REPORT ON BHUJAL MOIST SOIL ROOF TOP WATER HARVESTING UNIT

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Wardha

(DRAFT REPORT)

Report on Bhujal Moist Soil Roof Water Harvesting Unit

Introduction

Wardha is a city and a municipal council in Wardha district in the Indian state of Maharashtra. It is the administrative headquarters of Wardha district. Wardha gets its name from the Wardha River which flows at the North, West and South boundaries of district. Founded in 1866, it was an important part of Gandhian Era. According to 2011 India census, Wardha district had a population of 1,296,157. The Wardha city lies on the geographical coordinate between latitude 20° 45' 0" N and longitude 78° 37' 0" E falling in Survey of India toposheets No 55 L/10 and falls in watershed WRWBD-1.

Climate and Rainfall

The climate of the Wardha city is characterized by a hot summer and general dryness throughout the year except during the south-west monsoon season i.e., June to September. The mean minimum temperature is 12.1°C and mean maximum temperature is 42.8°C. The normal annual rainfall varies from 985 mm to 1100 mm.

Geology and Hydrogeology

Wardha city is covered by Deccan traps. The joints and fissures present in the massive traps aid movement and percolation of groundwater; but by and large the traps are generally found unsuitable for ground water storage except where there is either a zone of weathered, or/and highly vesicular trap.

Groundwater Levels in Wardha City

Groundwater surveys and development agency has established an observation well in Wardha City for periodic monitoring of groundwater levels. The well is Situated in Nagar parishad,On Railway Station Road. The Depth of well is 9.50 meters (bgl) having diameter 3.80 meters. The data on pre and post monsoon water table of Wardha observation well is studied from 1986 to 2017 year. The hydrograph is studied in relation to annual rainfall

which shows that there is a good relation of post monsoon water table with rainfall. The post monsoon water levels show rising trend while pre monsoon water levels show depleting trend, the depleting trend indicates that there is increase in use of groundwater in summer seasons. The depleting groundwater levels of pre monsoon show that there is a good scope of groundwater recharge in the area **(Figure 1)**.

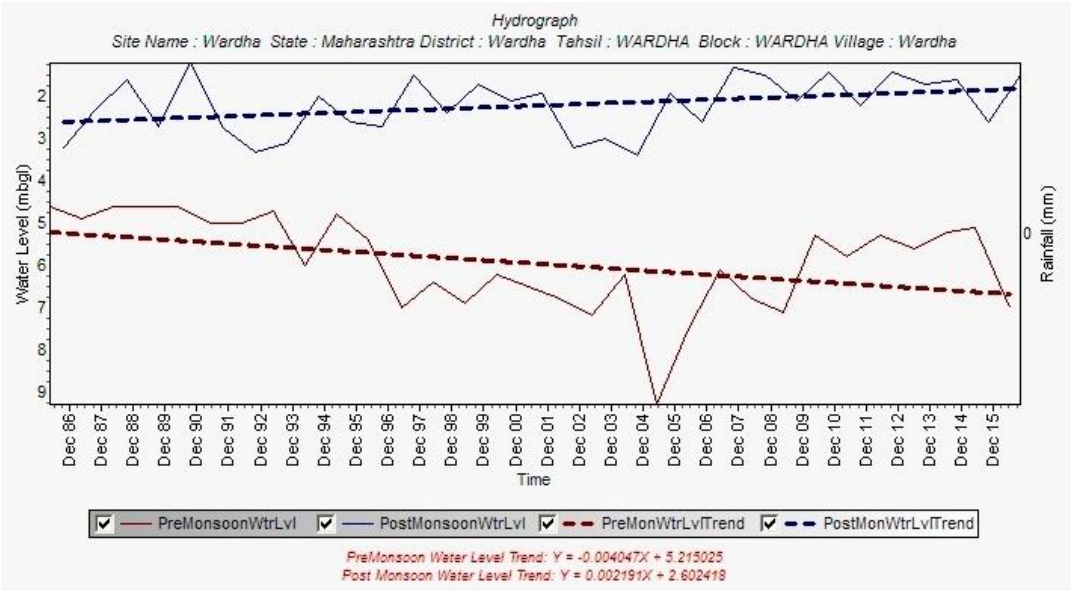


Figure 1: Hydrograph of Wardha City

Roof top Rainwater Harvesting an Overview:

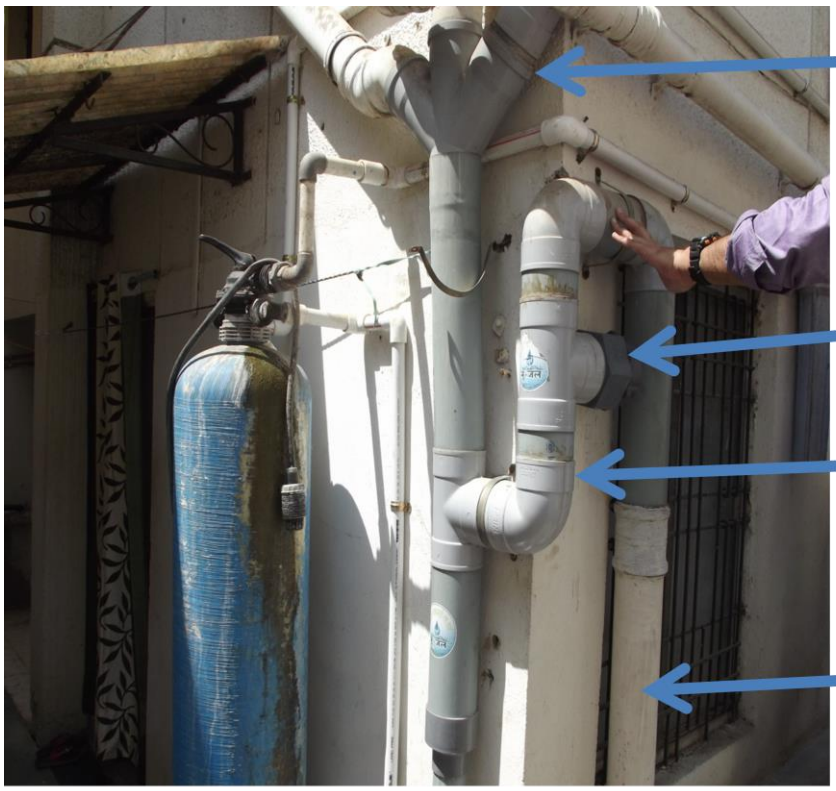
Almost all urban areas, consisting of large and medium sized cities, face the twin Problems of floods during monsoon and shortage of fresh water during non-monsoon months. Unlike in the past, present day urbanization has resulted both in shrinking of open spaces and very minimal area remaining unpaved. This has ultimately resulted not only in flooding of cities but has also caused water scarcity due to groundwater depletion. Roof top Rainwater Harvesting is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and the rainwater is collected from the roof of the house/building. It can either be stored in a tank or diverted to artificial recharge system. This method is less expensive and very effective and if implemented properly helps in augmenting the ground water level of the area. The water collected from the roof is first passed through filters so that it can directly be put in wells and bore wells so that aquifer is not contaminated.

According to Maharashtra Government notification number TPB-4307/396/CR-124/2007/UD-11 dated 06.06.2007 of Urban Development department, rainwater harvesting is compulsory for all the layout open spaces/amenity spaces of housing societies and new constructions/ reconstruction/ additions on plots having area not less than 500 sq.mt. In non gaothan areas of all towns shall have one or more Rain Water Harvesting structures having a minimum total capacity as detailed in Schedule.

Keeping this in mind Directorate GSDA, Pune as ordered its District Senior Geologist to verify new invention made by Dr.Sachin Pawade, Wardha on filter-separator device for rainwater harvesting system. The Geologist's of GSDA,Wardha has visited Dr.Sachin Pawade Nursing Home on date 21/03/2017 located at Bachelor Road, Wardha city, detailed observations are given below.

The Nursing Home premises consist of one dugwell(Behind the Nursing Home) and borewell(In front of Nursing Home). The dugwell depth is 6.10 m bgl, Diameter 1.50 m,Curbing 2.40 m bgl and Static water level was 3.00 m bgl at the time of visit.The dugwell litholog shows 0 to 2.40 bgl black cotton soil followed by highly weathered basalt and 2.40m to 6.90m bgl poorly weathered basalt. The Borewell is approximately 55 meters deep and currently is not in operation. The total built-up area of the Nursing home is 60 X 30 feet i.e 1800 sq.feet out of which the terrace is having an area of 1500 sq.ft. To collect the rain water from the roof 2 PVC Inlet pipes of 100MM Diameter are connected to the filter-separator device **(Figure-2 and 3).**The Filter Separator device within the PVC pipe of diameter 100mm is connected to inlet which is divided into four chambers sequentially including Coarse aggregate pebbles 2-5-8 mm, fine aggregate, activated charcoal 912 ID and high density foam each layer is having approximate thickness of 2 inches.

This sequence of filter is from bottom to top and each filter chamber is separated by wire mesh. An overflow pipe is attached to inlet pipe in case there is heavy rainfall and cleaning port is attached to the filter unit for cleaning the filters. The schematic diagram of the filter is shown in **Figure-4**.This unit is installed at approximate 1.5 meters height above ground level near the Dug well at the bottom of the inlet there is flush valve which also acts as a pressure valve to control water in the filter.


INLET
(RAINWATER)
Cleaning
Port
Filter
OUTLET TO
DUGWELL


FIRST VALVE
OR PRESSURE
VALVE

Figure-2

Figure-3

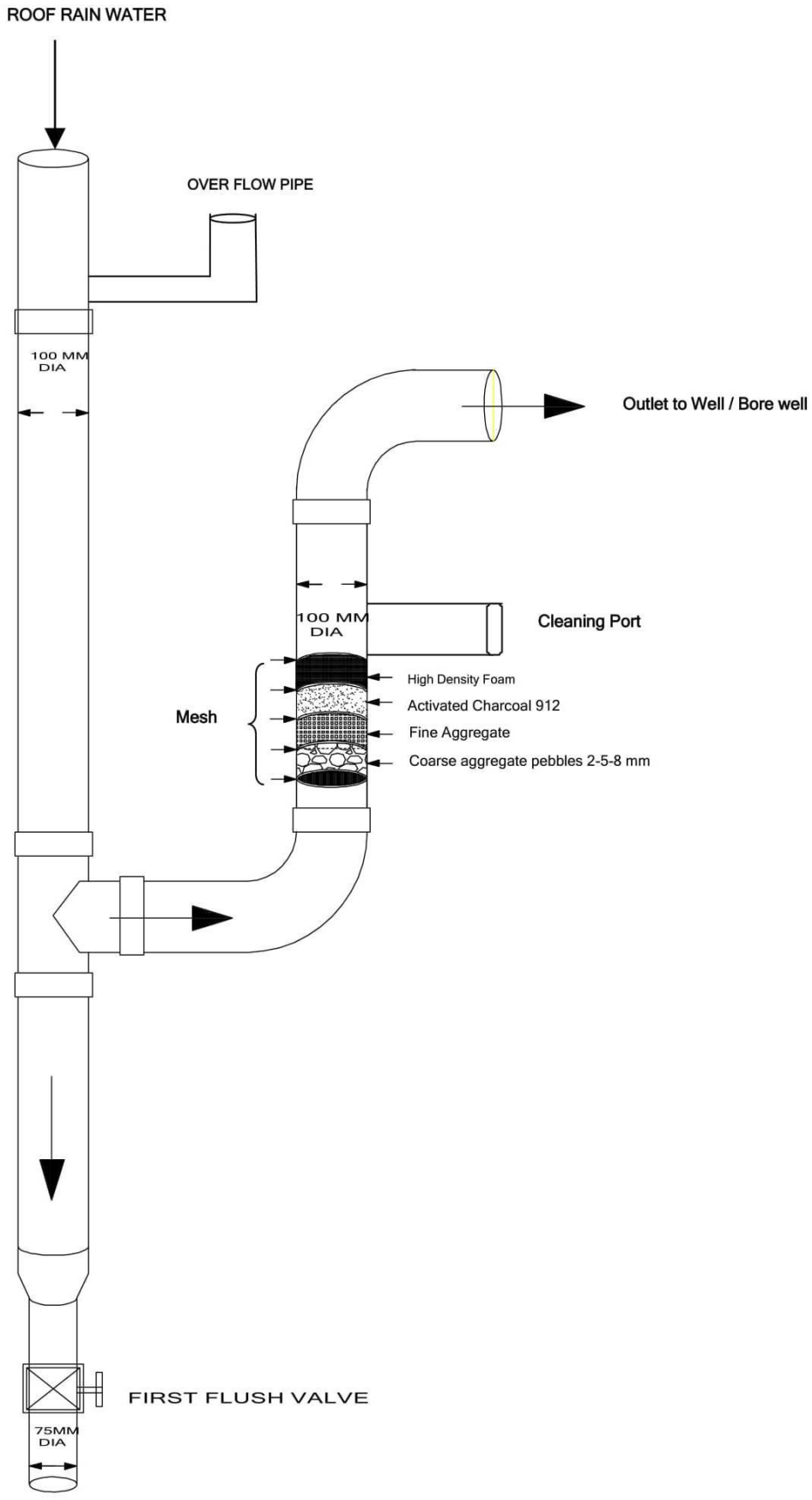


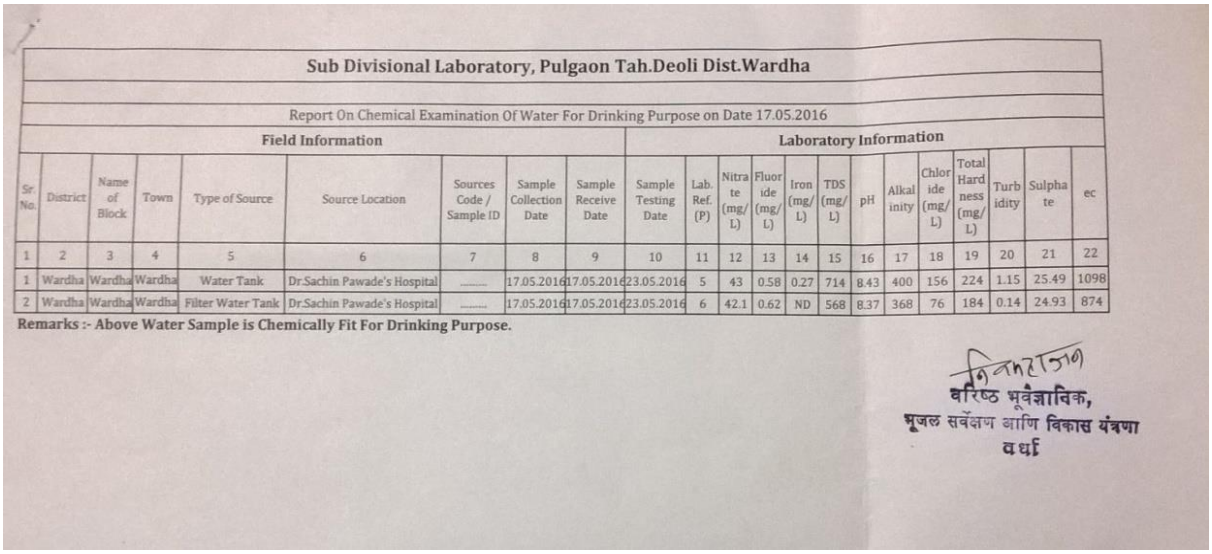
Figure 4: Schematic diagram of the filter (Source Dr. Sachin Pawade).

Working of Filter

As the Monsoon starts two rain storms are drained through the first flush valve so that solid and organic material is washed out. After the cleaning the roof naturally the valve present at the bottom of inlet pipe is closed so that rain water gushes upward by gravity in the filter chamber and the filtered water through outlet pipes which is connected to dug wells or bore wells to recharge the aquifer.

Chemical Quality

To check the water quality of filter, 4 water samples (2 chemical and 2 bacteriological) were collected from the dug well and filter. These samples were analysed for chemical and bacteriological parameters. The chemical analysis shows that parameters like TDS, EC and Total hardness has been reduced in the filter water as compared to raw water. So the chemical and bacteriological analysis of filter water shows that the water is safe for drinking purpose. Both reports are attached below.



Sub Divisional Laboratory, Pulgaon Tah.Deoli Dist.Wardha

Report On Chemical Examination Of Water For Drinking Purpose on Date 17.05.2016

	Field Information								Laboratory Information													
Sr. No.	District	Name of Block	Town	Type of Source	Source Location	Sources Code / Sample ID	Sample Collection Date	Sample Receive Date	Sample Testing Date	Lab. Ref. (P)	Nitrate (mg/L)	Fluoride (mg/L)	Iron (mg/L)	TDS (mg/L)	pH	Alkalinity	Chloride (mg/L)	Total Hardness (mg/L)	Turbidity	Sulphate	ec
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	Wardha	Wardha	Wardha	Water Tank	Dr.Sachin Pawade's Hospital	.....	17.05.2016	17.05.2016	23.05.2016	5	43	0.58	0.27	714	8.43	400	156	224	1.15	25.49	1098
2	Wardha	Wardha	Wardha	Filter Water Tank	Dr.Sachin Pawade's Hospital	.....	17.05.2016	17.05.2016	23.05.2016	6	42.1	0.62	ND	568	8.37	368	76	184	0.14	24.93	874

Remarks :- Above Water Sample is Chemically Fit For Drinking Purpose.

वरिष्ठ भूवैज्ञानिक,
भूजल सर्वेक्षण आणि विकास यंत्रणा
वर्धा

Chemical Analysis Report

जा.क्र./वभूवै/भूसविय/ 906 /२०१५
दिनांक :- २५/५/२०१५

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कार्यालय वर्धा - दुरध्वनी क्र.०७१५२-२४३८८५,२४३६३० ई मेल . gsdawardha@gmail.com
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पाठविणा-यांचे नांव व पत्ता :- मा.अध्यक्ष,वैघकिय,जनजागृतीमंच वर्धा.
पाठविणा-यांचे पत्र क्रमांक व दिनांक :- निरंक / दि.१७.०५.२०१६
प्रयोगशाळा संदर्भ क्रमांक :- ०१-०२

नमुना घेतल्याचा दिनांक :- १७.०५.२०१६
नमुना पोहोचल्याचा दिनांक :- १७.०५.२०१६
परिक्षण सुरु केल्याचा दिनांक :- १७.०५.२०१६

अ. क्र.	प्र.सं.क्र.	गांव	नमुन्यांचे विवरण	उपलब्ध क्लोरीनचे प्रमाण पि. पि.एम.	परिक्षणाचे निष्कर्ष		इतर अभिप्राय
					प्रति १०० मिली पाणी नमुन्यातील संभाव्य सुक्ष्मजंतुंची संख्या		पाणी पिण्यांस
					क्लोलीफॉर्म्स	थरमोटॉलरंट	
१	०१	वर्धा	डॉ.सचिन पावडे यांच्या पाण्याच्या टाकीतील	०.१	०:०	०:०	पाणी पिण्यांस योग्य
२	०२	वर्धा	फिल्टर टॅक मधिल पाणी	०.३	०:०	०:०	पाणी पिण्यांस योग्य

जा.क्र./वभूवै/भूसविय/उविप्रयु/२७/२०१६
दिनांक :-२३/०५/२०१६

अणुजैविक तज्ञ
(कु.रिता भ.रायपुरे)

वरिष्ठ भुवैज्ञानिक
भुजल सर्वेक्षण आणी विकास यंत्रणा
वर्धा.

प्रत सादर :-
१) मा.उपसंचालक,भुजल सर्वेक्षण व विकास यंत्रणा,नागपंर विभाग,नागपुर यांचे माहितीकरिता सादर
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वर्धा

Bacteriological Analysis Report

Conclusions

1. The filter does not require space like soak pit.
2. The filter works on gravity so no pumping is required.
3. The filters can be easily cleaned through cleaning port and also through pressure valve so filter media is automatically cleaned by means of gravity and pressure of water flow.
4. The filter is compact and low-cost as compare to traditional filters.
5. The chemical and bacteriological quality of water after filtration has been improved as per the analysis report.

Recommendations

1. The filter should be checked for its durability and performance by engineering agency.
2. Flow meters should attach to inlet to measure amount of water entering the aquifer system.
3. Pre and post monsoon ground water levels should be monitored.
4. Yield test of the dug well should be conducted for the performance of aquifer.
5. Monitoring of Pre and post monsoon chemical and bacteriological parameters of water.
6. The filter can be used preferably in urban area.