Evaluation of Ground Water Quality Of M. I. D. C. Area, Roha Through Water Quality Index Assessment

S. M. Tandale, Dr.H. A. Mujawar,Dr.P.B.Lokhande

Abstract— In present investigation an attempt has been made to investigate the water quality by means of Water Quality Index. Physicochemical analysis of ground water near industrial area Dathav, Roha, Raigad were carried out for one year. The values of P^H, total hardness, total dissolved solids, alkalinity, chlorides, sulfate, calcium, magnesium, biochemical oxygen demand, ammonia except at G3 sampling site were within permissible limit. The values of parameters like electric conductivity, dissolved oxygen, turbidity were above the permissible limit. The water quality index values showed that the quality of water is good.

Index Terms— COD, Dissolved Oxygen, Ground Water, Roha, TDS, Water quality, Water Quality Index

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1 INTRODUCTION

Ground Water is the ultimate, most suitable major source of fresh water for drinking, agriculture and industrial desires. Over burden of the population pressure, unplanned urbanization, unrestricted exploration policies and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water [1]. For evaluating the suitability of ground water for different purposes, understanding of the chemical composition of ground water is necessary. Ground water contamination process might take many years and might take place at a distance from the well where the contamination is found. Since the effect of ground water pollution persists for longer time than surface water contamination, the time required to flush out an aquifer is enormous as compared to few days required for flushing the river. The detection of ground water pollution is rather difficult unless the aquifer gets filthy because the ground water pollution takes a long time to be apparent.

2 Materials and Methods:

2.1 Study Area:

The area is located around Roha industrial area in Dhatav village and Roha town. The three sampling sites are located in Dhatav village at different locations. The fourth sampling site is located in Roha town at Dhavir temple. The sites are about seventy kilometers from Panvel city.

2.2 Method:

The samples were collected for the three seasons namely, summer, monsoon and winter for one year.

The samples were collected in polythene container of 3 L capacity. The collection, transportation and preservation were done properly. The various water quality parameters such as, P^H, electric conductance (EC), dissolved Oxygen (DO), Alkalinity, Total Hardness (TH), Total dissolved Solid (TDS), Biochemical Oxygen Demand (BOD), Chloride (Cl), Turbidity, Sulfate (SO_4), Ammonia (NH_3) etc were analyzed in laboratory according to standard procedure (APHA)[11].

Water Quality Index (WQI) was calculated by weighted index method to determine the suitability of ground water for drinking purposes.

3 Result and discussion:

3.1 P^H:

The P^H value of water is indication of its quality. P^H values usually changes due to contamination from industrial waste, carbonate and bicarbonate. The P^H values for the samples are within the range of standard limit.

3.2 Electrical Conductivity:

It indicates mineral, geological effect and organic pollution. It increases as dissolved salt concentration increases. The conductivity values at three sampling sits are higher than the desirable limit.

3.3 Total Hardness:

The total Hardness value of water is due to the calcium and magnesium salts. The total Hardness values for samples are within the range of permissible limit.

3.4 Total Dissolved Solids:

Total dissolved solids values does not cause harm to human but higher concentration may cause heart and kidney dieses. Total dissolved solids values for all sampling sites are within the range of permissible limit.

3.5 Dissolved Oxygen:

Dissolved Oxygen is important for sustenance of aquatic life. The values of Dissolved Oxygen for all samples were above the permissible limit.

3.6 Turbidity:

The turbidity is due to existence of many types of pathogenic organisms. It is an indicator of pollution. All samples were having values more than standard limits. Water needs proper treatment.

3.7 Alkalinity:

The source of alkalinity in water body is mainly due to weathering of rocks. The values of the present study lie well within the permissible limit.

3.8 Chloride:

The presence of chloride is an indicator of organic pollution [5]. The presence of chloride in water body is mainly due to discharge of sewage, industrial effluents and agricultural fertilizers [6].The values for all samples are well below the standard limit.

3.9 Sulfate:

The sulfate in water is due to leaching of gypsum and other minerals. The values of the present study lie below the standard limit.

3.10 Ammonia:

Ammonia accounted for the major proportion of total soluble inorganic nitrogen. The values of ammonia for all samples except G3 are within the permissible limit.

3.11 Calcium:

The presence of calcium in water is mainly due to the dissolution of rocks. The values for calcium are within the permissible limit.

3.12 Magnesium:

The magnesium hardness is due to the presence of sulfate ions in it. The values are within the desirable limit.

3.13 Biochemical Oxygen Demand:

The amount of oxygen in water is from biochemically oxidisable carbonaceous matter [10]. The BOD values of present study are greater than 3 mg/L, which indicates that the quality of water is bad and it needs proper management.

3.14 Water Quality Status:

The water quality index is found to be
G1 = 36.67, G1 = 45.43, G3 = 58.54,
G4 = 39.72.
The water quality index for four sampling sites is less than 100 and in between 50 to 100 so quality of water is good.
The water Quality Index is calculated by following steps:

1. Calculation of Qn:

$$Qn = 100 \times \frac{(Vn - Vi)}{(Vs - Vi)}$$

Vn - Observed value
Vs - Standard value
Vi - Ideal Value
The value of Vi is Zero for almost all parameters
Except P^H and dissolved oxygen
For P^H Vi = 7
Dissolve Oxygen Vi = 14.6

2. Calculation of Wn:

Wn is calculated by using the equation-

$$Wn = \frac{K}{Sn}$$

K - Proportionality constant
Sn - Standard permissible limit for nth parameter

3. Calculation of K:

The value of K is obtain using the following equation-

$$K = \frac{1}{\sum_{i=1}^{n} \left(\frac{1}{S_1 + S_2 + S_3 + \ldots\ldots S_n} \right)}$$

Sn - Standard values

4. Calculation of water quality index (WQI):

The WQI values are obtained from the Equation given below-

$$WQI = \sum_{i=1}^{n} Q_n W_n / \sum_{i=1}^{n} W_n$$

Table: 1 Physico Chemical Analysis of Four Ground-Water Samples.

Parameters	G1	G2	G3	G4	Standard Limits
PH	6.98	7.07	7.41	6.91	6.5-8.5
Electrical Conductivity	520.66	250.86	344.66	516.33	300-1500
Total Hardness	146.66	95	163.33	188.33	300-600
Total Dissolved Solids	333.26	160.55	220.58	330.45	500-2000
Dissolved Oxygen	4.5	4.23	6.53	5.23	4-7
Turbidity	5.3	7.36	20.6	23.93	5-10
Alkalinity	56.16	84.16	114.16	126.66	200-600
Chloride	42.47	15.95	19.49	41.89	250-1000
Sulfate	23.42	14.78	29.89	32.14	200-400
Ammonia	0.043	0.023	0.075	0.019	<0.05
Calcium	40.30	27.38	42.08	44.75	75-200
Magnesium	16.34	8.50	18.63	26.73	30-100
Biological oxygen Demand	7.85	19.5	10.32	9.90	05
$\sum W_n$	6.1356	6.1356	6.1356	6.1356	
$\sum Q_n W_n$	237.2686	311.4119	401.26	272.2848	
WQI	36.67	45.41	58.54	39.72	

All the values are expressed in mg/L except P^H, EC (µS/cm) and Turbidity (NTU)

Where, G1, G2, G3, G4 are Four Different Ground Water Samples in Different Areas.

4 CONCLUSION

The physicochemical analysis of 13 water quality parameters showed that the values of P^H, total hardness, total dissolved solids, alkalinity, chlorides, sulfate, calcium, magnesium, biochemical oxygen demand and ammonia except at G3 site were within permissible limit. The values of parameters like electric conductivity, dissolved oxygen, turbidity were above the permissible limit. The water quality index values at four sampling sites namely, G1 = 36.67, G1 = 45.43, G4 = 39.721 were below 50 except at G3 =58.54, means that the quality of water is good.

5 ACKNOWLEDGMENT

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