Research Article

Groundwater quality studies of Kamlapur village industrial area of Aurangabad, India

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Abstract

The present paper deals with the assessment of variation in the groundwater samples and its suitability for drinking purposes. Spatial distribution of pH, electrical conductivity (EC), total dissolved solids (TDS), Calcium, Magnesium, Total hardness, chloride, and total alkalinity content of 30 ground water samples collected from the kamlapur village, near industrial area of Aurangabad has been studied. In the study area majority of samples shows high content in parameters such as electrical conductivity (EC), total dissolved solids (TDS), Calcium, Total hardness and Chloride. The degradation of water quality can be attributed to the use of agricultural fertilizer, urbanization and industrial discharges in the study area.

Key words: Groundwater quality, physicochemical parameters, Kamlapur village, spatial distribution.

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INTRODUCTION

Water is a fundamental resource of life, not only for human beings but also for all living organisms. Ground water is a precious natural resource for several vital functions such as for public, industrial, agricultural and water supply. Groundwater acts as a water reservoir and gets transported long distances through aquifers. The ground also acts as a mechanical filter improving its quality by removing suspended solids. A number of studies have been carried out on physicochemical characteristics of groundwater in India to assess groundwater quality variation. The sources and causes of ground water pollution are closely associated with human use of water. For many years ground water was thought to be protected from contamination by the layers of rocks and soil that acts as filters, but contaminants do make their way into the ground water and affect its quality. Groundwater quality plays an important role in promoting agricultural production and standard of human health. The present paper deals with the groundwater quality studies and its suitability for drinking purposes. A number of studies on groundwater quality with respect to drinking and irrigation purposes have been carried out in the different parts of the country (Ballukraya, and Ravi,1999; Kaplay,1998; Pawar *et al*, 1998; Pondhe *et al*,2008; Deshpande and Aher,2011, 2012; Aher and Deshpande, 2014),

Spatial distribution of pH, electrical conductivity (EC), total dissolved solids (TDS), Calcium, Magnesium, Total hardness, chloride, and total alkalinity content of 30 ground water samples collected from the Kamlapur village, near industrial area of Aurangabad has been studied.

MATERIALS AND METHODS

Groundwater samples collected from 30 dugwells and borewlls of the study area were collected and analyzed for the present study to understand the groundwater quality variation. Sample were drawn with Pre cleaned polythene bottles of one litre capacity were used. Prior to sampling

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all the sampling containers were washed and rinsed with the groundwater.

Methods of analysis

The physico chemical parameters of ground water such as pH and EC were determined in the field itself. The chemical characteristic such as Calcium, Total hardness, chloride, total alkalinity were determined immediately in the lab as per the standard method for examination of water and waste water given by APHA (1980) and Trivedi and Goel (1984). Magnesium estimated by the difference of the total hardness and calcium hardness. The results obtained were evaluated in accordance with the norms prescribed as Bureau of Indian Standards IS: 10500, Manak Bhavan, New Delhi, India (1991).

RESULT AND DISCUSSION

pH:

Is the logarithm of reciprocal of the ion concentration (pH) in the study area groundwater water sample varies from 6.49 to 7.14 (Table 1). The pH values of all samples are well within the limits prescribed by BIS (1991) and WHO (1993). From the Fig 1.1 it is seen that the pH of groundwater from Northwestern and southwestern part of study area is more than the groundwater from the remaining part of study area.

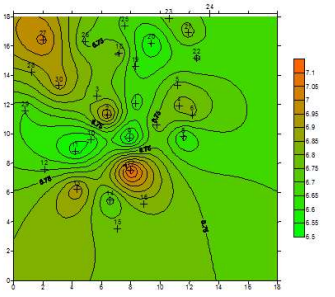
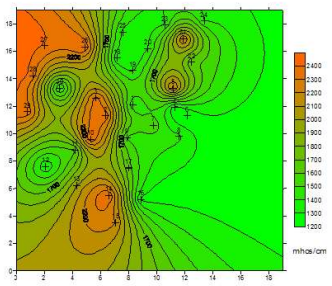


Figure 1.1



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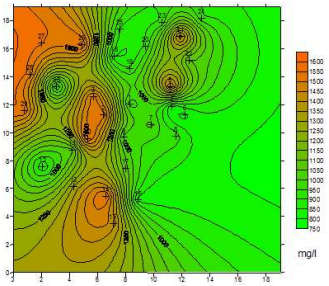

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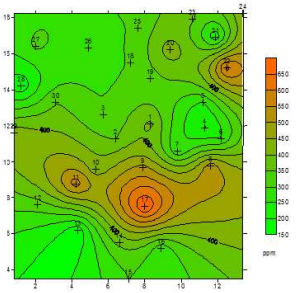

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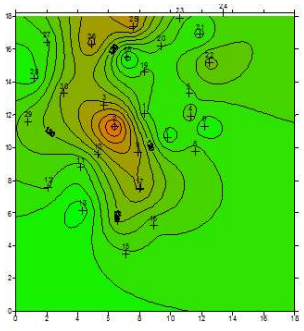

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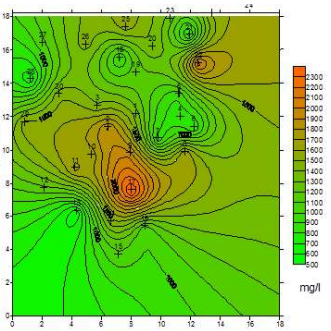

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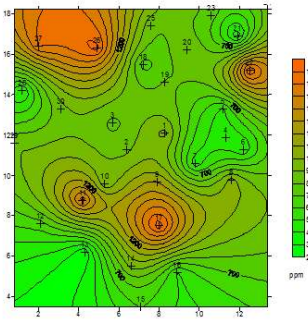

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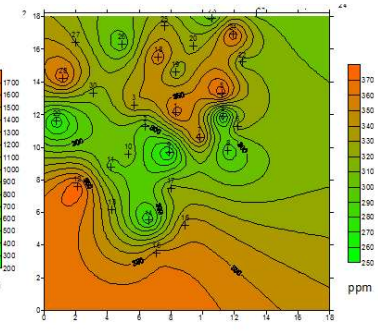

Figure 1.8

Legend:

Figure 1.1: Map of Kamlapur area showing Ground Water pH pattern in 2012 (+30 samples)
Figure 1.2: Map of Kamlapur area showing Ground Water Conductivity pattern in 2012 (+30 samples)
Figure 1.3: Map of Kamlapur area showing Ground Water TDS pattern in 2012 (+30 samples)
Figure 1.4: Map of Kamlapur area showing Ground Water Calcium pattern 2012 (+30 samples)
Figure 1.5: Map of Kamlapur area showing Ground Water magnesium pattern in 2012 (+30 samples)
Figure 1.6: Map of Kamlapur area showing Ground Water Total Hardness pattern in 2012 (+30 samples)
Figure 1.7: Map of Kamlapur area showing Ground Water Chloride pattern in 2012 (+30 samples)
Figure 1.8: Map of Kamlapur area showing Ground Water Alkalinity pattern in 2012 (+30 samples)

Conductivity (EC)

The conductivity of groundwater sample ranged from 1210 to 2410 µmhos/cm at 25ºC with average of about 1772.5 µmhos/cm (Table 1). From the Fig 1.2 it is seen that the EC of groundwater from Northwestern and southwestern part of study area is more than the groundwater from the remaining part of study area.

Total Dissolved Solid (TDS)

The Total Dissolved Solids ranged from 786.5 to 1566.5 mg/L with average of about 1152.13 mg/l. (Table 1). From the Fig 1.3 it is seen that the TDS of groundwater from Northwestern and southwestern part of study area is more than the groundwater from the remaining part of study area.

Calcium (Ca)

Content of groundwater showed variation from 162.72 to 708.61 mg/L (Table 1). From the Fig 1.4 it is seen that the Calcium of groundwater from Southern and Eastern part of study area is more than the groundwater from the remaining part of study area.

Magnesium (Mg)

The values of magnesium from groundwater ranged between 25.78 to 253.59mg/L (Table1). From the Fig 1.5 it is seen that the Magnesium of groundwater from Northwestern part of study area is more than the groundwater from the remaining part of study area.

Total Hardness (TH)

It is the concentrations of calcium and magnesium ions. Calcium and magnesium are dissolved from most soils and rocks. The hardness of natural waters depends mainly on the presence of dissolved calcium and magnesium salts .The values of total hardness of groundwater varied from 512 to 2436mg/L (Table 1). A limit of 300 mg/L has been recommended for potable water. As evident from the results, one sample exceeds the desirable limit. About 96.66% (29) samples exceed maximum permissible limit of 600 mg/L BIS (1991) and WHO (1993) (Table1 and Fig no1.6). From the Fig1.6 it is seen that the total hardness of groundwater from Southern and Eastern part of study area is more than the groundwater from the remaining part of study area.

Chloride (Cl)

The chloride content of groundwater varied from 221.52 to 1770.74mg/L (Table 1), As evident from the results, 100% of the samples are above desirable limit of 200mg/l , and 23.33 % (7) of the samples exceeds the maximum permissible limit of 1000 mg/L ISI (1991) and WHO (1993). From the Fig 1.7 it is seen that the Chloride of groundwater from Northwestern southern and Northeastern part of study area is more than the groundwater from the remaining part of study area.

Bicarbonate Alkalinity (HCO3)

The Alkalinity in the water is generally imparted by the salts of carbonates, silicates, etc. together with the hydroxyl ions in free State. Most of the natural waters contain substantial amounts of dissolved carbon dioxide, which is the principal source of alkalinity. The bicarbonate alkalinity ($HCO3^-$) content of the groundwater ranged from 255 to 380 mg/L (Table 1and Fig1.8). From the Fig 1.8 it is seen that the bicarbonate of groundwater from Southern and Northwestern part of study area is more than the groundwater from the remaining part of study area.

CONCLUSION

Based on the analytical result for the field groundwater samples it can be concluded that the quality of groundwater in Kamlapur village is more deteriorated because of continued discharge of effluents through surface stream. The data revealed that the parameters such as electrical conductivity (EC), total dissolved solids (TDS), Calcium, Total hardness and Chloride shows high contents in groundwater of Kamlapur village. The parameters like total hardness in the groundwater samples of the study area are more than the limits prescribed by BIS (1991) WHO (1993) indicating that the groundwater of the study area is lightly and moderately polluted and unsuitable for drinking. In the study area it was observed that urbanization, urban activity and industrialization had significant passive and negative impact on groundwater quality of Kamlapur.

REFERENCES

1. Aher K.R. and Deshpande S.M., Groundwater Hydrogeochemistry of Mula river Basin, Maharashtra, India, Gondwana Geological Magazine, 2014;Spl Vol. 14: 167-716.
2. APHA,Standard methods for examination of water and waste water 15th Ed. American pub. Health Asso., Washington D.C. 1980.
3. Ballukraya, P.N. and Ravi, R.Characterization of groundwater in the unconfined aquifer of the Chennai city, India. Jour. Geol. Soc.1999,V.54, pp1-11
4. BIS., Bureau of Indian Standards IS: 10500, Manak Bhavan, New Delhi, India.
5. Deshpande, S.M. and Aher K.R.,Quality of groundwater from Tribakeswar-Peth area of Nasik District and its Suitability for Domestic and Irrigation Purpose, Gondwana Geological Magzine, 2011;V.26 (2),pp 157-162.
6. Deshpande, S.M. and Aher K.R.,Evaluation of Groundwater Quality and its Suitability for Drinking and Agriculture use in Parts of Vaijapur, District Aurangabad, MS, India, Research Journal of Chemical Sciences,2012, Vol. 2(1), 25-31.
7. Kaplay R. D.,Groundwater quality in an industrial area of Tupa, Nanded Pol. Res., 1998, V.17, pp 251-254
8. Pawar N.J., Pondhe G.M. and Patil S.F.,Groundwater pollution of sugar mill effluents at Sonai Maharashtra, India. Env. Geology, 1998,V.34, pp 151-158
9. Pondhe G.M., Hase P. C., Thitame S.E. and Patil S.S.,Characteristic and quality of groundwater in Ghulewadiand Malad villages near sugar factory, Sangamner, District Ahemadnagar, Maharashtra J. Aqua, Biol.,2008, V.2 3, pp 51-54
10. Trivedy, R.K.and Goel, P.K.,Chemical and biological methods for water pollution studies. Environmental Publ. Karad, India,1984.
11. WHO., International standards for drinking water, WHO, Geneva,1993.

Table 1: Result of chemical parameter groundwater, Kamlapur area, Aurangabad District

Sample No.	pH	Ca	HCO3	Cl	TH	Mg	EC	TDS	Na	K	SO4
1	6.62	411.22	365	1028.08	1370	83.73	1420	923	55	1	275
2	6.97	348.69	295	877.56	1910	253.59	2370	1540.5	125	1	258
3	6.76	299.79	340	771.06	1424	164.8	2340	1521	130	1	249
4	6.82	197.19	260	460.08	866	91.16	1230	799.5	45	2	232
5	6.77	246.89	380	487.06	922	74.57	2250	1462.5	100	1	224
6	6.81	251.7	325	417.48	798	41.3	1210	786.5	35	1	222
7	6.79	258.11	355	435.94	840	47.7	1560	1014	75	2	213
8	6.58	531.46	280	1042.28	1700	90.1	1420	923	70	1	253
9	6.49	513.82	255	1205.58	1970	167.62	1490	968.5	72	2	280
10	6.55	417.63	310	920.16	1610	138.39	2390	1553.5	145	1	151
11	6.52	579.55	295	1559.16	1726	68.04	1590	1033.5	83	2	1030
12	6.69	325.44	380	665.98	1148	81.83	1310	851.5	45	1	870
13	6.95	162.72	325	221.52	512	25.78	2000	1300	125	1	463
14	6.67	367.13	270	928.68	1420	122.8	2400	1560	141	1	665
15	6.78	301.25	355	604.92	1068	77.05	2200	1430	155	2	778
16	6.82	263.72	345	492.74	1004	84.3	1280	832	44	1	257
17	7.14	708.61	325	1770.74	2436	162.65	1640	1066	83	2	507
18	6.81	305.4	360	656.04	874	27.73	1310	851.5	45	1	704
19	6.64	330.25	320	810.82	1170	84.27	1390	903.5	63	2	1120
20	6.54	430.45	325	890.34	1404	80.31	1400	910	65	2	560
21	6.78	213.22	370	332.28	746	52.11	2230	1449.5	98	2	968
22	6.64	617.62	315	1704	2062	130.48	1610	1046.5	85	1	788
23	6.73	357.31	295	754.02	1258	89.13	1400	910	52	1	511
24	6.66	450.49	305	864.78	1508	93.48	1400	910	52	2	452
25	6.68	310.21	335	825.02	1568	193.59	1370	890.5	56	1	303
26	6.73	271.74	290	1732.4	1446	187.26	2410	1566.5	142	2	561
27	7.02	308.61	330	1606.2	1072	73.54	2390	1553.5	140	1	467
28	6.85	162.72	370	384.82	618	51.65	2350	1527.5	138	2	562
29	6.65	430.45	260	887.5	1542	113.98	2380	1547	142	1	685
30	6.93	347.89	315	860.52	1472	147.21	1360	884	53	1	1360
Min	**6.49**	**162.72**	**255**	**221.52**	**512**	**25.78**	**1210**	**786.5**	**35**	**1**	**151**
Max	**7.14**	**708.61**	**380**	**1770.74**	**2436**	**253.59**	**2410**	**1566.5**	**155**	**2**	**1360**
Average	**6.75**	**362.27**	**321.41**	**880.94**	**1325.38**	**105.61**	**1772.5**	**1152.13**	**89.03**	**1.41**	**532.27**

* All value in mg/L, except pH and EC in µs/cm at 25°C

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