UTRAN-GBPS PLANT – GSECL, SURAT, INDIA.

VOLUMETRIC WATER BENEFIT ACCOUNTS

(Water Audit)

Only Rainfall Based Calculations.

Treated Wastewater (TWW) inclusion needs a study.

Audited BY: DHAVAL PANDYA (COMMITTEE MEMBER, WRD03 – BUREAU OF INDIAN STANDARDS. GOVT OF INDIA)

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Certificate

This is to certify that the **Tender Work No.Web-04/Civil-Works/2024 for Consultation of Developing Total Rainwater Management program for GSECL, Uttran-GBPS** is an action towards SDG6 and Mission LiFe lead by **P.M Shri Narendra Modiji.** Along with Social Responsibility of GSECL, Uttran-GBPS, this project is an example of **"pre-prep" of Green Credit System, which is supposed to be launched in the year 2025 by Gazette Notification CG-DL-E-26102023-249692.**

In the proposed plan under **Global Rainwater Management Program (GRMP)**, GSECL, Uttran-GBPS is suggested to develop two suitable systems at the plant site having area above 44 Hectors **following Guidelines of CGWB and National Laws:**

A. Artificial Wetlands based Groundwater Recharge System with Contamination Reduction abilities (IS 15792:2008).
B. Rooftop Rainwater Harvesting System with Contamination Reduction abilities (IS 15797:2008).

GSECL, Uttran-GBPS's average yearly spending on water procurement for the Industrial and Drinking uses is around **₹.3,74,78,008/Year** with an average annual usage at **9,95,110 Kiloliters.** Where with the plant area above **44 hectors** and average annual rainfall at **1787mm** in the region, plant has a potential to conserve around **7,07,652 Kilolitres** of rainwater valuing around **₹. 2,85,04,223/YEAR. Considering minimum life of the project at 10 years with the maintenance (Negligible), ₹. 28,50,42,230/- can be saved** by spending around ₹. 2,95,00,000/- **on developing a TOTAL RAINWATER MANGEMENT PROGRAM. (OPTIONAL PLAN OF DEVELOPING POND BASED WATER SUPPLY SYSTEM IS ALSO PROPOSED.)**

Certified BY:

DHAVAL PANDYA (CEO: Shree Someshwar Education Trust, Surat.)

(Member: National Committee of Bureau of Indian Standards, Water Resources Department – WRD03)

CURRENT SCENARIO

USED QUANTITY AND COSTS (KILO-LITRES)						OPPORTUNITY LOST		
YEAR	INDUSTRIAL USE	Rate Rs.40.28 per KL	DRINKING USE	Rate Rs.4.27 per KL	TOTAL EXPENSES	RAINFALL (MM)	QUANTITY {KL} (44 HECTORS)	MONETARY VALUE @ Rs 40.28
2019-20	9,58,417	3,86,05,037	65,085	2,77,913	₹ 3,88,82,950.00	2167	9,53,480	₹ 3,84,06,174.40
2020-21	20,87,319	8,40,77,209	65,030	2,77,678	₹ 8,43,54,887.00	1599	7,03,560	₹ 2,83,39,396.80
2021-22	6,31,160	2,54,23,125	65,920	2,81,478	₹ 2,57,04,603.00	1822	8,01,680	₹ 3,22,91,670.40
2022-23	1,88,236	75,82,146	99,414	4,24,498	₹ 80,06,644.00	1222	5,37,680	₹ 2,16,57,750.40
2023-24	7,48,708	3,01,57,958	66,276	2,82,999	₹ 3,04,40,957.00	2126	9,35,440	₹ 3,76,79,523.20
TOTAL	46,13,840	18,58,45,475	3,61,725	15,44,566	₹.18,73,90,041	8936	39,31,840	₹.15,83,74,515
AVG	9,22,768	3,71,69,095	72345	308913	₹.3,74,78,008	1787	7,86,368	₹.3,16,74,903

SOURCE:

1. Data Provided by GSECL, Uttran-GBPS.
2. India Meteorological Department.
3. NAQUIM Report, District Surat -2023 by Central Groundwater Board (CGWB)

Groundwater Conditions and Stakeholders

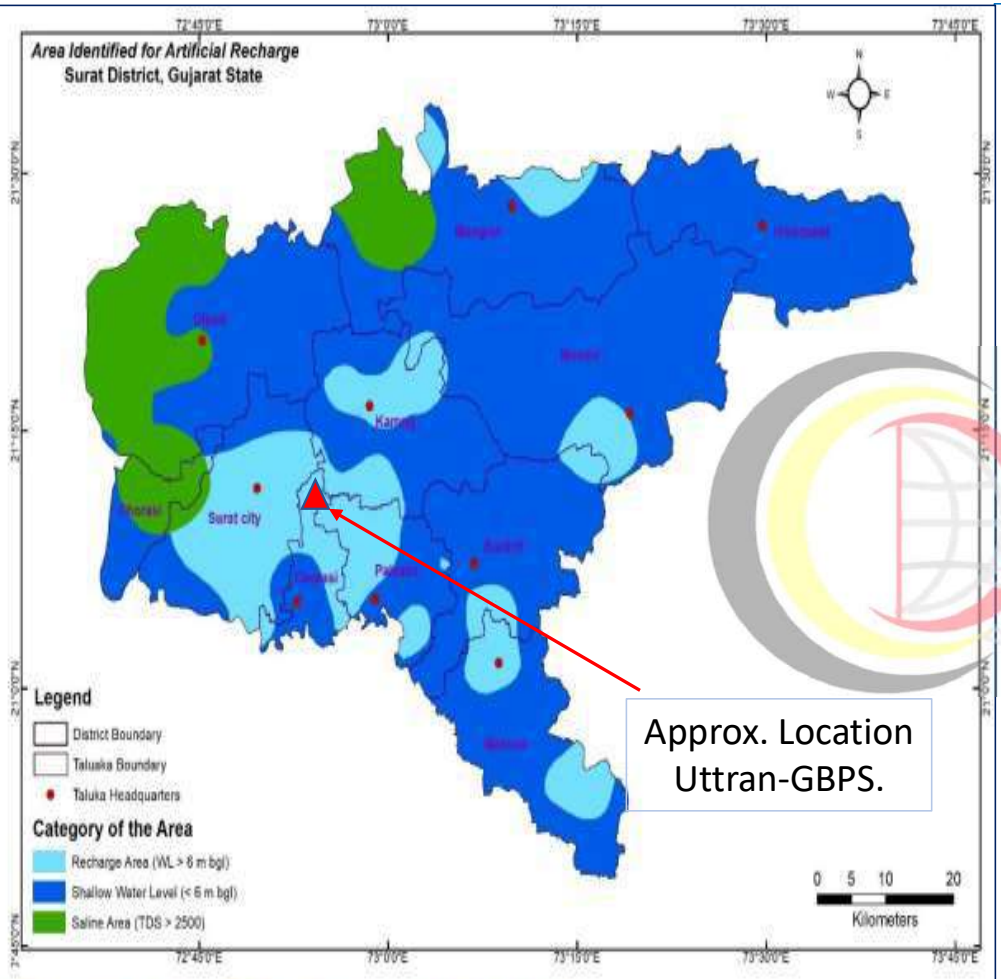


Figure 57 Suitable area identified for artificial recharge in Surat district.

- **<u>As per National Aquifer Mapping (Naquim Surat -2023) by CGWB</u>** Aquifer in Surat Urban area including Plant Location comes under OVER-EXPLOITED CATEGORY with 118.39%.

- UTTRAN-GBPS falls under Surat Municipal Corporation.

<u>GROUNDWATER QUALITY of EXSISTING BOREWELLS.</u>

YEAR	PH	TDS
2024	7.2	198

- Residents around the Plant area are totally dependent on Municipal water supply, Where Plant gets it's water from Gujarat Water Supply and Sewage Board (GWSSB).

<u>LEGAL FRAMEWORK:</u>

The Water (Prevention and Control of Pollution) Act, 1974, as amended in 1978, makes even the companies and the Heads of the Government Departments punishable under the said Act, **if the offences under that Act are found to have been committed by a company,1 or a Government Department, 2, as the case may be.**

POTENTIAL WATER CONSERVATION USING Global Rainwater Management Program (GRMP) & RETURN on INVESTMENT.

NO	SYSTEM	CATCHMENT (in Sq.Mtr)	Average Annual Rainfall (In MM)	Rainwater Availability (in KL)	WASTAGES @10% (in KL)	POTENTIAL Availabilty (in KL)
1	Rooftop RWH System	25,000	1787	44,675	-4,467.50	**40,207.50**
2	Artificial GWR SYSTEM	4,15,000	1787	7,41,605	-74,160.50	**6,67,444.50**
TOTAL		4,40,000	NA	7,86,280	-78,628	7,07,652 *

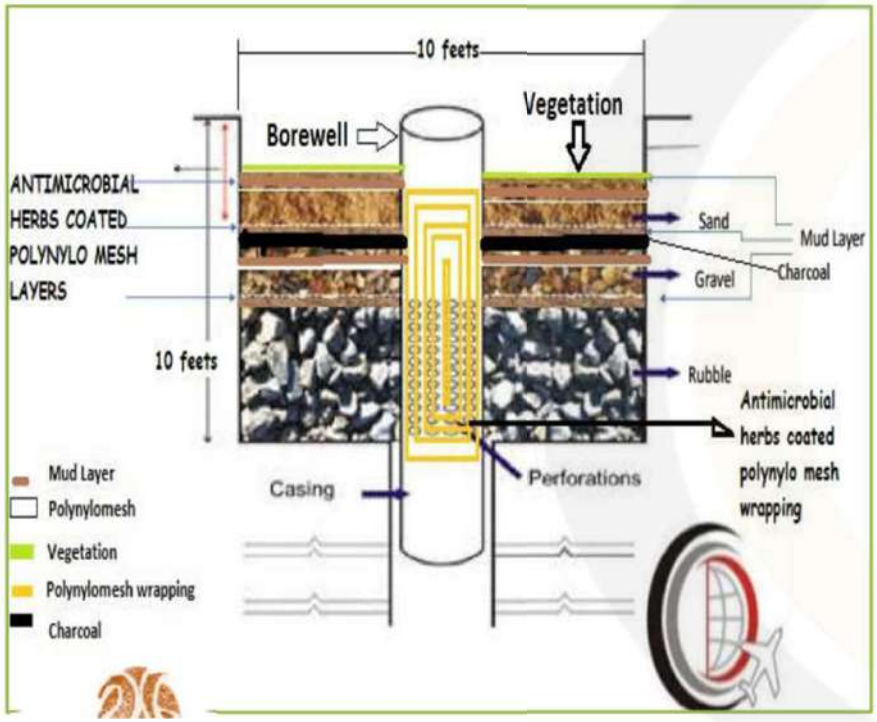
MONETORY VALUE (₹40.28/KL): 7,07,652* x 40.28 = ₹. 2,85,04,223*/YEAR.

Minimum life - 10 Years, Probable SAVINGS - ₹. 28,50,42,230*/-.

1. GRMP has a potential to save around 66% of yearly water expenses of UTTRAN-GBPS.
2. With the Investment of Less than a YEAR's Water Expenses, 1000% of Future costs can be saved in next 10 years.

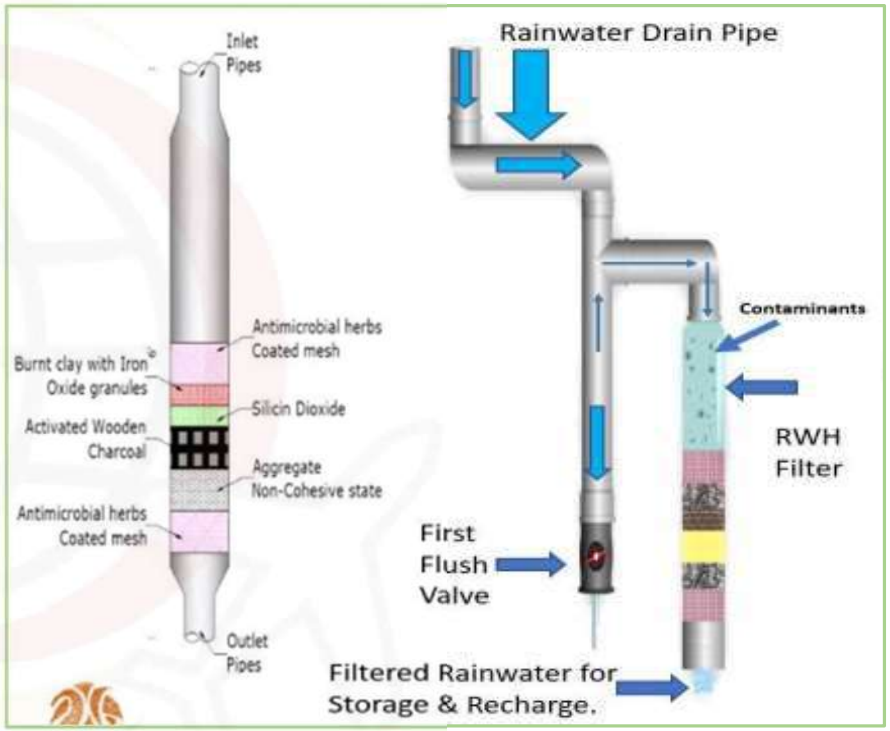
Proposed Rainwater Management Program.

Artificial Wetland Based Groundwater Recharge System with Contamination Reduction Abilities.



BIS STANDARDS. IS: 15792:2008, REVISION-2024

Rooftop Rainwater Harvesting Filter with Contamination Reduction Abilities.



BIS STANDARDS. IS: 15797:2008, REVISION-2024

Patent (A) No.: 202221067556

Office of the Controller General of Patents, Designs & Trade Marks
Department for Promotion of Industry and Internal Trade
Ministry of Commerce & Industry,
Government of India

STAGEWISE FILTRATION PROCESS & ROLE of FILTER MEDIA.

1. **Jaali (Trap) at terrace** : which avoids big flakes of organic and inorganic waste.

2. **Waste line Valve**: Where rest visible debris, small flakes, and heavy waste particles apart from microbial and chemicals contaminants get flushed. This valve is suggested to keep just 5% open to avoid pressure building and leakages from existing drain pipes.

3. With this separation process, rainwater reaches to **"Y" STRAINER** after climbing around 4 feet of height where pressure from incoming rainwater from Up line helps more particles getting flushed away.

4. After water reaching in filter it touches the first layer which is **Antimicrobial herbs coated mesh** with controlled release where almost 40% of microbial contaminants gets avoided and contributes to degradation of the CHEMICAL PARTICLES.

5. After this layer, the water reaches specially designed **polyol decalsinated foam** which helps in clearing micro waste particles and retaining herbs released by mesh in filter for a longer period of time to balance microbial and chemical activities.

6. After the process from foam, the water reaches again to a **Antimicrobial herbs coated mesh with controlled release** where it continue it's predefined process.

7. After this steps water reaches to a layer of **burnt clay with iron oxide granules** size depending on geo and hydrological requirements of the location. This layer helps in absorbing chemical Contaminations and impurities by along with odors.

8. Then water reaches to **silicon dioxide microgranules** which settles the water for a while as this a semi permeable layer. This layer helps in balancing color of the water too.

9. Speed of water gets a bit slow after semi permeable layer, and reaches to a layer of **activated wooden charcoal layer** which clears almost all chemical Contaminants odors and color.

10. After processing of activated wooden charcoal, the Water reaches to a layer with **Noncohesive loose stated processed aggregates** for additional cleaning of microparticles, odour and colour balancing.

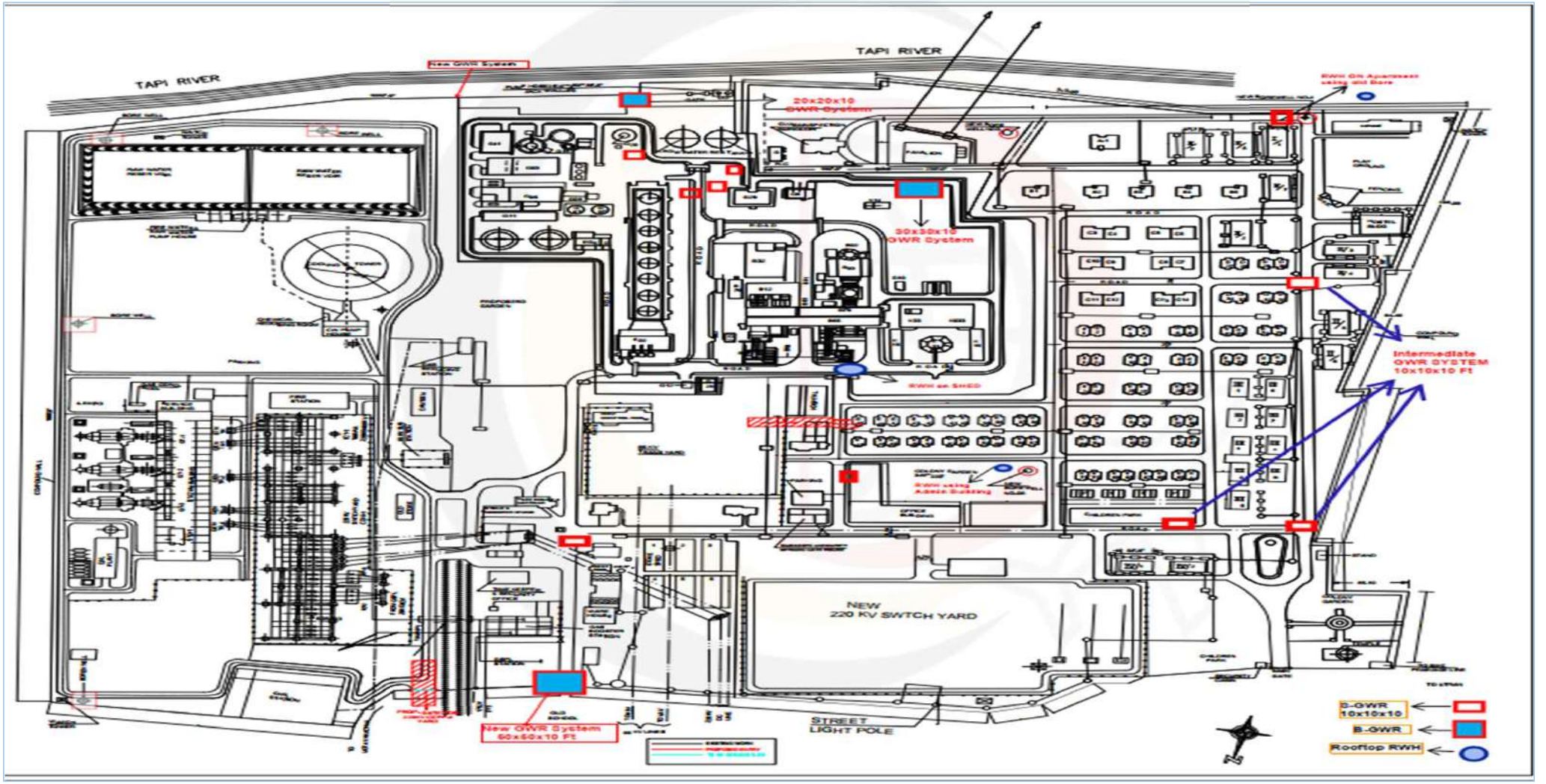
11. Then water reaches again to another **Antimicrobial herbs coated mesh with controlled release** where rest microbial contaminants get avoided.

12. After this layer, the water again reaches to specially designed **polyol decalsinated foam** which helps in clearing micro waste particles and retaining herbs released by mesh in filter for a longer period of time to balance microbial and chemical activities.

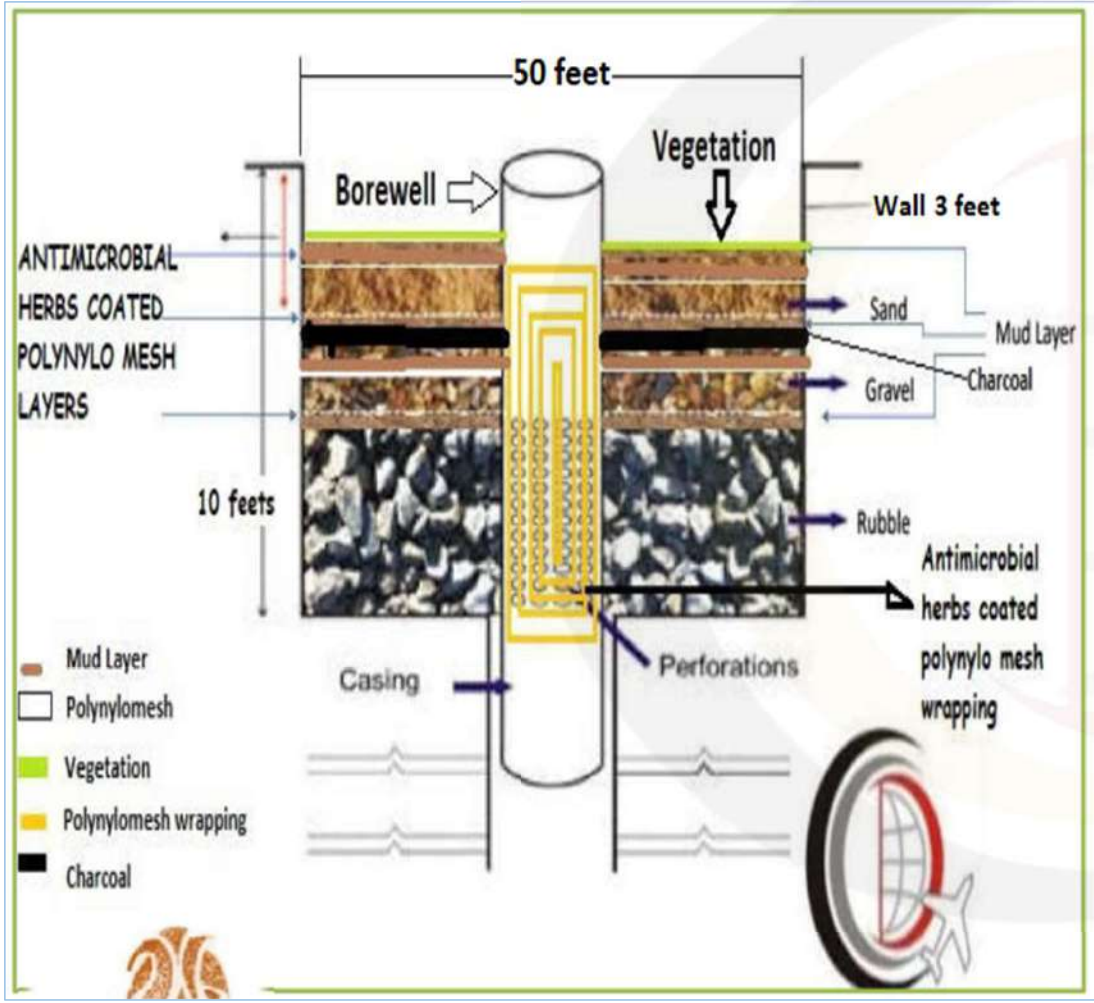
13. After the process from foam, the water reaches again to a Antimicrobial herbs coated mesh with controlled release where additional microbial contaminants gets avoided.

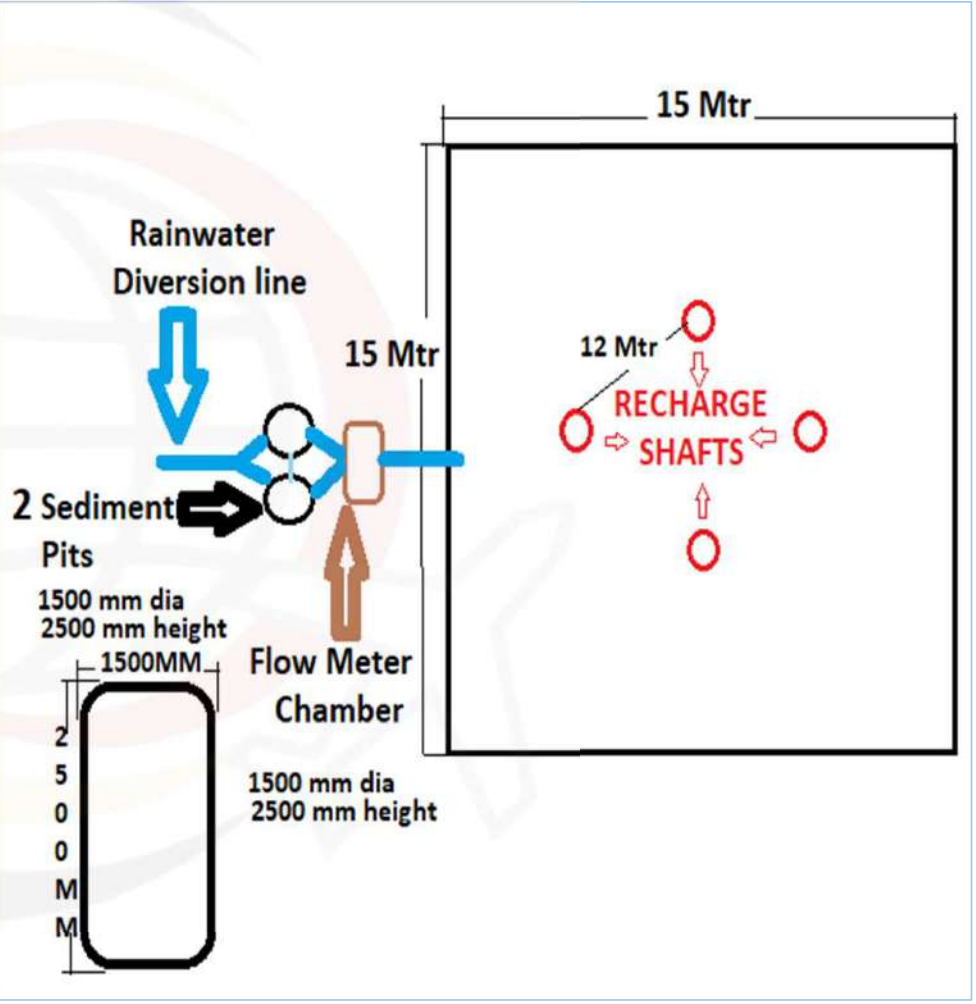
14. Finally your run-off rain water is ready for storage or for supply to Aquifers through bore wells.

Proposed Rainwater Management Program on LAYOUT.

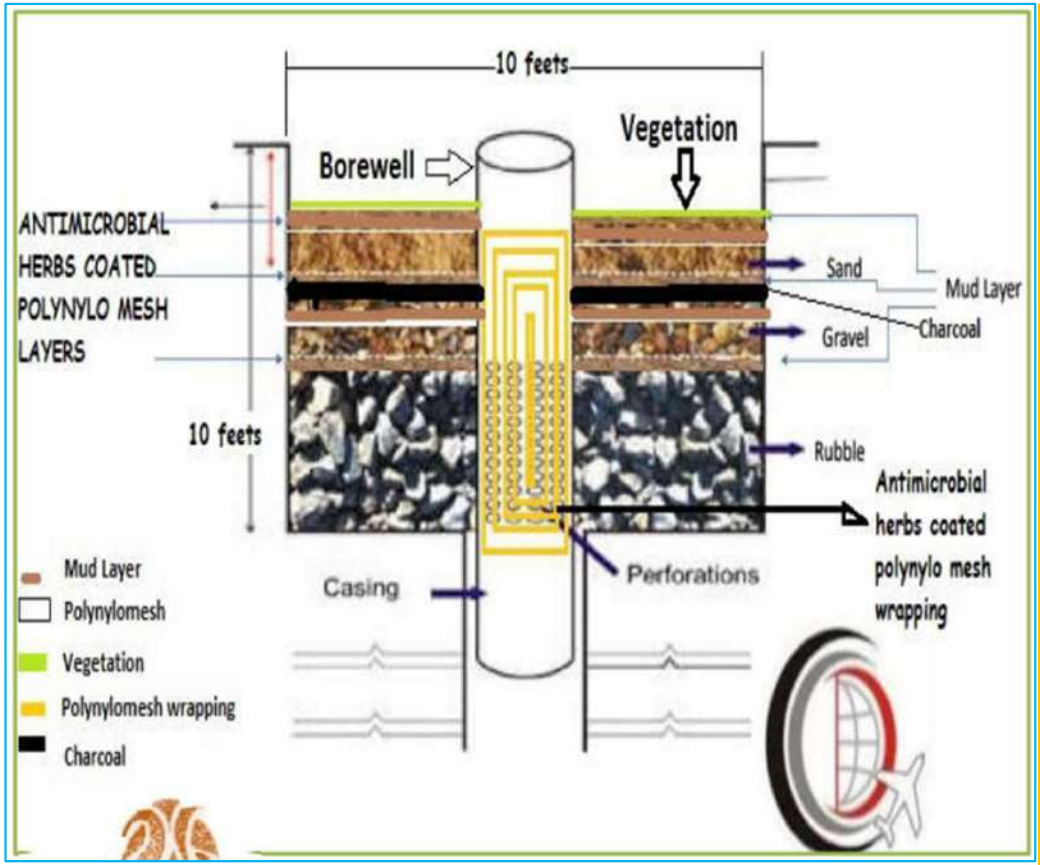


Big Artificial Wetland based GWR Systems (Nos-3).





Small Artificial Wetland based GWR Systems (Nos-10).



NO	Sequence of FILTER MEDIA	HEIGHT (Feet)
Double layer Wrapping of Recharge Shafts with AMBH Mess till 10 feet.		
1	RUBBLES	
2	Mud + Gravel + AW Charcoal	
3	AMBH Mess	
4	Gravel	
5	AMBH Mess	
6	SNAW Carbon	
7	AMBH Mess	
8	Gravel	
9	Mud + Gravel + AW Charcoal	
10	Vetiver Grass and Plantations	

DESIGN, SIZE, SEQUENCES of LAYERING etc. are Subject to Change after actual drilling and excavation jobs are completed at all GWR Systems. Patent (A) No.: 202221067556.

STAGEWISE FILTRATION PROCESS & ROLE of FILTER MEDIA.

Let us see how Artificial Wetland based GWR functions:

- Building a **Cleaning Chamber** before GWR system for cleaning visible wastes from existing drain pipes.
- With this separation process, rainwater reaches in filter bed after climbing around 4 feet of height where **sedimentation process** is done from incoming rainwater from Upline.

- After water reaching in GWR system it touches the layer which is **Vetiver Grass and Vegetation Layer with Mud + Gravel + AW Charcoal.** At this stage Bacterial Contaminants get diluted.

- After that process, the water reaches to a **gravel layer** to cutoff microparticles.

- After that water touches the layer which is **antimicrobial herbs coated mesh** layer with controlled release where almost 30% of microbial contaminants gets avoided.

- After above processes the Speed of water gets a bit slow after semipermeable mud layer, and reaches to a layer of **activated wooden charcoal layer** which clears almost all chemical Contaminates odors and color.

- After the process from, the water reaches again to a Antimicrobial herbs coated mesh with controlled release where additional microbial contaminants gets avoided.

- After that process, the water again reaches to a **gravel layer** to cutoff further microparticles.

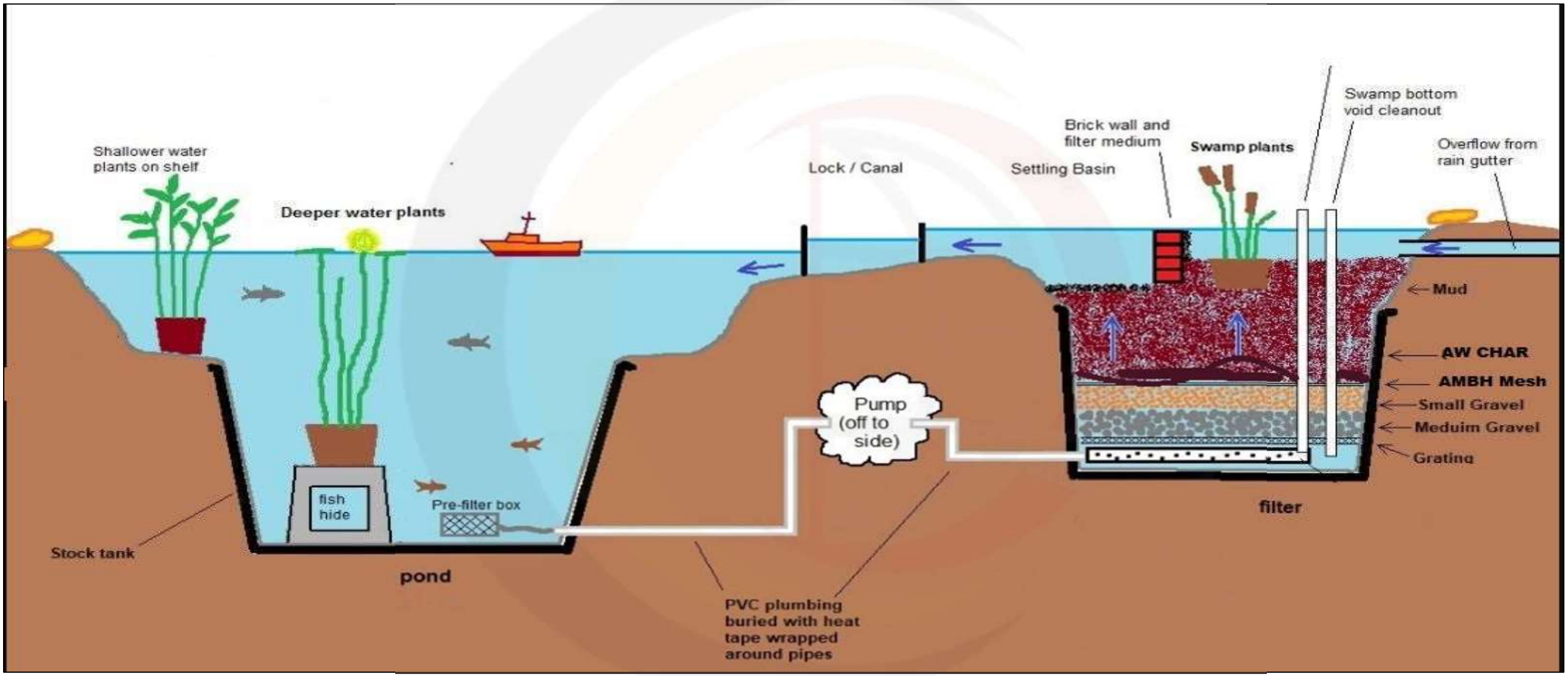
- After that water touches the layer which is antimicrobial herbs coated mesh layer with controlled release where another set of microbial contaminants gets avoided.
- EACH Mud + Gravel + AW Charcoal LAYER at regular intervals is to clear additional organic microbes and stabilizing water flow to address turbidity PH, and TDS in water and retaining released Herbs in system for longer periods of time.
- Now, Water reaches to Rubble Layer, Where biofilm of the rubble helps in further purification, and stabilization of the filter bed.
- After that water touches the wrapping of the antimicrobial herbs coated mesh layers on Perforated casing pipe of borewell with controlled release where final set of microbial, chemical and other contaminants gets avoided.
- Finally, your run-off rain water is ready for supply to Aquifers through borewells.

ESTIMATES for Total RW Management.

TYPE Of SYSTEM	NO's OF SYSTEM	RECHARGE SHAFT 140' FEET DEPTH (DIA. IN INCH)	NO.s Of Bore In 1 system	SEDIMENT PIT PER SYSTEM (IN Cub. Feet)	FILTRATION PIT PER SYSTEM (IN Cub.Feet)	Average Recharge Speed /system (in LPM)	TOTAL RECHARGE in 24 HOURS. (IN LITERS)	UNIT COST INCLUDING 18% GST. (IN INR)	PROBABLE INVESTMENT (IN INR) INCLUDING 18% GST.
S-GWR	9	8	9	NA	300 **10X10X10FT**	360	46,65,600	3,54,000	**31,80,000**
B-GWR	2	8	9	1800 **15X15X8FT**	25000 **50X50X10FT**	3600	51,84,000	70,47,500	**1,40,95,000**
RWH	3	NA	NA	NA	**NA**	NA	NA	NA	**32,53,000**
DS	2	NA	NA	NA	**NA**	NA	NA	NA	**8,29,000**
TOTAL								-	**2,13,57,000**

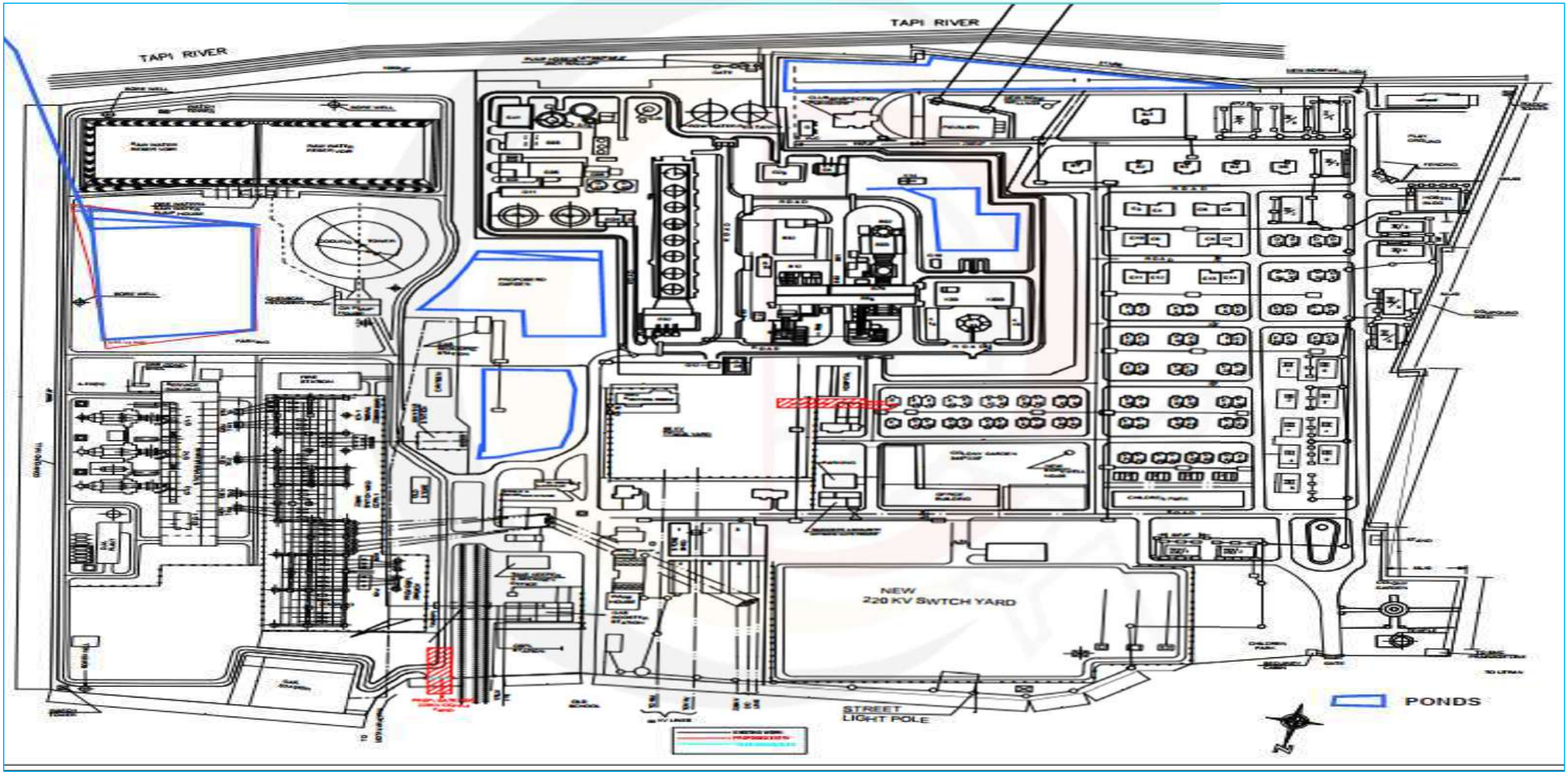
1. This RAINWATER MANAGEMENT PLAN is developed, using existing stormwater drainage infrastructure.
2. **Repairs and Resurfacing of existing Stormwater diversion network cost is NOT INCLUDED (If any).**
3. Rates includes one time patent licensing charges, royalties excluded at ₹. 0.009 per liter per year.
4. Above rates are including a new recharge bore-wells drilling. NOC for GROUNDWATER RECHARGE is not required.
5. **Awarded Contractor must need to obtain WORK-COMPLETION CERTIFICATE from DEVRAM INTERNATIONAL-SURAT.**

OPTIONAL: POND BASED WATER MANAGEMENT SYSTEMS



Developing TOTAL 7,00,000 Cubic Meter of Storage PONDS on Various Location with Filtration + seepage & Evaporation Reduction abilities. (Total Size: 540x540x3 M).

OPTIONAL: POND BASED WATER MANAGEMENT SYSTEMS



FINANCIAL COMPARISION AND ANALYSIS OF OPTIONS.

10 YEAR'S COMPARISION, ASSUMING 7,00,000 KILO-LITERS WATER DEMAND AND ELCTRICITY COSTS CONSTANT						
PERTICULARS	**CURRENT**		**GWR SYSTEMS**		**PONDS**	
	FIGURES	TOTAL IN 10 YEARS	FIGURES	TOTAL IN 10 YEARS	FIGURES	TOTAL IN 10 YEARS
CAPITAL INVESTMENTS AND MAINTENANCE	NA	1,20,00,000	2,13,57,000	2,34,92,700	5,40,90,000	5,94,99,000
ELECTRICITY	9,00,000	90,00,000	9,00,000	90,00,000	9,00,000	90,00,000
YEARLY EXPENDITURES **(FOR 7 LAKH KL)**	3,75,00,000	37,50,00,000	56,00,000	5,60,00,000	60,00,000	6,00,00,000
TOTAL FOR 10 YEARS	NA	39,60,00,000	NA	8,84 ,92,700	NA	12,84,99,000
SAVINGS FOR 10 YEARS	NA	0	NA	30,75,07,300	NA	26,75,01,000
% Savings for 10 years	NA	0	NA	77.65%	NA	67.55%

1. IF KEEPING CURRENT SITUATION AS IT IS, GSECL MAY INCURE THE ONLY MAINTENANCE + WATER BILLS.
2. WITH GWR SYSTEM MEGA SAVINGS ARE POSSIBLE EVEN AFTER PAYING CGWB BILLS AND OUR ROYALTIES @ ₹.0.009/LITER. **(NOC FROM CGWB FOR WATER EXTRACTION NEEDS TO BE TAKEN BY GSECL.)**
3. POND DEVELOPMENT WILL NOT HAVE RECURING BILLS BUT MAINTAINING PONDS MAY COST REGULARLY.