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Increasing Ground Water Level by Penetrating Surface Runoff

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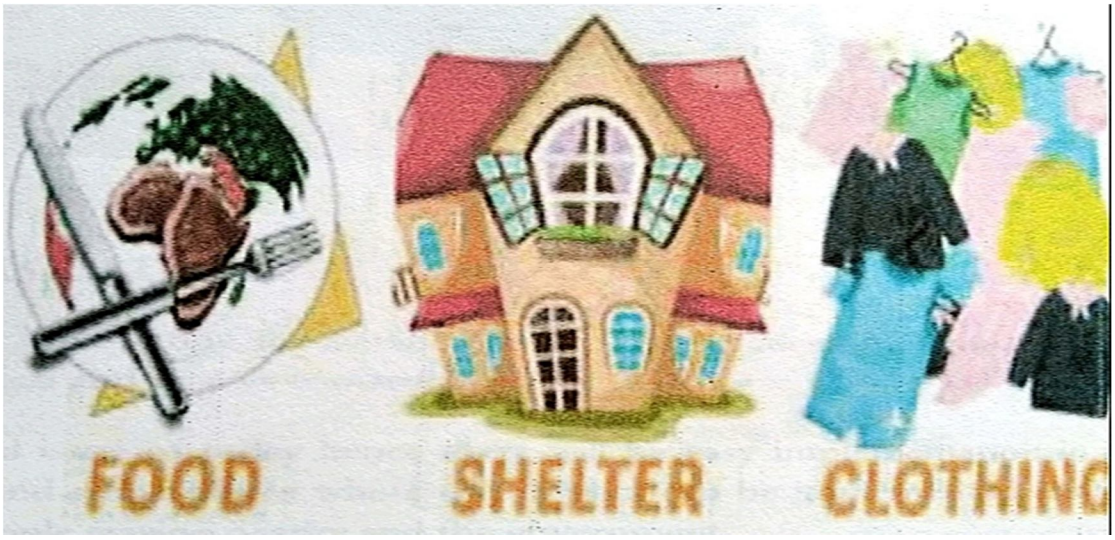
Abstract: ***System proposed in this paper is the planned filtrating penetration system to harvest the surface runoff like storm water into our designed unit in order to increase the natural level and replenishment of ground water resources. Ground water recharge is increasing in popularity as ground water resources are being depleted due to excess of water extraction of water from boreholes in the urban areas. Although the primary objective of this technology is to preserve or increase ground water resources, this kind of artificial recharge has been used for many other beneficial purposes. These include additional treatment (through soil filtration) and conservation or disposal of treated wastewater or floodwaters, storage of water to reduce pumping and piping costs as well as temporary regulation of ground water abstraction. Furthermore water quality can be improved through the removal of suspended solids via soil filtration (see also aquifer treatment) or through the dilution with naturally occurring ground water.***

I. INTRODUCTION

The basic necessity of human beings is food, shelter and clothing. Out of these as Civil Engineers we need to focus on two things that is food and shelter. Food is the most important part, which includes solid materials and liquid materials. The solid materials are grown with the help of liquid i.e. WATER. If we talk about India, there are many places where there is scarcity of water, areas where people don't even get drinking water. As per the analysis done by the government officials at the WTP plant, they treat and distribute around 200Lt/capita, this much water is also 135Lt/capita. No major steps are taken towards it. What's the solution?

System proposed in this paper is the planned filtrating penetration system to harvest the surface runoff like storm water into our designed unit in order to increase the natural level and replenishment of ground water resources. Ground water recharge is increasing in popularity as ground water resources are being depleted due to excess of water extraction of water from boreholes in the urban areas. Although the primary objective of this technology is to preserve or increase ground water resources, this kind of artificial recharge has been used for many other beneficial purposes. These include additional treatment (through soil filtration) and conservation or disposal of treated wastewater or floodwaters, storage of water to reduce pumping and piping costs as well as temporary regulation of ground water abstraction. Further more water quality can be improved through the removal of suspended solids via soil filtration (see also aquifer treatment) or through the dilution with naturally occurring ground water.



II. METHODOLOGY

As this id actual field work based project we need some data for working out the result i.e. increasing the ground water level. For the data we need to decide the area first which we are going to develop.

A. Data Required

1) Average annual rainfall.
2) Surface runoff.
3) Topographical data.

B. Steps to be Adopted

Following are the steps:

1) Finding Average Annual Rainfall

It is the most important part of our data as we need to find he quantity of water which can be utilized by our system efficiently.

2) Formula For Average Rainfall

$$\textbf{Average rainfall} = \frac{\textbf{summation of rainfall}}{\textbf{number of years}}$$

3) Calculating The Surface Runoff

This id the important part of the efficiency that can be calculated by the runoff and not by the rainfall, but for the surface runoff of the particular region we need the rainfall data of that region and then we can find the efficiency.

4) Following is the formula of calculating runoff

$$R = \frac{(P(P-17.74))}{254}$$

Where,
R= Runoff in mm
P= Rainfall in mm

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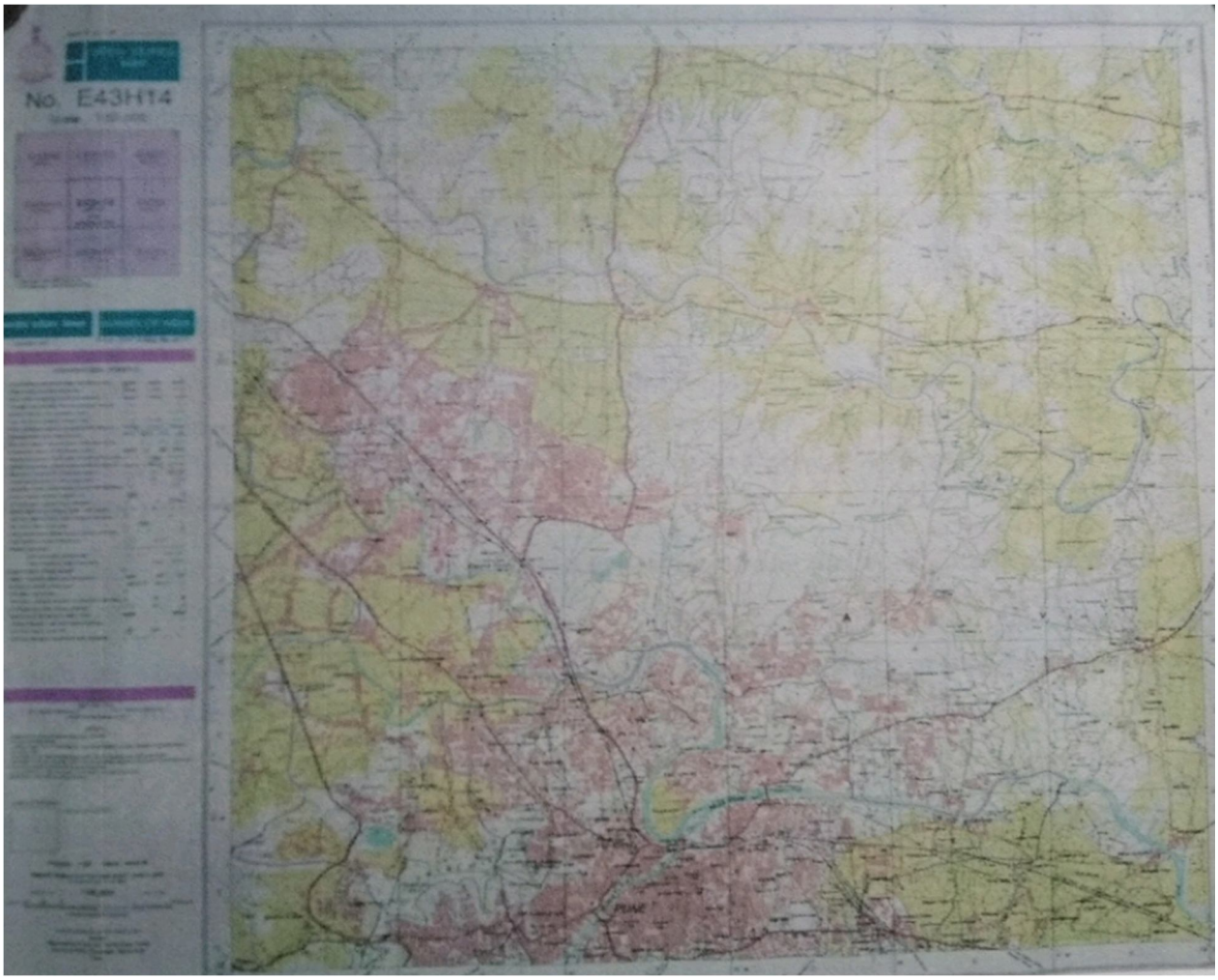
C. Collecting the Topographical Data

We need the topographical data of that region where our system is going to be installed, as the direction of flow of surface runoff is essential to be known, for our system to be located where to be placed and whether it is really feasible or not. Following is the map we secured from the Map Sale Office, Survey of India Department.

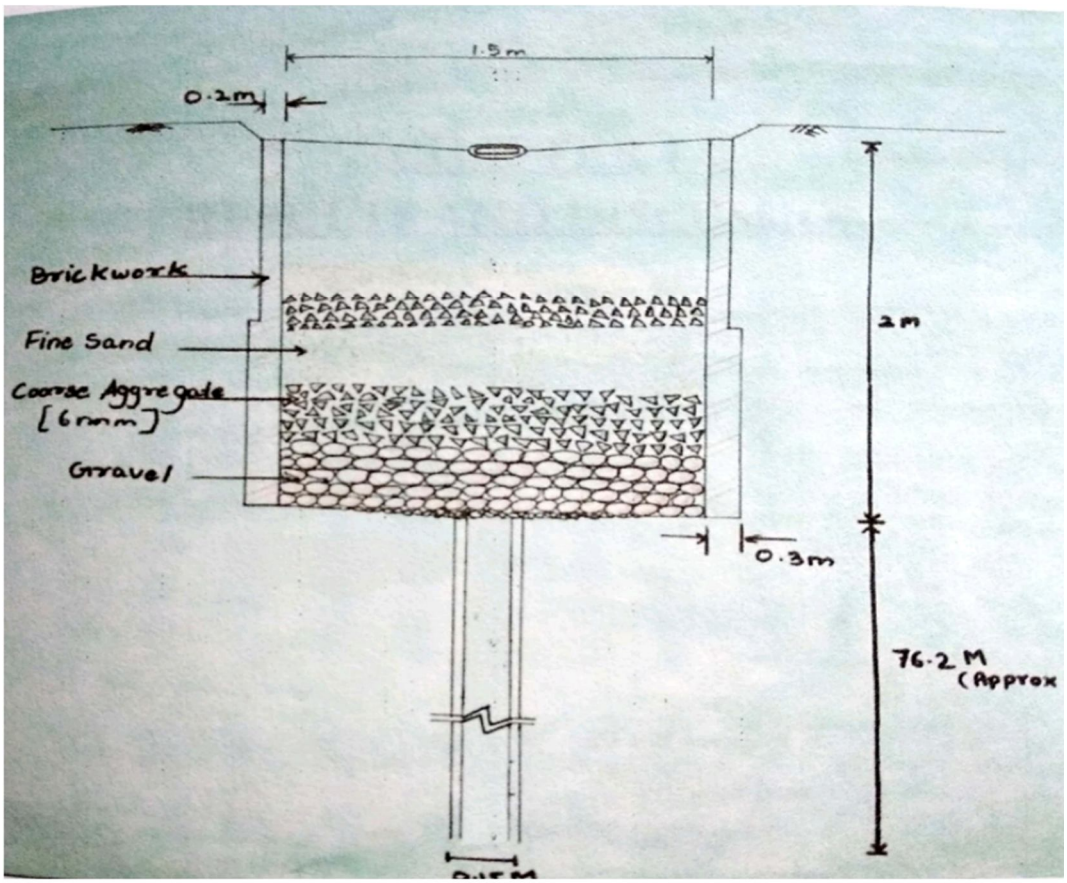


Contour map of Pune and PCMC region

D. Construction Procedure

1) Excavation of pit upto 2m depth and 1.5m diameter.
2) Digging a bore hole from the centre of the base of the pit up to 250 feet under the ground.
3) Placing the casing pipe in the bore hole consisting of pores.
4) Place a dense mesh at the bottom of the pit to avoid the filter media entering into the bore hole.
5) Construct a circular retaining wall around the pit in the form of steps. Thickness of wall in step 1 is 0.3m and step 2 is 0.2m.
6) Apply the filter media according to the following order:
a) Gravel (0.3m)
b) Coarse aggregates (0.3m)
c) Fine sand (0.2m)
d) Coarse aggregates (0.1m)
e) Fine sand (0.1m)

7) The above filter media is up to 1m from bottom and keep the remaining 1m as tolerance for the disposal of silt and other debris.
8) Cover the top with precast R.C.C. chamber of 1.9m diameter and 0.15m thickness consisting of holes at intermediate points.



Design of the structure

III. RESULT

Sr. No.	Type of Water.	Volume (mL)	Initial Wt. of Filter Paper (W1) in gm.	Final Wt. of Filter Paper (W2) in gm.	Diff. (W2 – W1)	Concentration of S.S. (mg/L)
1	Turbid Water	50	0.500	1.187	0.687	13740
2	Purified Water	50	0.500	0.853	0.353	7060

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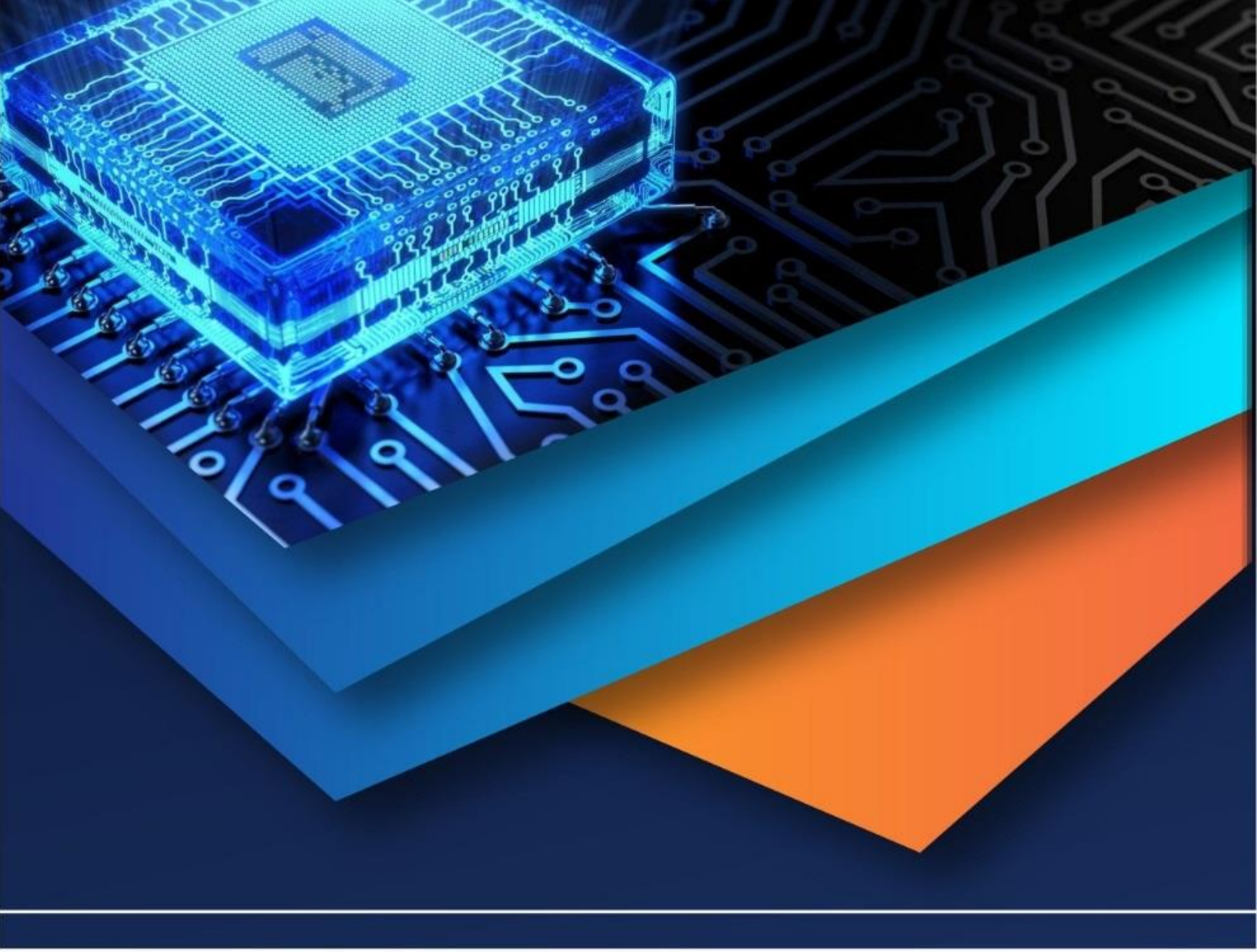

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