Ground Water Quality Monitoring of Dhule City

Mr. Hemant Kuwar[1], Prof. F.I Chavan[2], Prof. M.Husain[3], Prof. Yakub Ansari[4]
[1]PG Student, Dept. of Civil Engineering, SSBT COE Bambhori Jalgaon , Maharashtra, India
[2]Asst. Professor, Dept. of Civil Engineering, SSBT COE Bambhori Jalgaon, Maharashtra, India
[3]HOD of Civil Engineering, SSBT COE Bambhori Jalgaon, Maharashtra, India
[4]Asst. Professor, Dept. of Civil Engineering, MMANTC Mansoora Malegaon, Maharashtra, India

Abstract-*Groundwater is used for domestic, industrial, waste supply and irrigation all over the world .In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid growth of population and the accelerated pace of industrialization. Rapid urbanization, especially in populated countries like India, has affected the availability and quality of groundwater due to its overexploitation and improper waste disposal, especially in urban areas. According to World Health Organization (WHO) organization, about 80% of all the diseases in human beings are caused by water. Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source. It therefore becomes imperative to regularly monitor the quality of groundwater and to device ways and means to protect it.*

The present study was conducted with the objectives of analyzing the quality of groundwater for Dhule city. The study will help to create awareness among people and prevent the ground water from getting further polluted and to protect the city from possible health hazards.

Most of parameters are in the standard Burro of Indian Standards (BIS) limits like pH, Dissolved oxygen, Fluoride, Alkalinity. But some parameters like total dissolved solids, Hardness, calcium, iron, nitrate, magnesium, sulphate, total solids, zinc, manganese and Chloride has high concentration and also determination of Biological characteristic of groundwater such as Most probable number (MPN) test some samples, exceeds Burro of Indian Standards (BIS) limits. For 30 bore well water samples collected and tested. The water parameters are within accepted Burro of Indian Standards (BIS) limits.

Certain previous investigations carried out by different researchers were referred and with certain degree of variability the same is incorporated into our study.

I. INTRODUCTION

1.1 GENERAL

Life owes its existence and obtains its substance, growth and fulfillment from the environment. This is the product of complex and dynamic interaction of physical chemical, biological and social systems. The fact that the quality of life is linked with the quality of environment is known to us from 400B.C. and has been stated in Yajurveda. In the natural ecosystem man has always played the role of destroyer, remakes and impress of various components which cause lot of disturbance in the ecological balance. Water pollution becomes not only an aesthetic problem, but an economical as well as medical problem too. About 97% of the water on the Earth is found in the ocean, more than 2% remains frozen in the, polar region and glaciers. The rest of less than 1% is found in the stream, rivers, and lakes and groundwater. The tern" Quality'' as applied to water embrace the combined physical, chemical and biological characteristics of the most abundant compound on the surface of the earth. Water is vital to the existence of all life as we know it and is essential, either directly or indirectly to almost all activities of man. Water quality is dominant factor in determining the adequacy of any supply to satisfy the requirements and its usefulness.

Water is nave found in its pure sate in the nature. Essentially, all water will contain substances derived from natural environment or form the waste products of the man's activities. These constituents are basic criteria in the determination of water quality. In addition, the various properties o water imparted by the constituents serve further to defined the quality of water.

Water quality is dynamic and its changing parameters require the water technologist, to be in constant touch with many segments of the scientific world. The chemist, the bacteriologist, the biologist and the toxicologist are making advances in the assessment and quantization of water quality parameters. However other segments of science are generating new products and new water contaminants at an essay-increasing rate. Man himself is multiplying and his range is increasing.

Water Quality is determined by analytically measuring the concentration of the various constituents and the effects or properties, caused by the presence of these substances.

The groundwater quality has become an area of increasing environmental concern contrasted with surface water pollution is difficult to control and may persist for decades. The growing recognition of the importance of groundwater resources from both health and economic prospective requires that comprehensive and systematic methods of evaluating groundwater supplies to be developed.

The groundwater resource evaluation and the quality of groundwater is of nearly equal importance as the quantity. The physical, chemical and bacteriological characteristics of groundwater determine its usefulness for domestic water supply, commercial, industrial, agricultural and municipal use. Development provides opportunities for pollution study of the groundwater and consideration must be given to the protection of quality.

1.2 SOURCES OF GROUNDWATER

Most of the groundwater is derived from one of the following sources.

1.2.1 Meteoric Water

The water derived from precipitation (rainfall and snowfall) although a great part of the rain water reaches the sea through surface flow or runoff, a considerable part of water reaching the surface in the form of precipitation infiltrates or percolates downwards below the surface and forms groundwater. Most of the water obtained from underground water sources belongs to this category. The infiltration of the rain water and melt water starts immediately after the water reaches the ground and it may also takes place from surface water bodies such water as rivers, lakes, sea in the form of an almost continuous process.

1.2.2. Connote Water

The water entrapped in the rocks. During the formation due to sedimentation about 65% water sample of primary saline secondary alkaline groundwater.

R.C. Dixit et al,reported that there is a continuous increase in the demand of water supply in cities due to the industrialization and growing population. This extra supply is generally met by groundwater or nearby available surface waters. It may lead into incomplete treatment and substandard supply of drinking water. To ensure that the intake water derived from surface and groundwater is clean, potable, neither corrosive nor scale forming, free from undesirable taste, odor and acceptable from aesthetic and health point of view, the final water quality in Delhi have been evaluated. The final water supply of four treatment plants and 80 tube well at Delhi ‘were surveyed in 2000-2001 for cadmium, chromium, copper, iron, lead, manganese, nickel, selenium and zinc. The levels of manganese copper, selenium and cadmium were marginally above the Indian standards (IS) specification regulated for drinking water. The data was used to assess the final water quality supplied at Delhi.

S.N.Kalu et al, conducted a detailed investigation into the groundwater quality in the surrounding areas of two sewage treatment plants. Water sample were collected from different groundwater sources. Viz.hand pump and bore well located in region and analyzed for this physio-chemical and bacteriological parameters. Most of sample ware found to exceed the standard limit for drinking water parameters with respect to total hardness, TDS, Sulphates, Chloride, Fluorides, Calcium, and Magnesium

M.Feroze Ahmed et al, studied an analysis of present situation of arsenic contamination of groundwater and arsenic related diseases in Bangladesh. The intensities of arsenic contamination in different aeras of Bangladesh have been further specified on the basis of physiographic and hydro geological conditions.

III. METHODOLOGY

3.1 Study Area

Dhule City the head quarters of the is Dhule district of Maharashtra. It is situated at a distance of 669 Kms. From the state capital Mumbai and at a of 141km The capital city of Mumbai. It is easily accessible from Mumbai both by road and railways. It is situated on Panzara River and National Highway NH3 also National Highway NH6.

3.2 Sampling Technique

In order to as ascertain the quality of water, it is subjected to various physical and chemical tastes. The sampling is the most important part of any analysis because the final result obtained, even from the most accurate analysis will be misleading, if the samples on such analysis is carried out, are not representative one of the liquids to be tasted. As a matter of fact it will be ideal to carry out all analysis immediately after collection of sample and the quicker the analysis the more representative will be the result of analysis of the liquid at the time of sample are taken, these precaution are as follows.

1. The water should be collected in bottles, especially of white glass, having well fitted stoppers. Bottle having

holding capacity of about 2 liters of water are necessary for the chemical analysis.

2. Bottle should be thoroughly cleaned, filled thrice with water and emptied before collecting the sample. However, it will not

3. When the sample of the water is to be collected from a pipe the water tap should be turned on and the water should be allowed to go waste for at least.2 minutes,so as to pass out the impurities of the pipes.

4. The bottle should be held as for away from its neck as possible. In no case the water entering the bottle should not come in contact with the hand.

5. After collecting the sample, the stopper of the bottle should be well secured and the bottles containing samples of water should be labeled stating the source, date and time of collection.

Table No: 3.1- Indian Standards (BIS) Guideline for quality parameters for Drinking Water.

SL.NO.	Parameters	Method	BIS Standards (mg/l)
1	Temperature	Thermometric	25˚
2	P^H	Digital P^H method	6.5-8.5
3	Total dissolved solid	Oven Drying Method	500
4	Total hardness	EDTA Titration	300
5	Calcium hardness	Spectrophotometer	75
6	Magnesium hardness	Spectrophotometer	30
7	Iron	Spectrophotometer	0.3
8	Fluoride	Spectrophotometer	1.0
9	Nitrate	Spectrophotometer	50
10	Chloride	Spectrophotometer	250
11	Sulphate	Spectrophotometer	200
12	Alkalinity	Titration method	200
13	Manganese	Spectrophotometer	0.1
14	Zinc	Spectrophotometer	5
15	Dissolved oxygen	Titration method	14
16	Total solid	Oven Drying Method	500
17	MPN	-	10

OBSERVATIONS TABLE NO 3.2

Ward number	Number of Tubes after 24 Hours			24 hours MPN index per 100 ml of sample presumptive test
	10 ml	1 ml	0.01 ml	
Ward No.1	0	0	0	3
Ward No.2	0	0	0	3
Ward No.3	0	0	0	3
Ward No.4	0	0	0	3
Ward No.5	0	0	0	3
Ward No.6	0	0	0	3
Ward No.7	0	0	0	3
Ward No.8	0	0	0	3
Ward No.9	0	0	0	3
Ward No.10	0	0	0	3
Ward No.11	0	0	0	3
Ward No.12	0	0	0	3
Ward No.13	0	0	0	3
Ward No.14	0	0	0	3
Ward No.15	0	0	0	3
Ward No.16	0	0	0	3
Ward No.17	0	0	0	3
Ward No.18	0	0	0	3
Ward No.19	0	0	0	3
Ward No.20	0	0	0	3
Ward No.21	0	0	0	3
Ward No.22	0	0	0	3
Ward No.23	0	0	0	3
Ward No.24	0	0	0	3
Ward No.25	0	0	0	3
Ward No.26	0	0	0	3
Ward No.27	0	0	0	3
Ward No.28	0	0	0	3
Ward No.29	0	0	0	3
Ward No.30	0	0	0	3

TABLE NO-3.3 Characteristic of ground water readings

Ward no.	P^H	TH mg/lit	Ca mg/lit	Mg mg/lit	CL mg/lit	TDS mg/lit	Fe mg/lit	F mg/lit	NO_3 mg/lit	SO_4 mg/lit	Alkalinity mg/lit	Mn mg/lit	Zn mg/lit	DO mg/lit	Ts mg/lit
1	7.22	100	80.1	18.4	140	459.3	0.292	0.275	14.2	16.5	60	0.07	2.2	5.7	491.3
2	7.0	101	82.1	19.2	130	450.1	0.280	0.272	14.4	19.3	60	0.078	2.12	5.7	490.2
3	7.34	207	85.2	13.8	160	405.0	0.222	0.262	16.5	21.2	72	0.085	2.21	5.7	482.4
4	7.75	102	86.2	20.2	170	412.8	0.250	0.368	15.8	23	85	0.032	1.7	5.1	578.3
5	7.70	115	90.2	21.1	170	402.3	0.270	0.454	22.6	26.8	87	0.028	2.12	5.5	582.3
6	7.74	96.7	75.0	16.7	140.2	455.8	0.150	0.280	16.6	25.1	85	0.112	2.1	5.5	519.0
7	7.2	120	92.3	25.	174	400.6	0.2	0.49	21.	30.	82	0.0	2.4	5.3	542.

	0			8			20	0	9	2		18			3
8	7.30	92.3	74.4	16.2	142.3	494.3	0.190	0.302	18.9	23.6	85	0.101	2.15	5.5	521.0
9	7.20	223.1	77.8	13.2	143.4	390.0	0.293	0.291	15.2	18.3	90	0.089	2.75	5.5	400.0
10	7.50	82.6	75.9	15.5	144.3	370.2	0.309	0.310	16.9	21.3	82	0.072	2.99	5.7	399.0
11	7.22	90.2	79.8	14.5	143.5	362.3	0.390	0.390	17.6	26	80	0.070	2.15	5.7	398.2
12	7.42	182.4	83.3	17.3	100	462.2	0.210	0.272	17.2	21.7	80	0.062	2.13	5.8	531.0
13	7.48	127.4	85.8	12.6	150	490.3	0.131	0.310	17.1	23.5	90	0.112	1.95	5.6	463.2
14	7.38	151	81.2	17.4	146.4	335.0	0.412	0.310	19	22.3	100	0.102	2.01	5.6	470.1
15	7.70	92.2	76.6	15.2	180	400.4	0.292	0.401	23.2	35.6	80	0.038	2.16	5.4	600.2
16	7.12	160.3	80.3	12.8	139.3	312.3	0.340	0.392	15.7	20.3	84	0.110	2	5.8	458.2
17	8.05	292.4	79.2	14.1	78.5	367.3	0.120	0.318	17.8	21.1	80	0.096	2.07	5.8	392.0
18	7.76	97.6	80.2	15.4	160	402.3	0.240	0.332	19.1	30.2	70	0.052	2.42	5.8	577.2
19	7.70	215.3	92.6	21.2	170.3	405.0	0.245	0.432	18.2	31.6	90	0.081	1.9	5.2	520.3
20	7.76	92.2	75.4	17.0	160	420.9	0.250	0.338	17.9	14.5	80.2	0.060	2.1	5.7	519.6
21	7.66	126.2	90.4	25.2	170	408.7	0.220	0.380	12.5	18.2	85	0.068	1.8	5.7	587.9
22	7.64	94.7	78.9	15.8	160	360.3	0.310	0.390	19.1	23	75	0.08	2.12	5.9	413.2
23	7.52	119	81.4	16.9	150	350.4	0.316	0.330	13.2	22.6	92	0.072	1.92	5.2	414.6
24	7.53	101.2	72.8	14.3	161.2	380.9	0.204	0.301	17.3	23.5	85	0.072	2.12	5.9	412.3
25	7.59	96.9	80.2	15.2	180	358.3	0.319	0.361	18.2	22.3	81	0.015	2.1	5.8	425.6
26	7.74	200.1	73.3	13.2	152.4	146.8	0.219	0.332	17.3	31.5	75	0.062	2.18	5.3	591.6
27	7.79	155.1	60.2	12.2	172.2	466.2	0.160	0.310	16.9	26.2	89	0.073	2.1	5.5	522.8
28	7.21	97.2	75.9	14.4	162.3	412.0	0.231	0.366	15.6	18.5	80	0.083	2.3	5.4	569.3
29	7.68	119.2	82.2	16.4	203.1	478.0	0.346	0.342	19.3	17.2	72.3	0.092	2.18	5.6	521.9
30	7.58	245.3	80.9	11.2	130	424.2	0.300	0.360	20.6	16.5	60	0.091	2.56	6	489.0
Total	225.4	4096.5	2409.8	492.4	4583.4	11984.2	7.731	10.271	525.8	693.3	2438.7	2.176	65.01	167.9	14884
Avg.	7.516	136.55	80.326	16.41	152.78	399.47	0.257	0.342	17.52	23.11	81.936	0.072	2.16	5.596	496.1
Max.	8.05	292.4	92.6	25.8	203.1	193.3	0.412	0.49	23.2	35.6	100.0	0.112	2.9	6.0	600.2
Mim.	7.0	82.6	60.2	11.2	78.5	146.8	0.12	0.26	12.5	14.2	60	0.015	1.7	5.1	392.0

IV. BIOLOGICAL CHARACTERISTIC OF GROUNDWATER

4.1. Most Probable Number (MPN)

For many years the coli form group of bacteria, as defined below, has been used to indicate the pollution of water with wastes and thus the suitability of particular water supply for domestic and dietetic uses. The coli form group includes all of the aerobic and facultative anaerobic, Gram- negative, non-spore forming, and rod shaped bacteria, which form lactose with gas formation within 48 h at 350C. The coli form group as define above is equivalent to the B-coil group. With developments in bacteriological techniques and the culture media, multiple tube fermentation test is accepted as a major standard method. The significance of the test and the interpretations of the results are well authenticated and have been used as a basis of standards of bacteriological qualities of water supplies.

V. CONCLUSION

After the careful study of experiments following conclusions have been drawn for the Dhule city.

1. The groundwater is crystal clear, odorless and palatable.
2. Most of the bore well yields potable water with moderate mineral or dissolved salt.
3. Water is soft in almost all the sampling points.
4. As there is no considerable increase in chloride and sulphate, it shows that there is no possible contamination of groundwater due to percolation of polluted surface water.
5. The concentration of iron and fluoride in entire Dhule city is well within the permissible limit.
6. The concentration of Nitrate was also well below the permissible limit.
7. The analysis reveals that the groundwater of the area, needs certain degree of treatment before consumption (atleast disinfection), and it also needs to be protected from the perils of contamination.
8. MPN index for all 30 bore well samples, As per BIS recommendations MPN index are within the limits. So biologically groundwater water is safe for drinking

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