International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.6, pp 246-249, 2017

Long-term Investigation of Ground Water Quality in Savali Village, Kupwad MIDC, Sangli, Maharashtra.

Ravindra V. Kupwade*

Department of Chemistry, Smt. Kasturbai Walchand College, Sangli, Maharashtra, India

Abstract : Three-Fifths of the earth's surface is covered by water, most of which is ocean salt water. Only three percent is fresh and all but three one thousandths of that is locked up in glaciers and ice caps or too deep in the earth to retrieve. Therefore very small portion of available fresh water for human consumption is being contaminated by various anthropogenic sources at a very high rate. As Earth's population keep on growing, people are putting ever-increasing pressure on water resources. Hence our oceans, rivers, and other inland waters are being "squeezed" by human activities, as well as its quality is reduced. Poorer water quality means water pollution. Therefore it is necessary to make the society aware of the water quality and its pollution. In this view present study was undertaken in March 2012 and after Five years in March 2017 re-investigation of water quality for comparative study is done. Water samples were collected from twelve different sites in Savali village covering borderline area of Kupwad MIDC. Samples were analyzed for various parameters such as pH, EC, TDS, total hardness, Ca hardness, total alkalinity, chlorides, free CO_2, DO, sulphate, nitrate and phosphate using standard method. It was found that for several sample values of TDS, total hardness, chloride, total alkalinity and sulphate of the samples are out of the highest desirable limit or exceeded the permissible limit. Comparative study of physico-chemical parameters discloses that water quality in Savali village is depleting at alarming rate.
Key words : Ground water, physico-chemical parameters, waste water, pollution.

Introduction

Groundwater is the vital and most suitable source of water for domestic, agricultural and industrial purposes of mankind. The safe and reliable source of water is an essential prerequisite for the survival of a stable society. Day by day increasing demands of water due to rapid urbanization and industrialization are putting pressure on natural resources. This leads to deterioration of quality as well as quantity of the water.[1] Many villages in Sangli district, Maharashtra are facing water quality problems especially in summer season.

Groundwater is contamination takes place in various ways such as such as municipal sewage disposal to nearby water bodies, use of inorganic fertilizers in agricultural farming and disposal or seepage of effluent from industries.[2] Most of the industries discharge the effluent without proper treatment into nearby open land or pass them through unlined channels, resulting in a deterioration of the groundwater resources. [3-4] As a result it water borne diseases has been the major cause of health hazards, as well as utilization of such water for agricultural purposes have adverse effect on crop production & fertility of agricultural land. Groundwater resource in study area, Savali has been previously studied by our group before five years.[5] Savali is situated down streams at East side of Kupwad MIDC, Sangli district. Kupwad MIDC encompass foundries, edible oil refineries, food

processing industries, dying industries and various small unit which uses water for diverse processes. The objective of present work is to examine the physico-chemical parameters of water along same 12 locations in Savali village nearby Kupwad MIDC and to compare current results with previous study.

Methodology

Groundwater samples were collected in two liters clean polyethylene container from all the sampling locations in open wells and bore wells from the study area. The samples collected were characterized by different parameters such as pH, conductivity, TDS, total alkalinity, total hardness, Calcium hardness, Chloride, Nitrate, Sulphate, Phosphate, DO, free CO_2 etc. DO was fixed at the site and then analyzed in laboratory by Winklers Method. The temperature, pH is recorded by pH-meter (Model No. EQ-610 Equiptronics), conductance is measured by conductivity bridge (Model No. EQ-660, Equiptronics). The other parameters are determined by using standard method available in literature[6].

Results and discussion

The physico-chemical properties of groundwater in the area under survey are given in Table-1 and Table-2. There is little variation in the physical characteristics of groundwater, whereas the considerable changes have been noticed in the chemical parameters of the groundwater in the study area.

Table 1: Results in March 2012

Parameters	B1	W2	W3	W4	B5	W6	B7	W8	W9	B10	W11	W12
pH	7.2	6.4	7.3	7.0	6.7	7.2	7.6	6.9	6.9	7.0	7.2	7.0
Conductivity	727	200	665	448	410	217	769	215	200	129	178	302
TDS	3800	1100	3305	2345	3015	1200	10000	1600	1130	500	1640	1290
Total Alkalinity	160	280	240	248	220	280	120	260	280	220	240	200
Total Hardness	2050	645	1750	1325	1175	690	2400	650	625	375	465	825
Ca Hardness	849.7	340.6	841.6	705.4	577.2	356.7	965.9	328.6	312.6	192.4	248.5	404.8
Chloride	2649	525	2299	1175	1125	499	1974	699	725	350	474	1249
Nitrate	28.44	22.25	33.65	25.15	28.15	19.62	32.79	29.62	32.45	16.37	26.62	26.64
Sulphate	81.0	16.65	89.40	32.25	30.81	20.12	61.99	17.98	19.65	19.12	15.97	39.65
Phosphate	0.51	0.26	0.55	0.75	0.68	0.29	0.35	0.56	0.59	0.23	0.25	0.68
Dissolved Oxygen	5.5	7.4	7.2	7.1	4.8	6.7	6.6	6.9	7.0	6.5	7.3	7.0
Free CO2	28.16	21.12	49.28	35.2	63.36	73.92	24.64	42.24	42.24	17.6	17.6	21.12

Table 2: Present physico-chemical status (March-2017)

Parameters	B1	W2	W3	W4	B5	W6	B7	W8	W9	B10	W11	W12
pH	7.1	6.7	7.2	7.1	6.7	7.1	7.4	6.7	6.8	7.2	7.5	7.1
Conductivity	754	223	697	412	408	235	797	223	254	156	197	364
TDS	4053	1420	3425	2300	3000	1345	10513	1660	1220	610	1675	1335
Total Alkalinity	175	198	250	275	195	265	135	280	300	240	265	250
Total Hardness	2000	600	1695	1250	1100	660	2435	660	690	390	480	1150
Ca Hardness	833.5	365.5	850.4	734.5	560.4	375.5	986.4	330.5	315.3	180.5	270.4	490.5
Chloride	2765	560	2345	1275	1284	460	2100	654	750	365	460	1395
Nitrate	27.56	22.35	34.56	25.60	30.15	20.45	31.26	28.16	32.46	15.65	25.34	28.15
Sulphate	85.00	20.56	90.56	35.26	32.16	20.56	60.55	19.24	19.32	20.45	16.35	45.65

Phosphate	0.56	0.20	0.59	0.69	0.59	0.31	0.39	0.59	0.65	0.21	0.24	0.77
Dissolved Oxygen	5.6	7.5	7.6	7.0	5.0	6.7	6.5	6.8	7.0	6.3	7.2	7.1
Free CO2	27.12	23.16	50.24	34.64	65.42	75.22	22.24	43.60	43.56	20.12	18.58	20.36

All values are in mg/l; except pH and EC, unit of EC are µmhos/cm (B- bore well, W-open well)

In previous study the pH value of the water samples ranges from 6.4 – 7.6, presently it varies between 6.7 – 7.2. The pH of W2 site has been slightly increased from 6.4 to 6.7. Electrical conductivity is measure of ionic concentration in water. Here EC value fluctuates between 129 – 769 µmhos/cm and 156 – 797 µmhos/cm during previous and present study respectively. Increase in EC values indicates that mineralization of water is increased in last Five years. High value of EC in water had adverse effect on its irrigation use, as it increases salinity of soil.[7]

The total dissolved solids (TDS) means concentration of all minerals, inorganic salts, small amounts of organic matter and gases. Values of TDS lie between 500 – 10000 mg/l (2012) and 610 – 10513 mg/l (2017). Almost at all sites TDS values are increased except at W4 and B5. TDS more than 1000 mg/l is unfit for irrigation purpose.[8] Only one site that is B10 shows low TDS value but it is also increased from 500 to 610 mg/l. Water at B7 site is highly saline with TDS 10513 mg/l totally unsuitable for agricultural as well as other domestic use.

Alkalinity is a measure of ability to neutralize acids. Excess alkalinity gives bitter taste to water and reacts with cations forming precipitates, which can damage the pipes, valves, household utensils, unhealthy for cooking, bathing etc. Total alkalinity ranges from 120 to 280 during both study periods.

The maximum allowable limit of TH for drinking purpose is 500 mg/l and the most desirable limit is 100 mg/l. Water hardness has adverse effects; hardness above 500 mg/l is objectionable for domestic use or irrigation, as it causes unpleasant taste to water, spoils milk, tea and reduces ability of soap to produce lather and chokes the nozzles of drip line. Total hardness is slightly raised or declined at various sites. The total hardness is very high in all samples except at site B10 and B11. But at these sites also hardness is increased as compare to previous analysis. Variation in hardness is due to leaching of carbonate and bicarbonate salts or may be due to geology of the rocks and industrial discharge.

Calcium hardness swings between 192.4 to 965.9 mg/l and 180.5 – 986.4 during March 2012 and March 2017. High calcium content makes water unpalatable for drinking as well as domestic or agricultural use. It forms depositions or scaling inside the irrigation pipeline and can damage steel pipes, joints or valves.

The chloride concentration varied from 350 - 2649 mg/l and 365 – 2765 mg/l in both cases. Most of sites in study area have higher concentration of chlorides which is further increased in these Five years. Sites B1, W3 and B7 are extremely high in chlorides content, this may be due to they are near to watercourses from MIDC area which carries waste water from industries.

The nitrate concentration is with in the permissible limit of nitrate is 45 mg/l prescribed by standards; it varies between 19.62 to 33.65 mg/l and 15.65 – 34.56 mg/l. Nitrate fertilizers[10] and plant nutrients are the main source of nitrate in ground water. Nitrate concentration is not much changed during the study period.

The sulphate is mainly derived from gypsum and sulphide minerals, sulfite ore which add the soluble sulphate[9] into the groundwater through oxidation process. In the study area the sulphate level is below 100 mg/l. The higher sulphate content at site B1, W3 and B7 may be due to bio chemical, anthropogenic sources and industrial process etc. The value of phosphate fluctuates from 0.23 to 0.75 mg/l and 0.20 – 0.77 during study period. Source of phosphate is rain or surface water runoff and agriculture run off.

The DO concentration is an indicator of organic pollution. The DO vary from 4.8 mg/l to 7.6 mg/l during study period. The value of free CO_2 ranges from 17.6 – 73.92 mg/l during last survey and currently it is in between 18.58 – 75.22 mg/l. Slightly rise is observed in free CO2 value at most of the sites.

Conclusion

Comparative study of physico-chemical parameters analyzed in March 2012 and March 2017 discloses that B1, W3, W4, B5, B7 sites are highly polluted and extent of pollution is increased in last Five years. Same is the case for all remaining sites which are better or moderately polluted. Only B10 water sample is suitable for drinking and domestic use. Overall observation reveals that the groundwater quality of Savali village is slowly declining. This is mainly due to industrial effluent, which is percolated through ground as well as mixed with water stream throughout the year causing deterioration of water resources. Installation of ETP and proper waste water management by the industries is the only solution to avoid future water pollution disaster.

References:

1. Deshmukh K.K, The chemistry of ground water in Sangamner area with regards to their suitability for drinking purposes., Rasayan J. Chem. 2011, 4, 770-779.
2. Sharma, H. Kaur B. K., Environmental chemistry, 1995, Goel Publishing House, Meerut.
3. Ramesh. K., Soorya V. Hydrochemical Analysis and Evaluation of Groundwater Quality in and around Hosur, Krishnagiri District, Tamil Nadu, India, Int. J. Res. Chem Environ., 2012, 2, 113-122.
4. Satish Kumar S., Ravichandran S. Ground water quality assessment in Cheyyar region, International Journal of ChemTech Research, 2011, 3, 1060-1063.
5. Kupwade R.V., Langade A.D. Pre and Post Monsoon Monitoring of Ground Water Quality in Region Near Kupwad MIDC, Sangli, Maharashtra. International Journal of ChemTech Research, 2013, 5, 2291-2294.
6. a) Trivedy, R. K. and Goel P. K. (1986): Chemical and biological methods for water pollution studies, Environmental Publication, Karad, Maharashtra. b) APHA, AWWA and WPCF: Standard methods for the examination of water and waste water, 1995, 19th Ed., APHA New York.
7. Senthil kumar D., Satheeshkumar P., Gopalakrishnan P., Ground Water Quality Assessment in Paper Mill Effluent Irrigated Area - Using Multivariate Statistical Analysis World Applied Sciences Journal, 2011, 13 (4), 829-836.
8. Gorrel, H.A., Classification of water based on Sodium Chloride content. Bulletin of the American Association of Petroleum Geologists, 1958, 42: 2513.
9. Prakash K. L., Somashekar R. K., Groundwater quality - Assessment on Anekal Taluk, Bangalore Urban district, India, Journal of Environmental Biology, 2006, 27, 4, 633-637.
10. Agrawal, G.D., Lunkad S. K., Malkhed T., Diffuse agricultural nitrate pollution of groundwater in India. Water Sci. Tech., 1999, 39, 3, 67-75.

*****