

Improvement of Infiltration by Artificial Recharge

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ABSTRACT

The concept of improvement in infiltration is achieved by recharging surface storm water into aquifer directly under gravity. The contaminants in the storm water are filtrated by using various layers in the bore well pit. It reduces the various physical and chemical properties which is harmful for drinking. The bore well pit consist of activated charcoal, ceramics, sand and brick aggregate. The perforated pipe is fixed above the surface level of pit hole which is used to stimulate the flow of filtered water into bore well. We have chosen vanur taluk, Villupuram district, Tamilnadu for improving infiltration effectively. It will be more effective in recharging the infiltration at downstream and sloppy region at various area. It will improve the infiltration level.

KEYWORDS: Artificial recharge, Aquifer, Storm water, and Water quality.

INTRODUCTION

The artificial recharge is one of the method to increase the ground water level. Water resources of Earth can be classified as surface water and groundwater. The total volume of groundwater is only 0.65% of the total water availability of the globe. Groundwater is the main source for the drinking, domestic and agriculture. Hence, the groundwater is the precious resources, in order to ensure a sensible use of groundwater the proper evaluation and management is required. The phenomenal population explosion and the resultant needs could not be satisfied with available surface water resources. Further, due to various activities, the surface water resources too substantially stand prone for pollution. Hence, the people has started mining of groundwater massively; such massive mining of groundwater has led to the drastic decline of water table. The Overall World ground water utilization is increased simultaneously.

The balance ground water level is not maintained. It may cause various problem in future like water scarcity in storm water. It causes problem like drainage issue and damage of road by rainfall runoff. The green coverage is reduced day by day. The concrete structure in various place may reduce the infiltration capacity. The urban and industrial area reduces the ground water. This problem is reduced by adopting artificial ground water recharge method. The problem in artificial recharge is contamination of waste water. It will affect the ground water level for long time. The runoff water has consist of various unwanted chemical like oil and grease. The contamination is controlled and then is passed in to the ground water level it preserve the water resource and restore the water table aquifer. For that over exploitation is balanced. For the way improved ground water level it will used to the dry season it will more helpful.

AIM OF THE PROJECT:

To penetrate the storm water by direct inject well method to increase the groundwater level.

OBJECTIVE OF THE PROJECT:

- Storage of excess surface water for future use.
- To remove unwanted impurity from storm runoff.
- To know the issues of ground water.
- Improve the quality of ground water.
- Increase the aquifer level for water distribution in area with many well.

SCOPE OF THE PROJECT:

- Usage of ground water during dry season.
- Prevention of flood.
- To bring awareness to public on increasing ground water level.
- Sea water intrusion will be prevent.

STUDY AREA:

Villupuram district lies between 11° 38' 25" N and 12° 20' 44" S; 78° 15' 00" W and 79° 42' 55" E with an area of

7194 sq. km. It was carved out from the South Arcot district on 30.09.1993 and was rechristened as Villupuram district. The residual part of the erstwhile South Arcot district was named as Cuddalore district. It is surrounded on east and south by Cuddalore district. The west by Salem and Dharmapuri district and on the north by Thiruvannamalai and Kanchipuram district.

The average rainfall of the district is 1060.3 mm. The rainfall is heavier in the coastal area compared to interior areas. About 93.82% of the normal rainfall is received during the Northeast and Southwest monsoon seasons. Normally the district does not get heavy rainfall with the exception of Marakkanam and Vanur blocks. While in Kandamangalam and Kolianur blocks, the rainfall is moderate, it is scanty in Kallakurichi and Sankarapuram Blocks. The vanur block rainfall range 133 mm. The maximum and minimum temperature in the district are 36 and 21 degrees Celsius respectively.

MONSOON RAINFALL DATA:

Place (villupuram)	Average rainfall (mm)	Actual rainfall (mm)	Deviation (+/-)
2013	1011.14	790.30	-21.84
2014	1011.14	963.30	-4.7
2015	1011.14	11375.50	+36.02
2016	1011.14	563.7	-41.28
2017	1011.14	1066.9	+5.5

Physiography:

Villupuram district can be divided into 3 classes, 1.hilly terrains 2.plain terrain 3. Coastal plains. The hill found in western part of district and they are Kalrayan and Ginjee hill in Ginjee taluk .the plain terrain occurs in the middle part of district and coastal plain lie in the eastern part of the district around Marakanam and Vanur taluks.

Geology

Rock type: sedimentary rock 60%, hard rock 40%.Geological formation of the granite, limestone,pegmatite,laterite, sandstone, shale, lignite,charnockite and alluvium this are mineral content present in the villupuram district.

Soil:

The soil formation of the district is mainly red soil, sandy soil, alluvialsoil, forest soil and black cotton soil

Groundwater potential:

Net groundwater availability (MCM) =1498.28

Gross ground water use (MCM) =1539.35

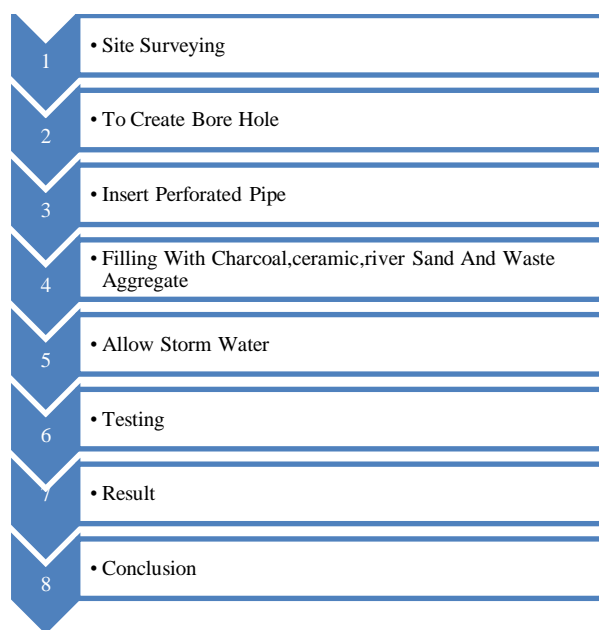
Stage of groundwater %=103%

result of district=over exploitation (critical 90%-100%)villupuram and vanur

Surface water potential:

The major rivers Gadilamriver,Pennar river ,Sankaraparannirivers, andManimuktha river and Vellar river this are major surface water resource, in that Pennai river are major water resource in Villupuram district.

Methodology



MATERIAL USED IN BOREHOLE:

Activated charcoal

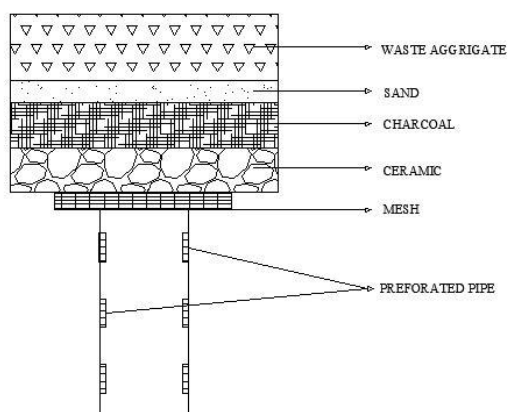
Activated charcoal is also called as activated carbon is highly absorbent substance that can attract and hold organic chemical inside it. It can be made from bituminous coal, lignite coal, peat, coconut shell and wood. This is then produced by first burning a carbonises material without oxygen which makes a carbon “char”. Afterwards, the char is chemically or physically treated to build up a unified series of holes or porous inside the carbon. Activated charcoal has the ability to “adsorb”. The process of adsorption is whereby a sponge drenching up in water, not being limited to the surface area. Since activated carbon has a large surface composed of porous material, the unnecessary substance sticks to the surface of the carbon particles. The activated charcoal size of 4.75mm to 20mm are effectively usedasfiltermedium. Benefit of charcoal 1.dechlorination 2.deodurisation and decolourisation 3.removes low molecular weight organics.

Ceramics

Ceramic are effective in removing bacteria, protozoa, helminthic and turbidly from water. It also removes some viruses and iron and taste, smell and colour of water are improved. The effectiveness of the filter also depends on the production quality, the initial water quality and handling practices of users. Highly turbid or iron containing water can be filtered. The size of ceramic used in filter medium is 8mm to 16mm. Benefit of ceramics is 1.Simple, cheap and easy to use and clean 2..Removes pathogens, turbidity and suspended solids.3.Somewhat effective for the removal of viruses and iron 4.Improves taste, smell and colour of water.

RECHARGE TECHNIQUE

Ground water recharge with surface infiltration systems is not feasible where permeable surface soils are not available. Various zones have restricting layers or undesirable natural and synthetic chemicals that can leach out or aquifers have poor quality water at top are confined. For those conditions groundwater recharge with recharge well is an option and it is similar to regular pumping well for unconsolidated aquifer (sand and ceramics), they consist of casing, screen, gravel pack, grouting and a pipe to apply water to the well for infiltration into the aquifer. For consolidated aquifer (sandstone, fractured rock and limestone with secondary porosity) the portion of wells in the rock is completed as an open bore hole without screen.



Advantage of project:

1. No large storage structure needed to store water. Structures required are small and cost effective
2. Enhance the dependable yield of wells and hand pumps.
3. Negotiable loss as compared to losses in surface water.
4. No adverse effects like inundation of large surface area and loss of crops.
5. Improved water quality due to dilution of harmful chemicals and salts.

6. No displacement of local population required.
7. Reduction in cost of energy for lifting water.

RESULT AND DISCUSSION:

In morphological hilly place artificial recharge technique is good .Soil such as alluvial soil, sandy soil are available in villupuram district. So, artificial recharge technique is good. Based on site selection.

parameter	Class	Recharge technique
Morphology	Structural hill	good
Water level	20m -80m	Moderate good
soil	Alluvial, sandy soil	good
geology	Terrain plain	good
Rainfall	130 mm	poor

The storm water is filtered in various porous layer of ceramic, charcoal, sand and waste aggregate. So the water quality is too good.

content	Before tested water	After tested water
pH	6.1	7.5
turbidity	0.56(NTU)	0.21(NTU)
Total dissolved solids	1000 mg/lit	600 mg/lit

Conclusion:

The techniques presented will be helpful in controlling storm water hazards in urban areas and industries with improvement in ground water storage by utilizing rainfall runoff on the roads. This method is less expensive than any other technique of artificial recharge, if implemented at the dry area it will more helpful to recharge the ground water level. The positive result based of rise water level and to improvement in water quality within short time.

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