement must be is smooth and horns will not be used within the parking areas of the residential scheme. Incoming and outgoing gates will be different, so as to avoid any traffic congestion due to parking. Plantation of the trees near the paved areas and roads of the residential scheme will be done for decreasing the air and also the noise pollution level. The traffic manager and all persons involved with these activities shall do traffic management.

A good control system shall be setup. The following standards shall be maintained for parking areas:

- **All resident vehicles shall have a parking sticker permanently affixed to the driver's side back seat window.**
- **All resident vehicles shall be limited to parking in designated spots.**
- **Vehicles shall enter from Entry Gate and leave from Exit Gate.**
- **No vehicle shall be parked in fire tender movement areas.**
- **All vehicle users who disregard policies shall be subjected to fine, or loss of parking privileges.**

Speed Limits

In the residential scheme, speed limits are set to provide for the safe movement of persons and vehicles. 20 Kmph on road ways and 10 - 15 Kmph in parking lots.

6.7 LANDSCAPING & HORTICULTURE

Natural landscaping is also referred to as sustainable landscaping. It stresses the use of native plants that are beautiful, hardy and that also benefit the local environment. Native plants are

especially good at preventing soil erosion, reducing flooding, sustaining wildlife and filtering out harmful pollutants in the soil. Natural landscaping offers residents, a way to reduce the use of chemical pesticides and fertilizers, while introducing natural techniques that are safer for the long-term health of the community.

The landscaping Proposed in an area=430542.10 m^2
Green Belt Development in an area+430542.10 m^2
As per MoEF bye-laws
Required number of trees=01 trees/80 square meter of area
Therefore, required number of trees =3914019.0 m^2/80 =48925 trees
Proposed nos. of trees;
Green belt area of 430542.10 m^2=26908 nos. at spacing of 4×4
Landscape Area; Tree Plantation area=23919 at spacing of 3.0 m ×3.0 m
Hence total proposed nos.of trees are =50827 trees **.Hence Justified.**

Table 19: Details/ Distribution of Tree Plantation
SHRUBS/ HERBS TO BE PLANTED

Avenue Trees:	*Azadirachta indica* (neem), *Polyalthia longifolia*, *Gravellia robusta* (silver oak), pine species (conifers), *Dilbergia sisoo*, *Cassia semea*, *Tecoma urgentia, Ficus pilkhan, Ficus relgiousa, Ficus infectoria*
Creepers:	Bougainvellas, *Tecoma grandiflora*, *Ficus repens*
Medium dwarf trees:	F*icus benjamina, Ficus prestija,Ficus retusa, Ficus citation, Ficus nuda, Ficus panda,Ficus b variegata, Plumeria alba, Bamboosa vulgaris*
Shrubs:	Malphigia, *Hamelia pattens*, Ixora, *Duranta golden, Ficus longisland*, China orange, Cophia, Fercaria, *Cycus revoluta*