The Scientific Temper
Vol. 2; No.1&2 : Jan.-July, 2011 : pp85-88
Email: letmepublish@rediffmail.com

ISSN 0976 8653
e-ISSN 2231 6396

GROUND WATER QUALITY OF JAGDISHPUR INDUSTRIAL AREA (U.P.)

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ABSTRACT

Ground water samples from bore wells of Jagdishpur Industrial area, district Sultanpur at present district C.S.M. Nagar (U.P.) were analysed for the assessment of the physico-chemical parameters with reference to BIS, 1998 standards for drinking water. Research findings revealed that, values of several parameters cross their permissible limit and pointing out to the necessity of proper treatment to disposal of municipal waste, industrial waste and domestic waste in that area.

KEY WORDS: Ground water quality, Jagdishpur industrial area.

INTRODUCTION

The post independence period in the country witnessed developmental programmes in various fields prominent among them were rapid industrialization, green revolution, urban development and protected water supply to rural and village mass. The implementation of these programme resulted in an unprecedented rush for the exploitation of ground water resources, in fact these water resources are becoming the dumping place for all that waste materials produced by human activities including toxic pollutants and hence creating a problem of water pollution, ground water is no exception to this. Once the ground water resources get polluted the effect map persist for decades or longer. The reclamation of surface water is easier than ground water. Hence pollution of ground water due to any cause is very important. In this paper an effort has been made to know the quality of water whether it is suitable for drinking purpose or not.

MATERIALS AND METHOD

STUDY AREA

Jagdishpur is Tehsil head quarter of C.S.M. Nagar. It is situated at a distance of 65 Km. West from Sultanpur district and 75 Km. East from Lucknow. Jagdishpur has mainly rural or semi urban Environment where major land use in the agricultural activity.

COLLECTION OF SAMPLES

Sampling of Ground water was done during Jan. 2011. High grade plastic bottles of one liter capacity were used, which were thoroughly cleaned and prior to filling, were rinsed with the water being sampled. Ten samples were collected from public hand pumps after running them for 15 to 20 minutes, so as to avoid errors due to water contained with in the pipes.

ANALYSIS OF SAMPLES

The analysis of water done using procedure of standard methods (**APHA**, 1995) and to analyse the water samples, which are very essential to know the water quality for drinking purpose, carried out water analysis. The findings of the present investigations are summarized in Table-1, and it has been made with BIS 1998 drinking water standards Table-2 which provides comprehensive picture of physico-chemical characteristic of ground water in the study area.

The parameters like pH, Electrical conductivity, Total dissolved solids were measured in the field at the time of sample collection, using water analysis kit (**ELICO**). Turbidity of water samples were measured using Nephalometer. Total hardness, calcium, magnesium and Alkalinity by the titrimetric method, while chloride estimation was done by Argentometric method, sulphate and phosphate by spectrophotometeric method (**APHA**, 1995).

OBSERVATION AND DISCUSSION

A total of ten numbers water-samples were taken from different locations of Jagdishpur. Three samples were taken from residential area (S_1 S_2 S_3), three samples from market area (S_4, S_5, S_6), and two each from agricultural fields (S_7, S_8) and solid waste dumping sites (S_9, S_{10}).

The pH value of the study area falls 7.1 to 8.4 and is well within the permissible limits prescribed for drinking water standards. However, higher values of pH hasten the scale formation in water heating

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apparatus and reduce the germicidal potential of chlorine (**Mohapathra and Purohit**, 2000).

Electrical conductivity values of the samples were observed and recorded as 480 to 1250 μmhos/cm. It also shows that all the water-samples collected for present observation fall well within the permissible limits (750-2000 μmhos/cm).

It is indicating high mineralization in that area and also presence of higher concentration of acid, base and salts in water, higher will be the EC (**Kataria and Jain**, 1995).

TDS values of the water-samples are 310 to 1320 mg/l and are well within the desirable limits of 1000 mg/l except the sample number S_9 and S_{10}. These two stations- S_9 and S_{10} are the solid waste dumping area. Here the local municipal authority adopted a common method for the disposal of solid municipal wastes by deposition on land. During percolation process, leachates from solid waste dumping sites may reach the ground water table and alters the quality of the water. **Foster and Hirata**, 1987, also concluded that the amount of dissolved solids increase with depth and with the time and distance the water has traveled in the ground. Landfills can be any area of land used for the deposition of mainly solid wastes and they constitute important potential sources of ground water pollution (**Everett**, 1980). **Olaniya and Saxena** (1977) also reported ground water pollution from refuse leaches in the vicinity of dumping sites detectable through increased TDS of water.

In the present study turbidity values vary from 1.8 to 30.7 NTU. Here all water-samples are well within the permissible limits except for the samples S_3, S_5, S_9, S_{10} which are highly turbid indicating leaching down of suspended colloidal particle in the ground water due to

TABLE-1

Physico-chemical Characteristics of Ground water quality data of Jagdishpur Industrial area

S.No.	Physico- chemical Parameters	Sample Numbers									
		S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
1.	pH	7.2	7.1	7.4	7.5	7.8	8.4	7.2	7.9	7.3	7.6
2.	EC	830	480	740	1250	1150	590	870	760	840	870
3.	TDS	760	790	520	960	310	720	670	830	1260	1320
4.	Turbidity	8.6	1.8	28.9	10.4	28.4	12.4	10.4	2.20	30.7	29.8
5.	Total Hardness	290	620	680	510	572	580	620	610	660	650
6.	Ca^{2+}	25.3	55.6	50.2	58.4	144.2	86.4	70.2	122.6	55.2	29.8
7.	Mg^{2+}	25.64	114.2	121.9	116.6	119.6	125.4	121.2	117.3	122.7	126.2
8.	Alkalinity	351	346	560	148	152	124	332	571	357	484
9.	Cl^-	125.2	182.2	127.6	225.9	140.6	456.5	732.4	660	620	684
10.	SO_4^{2-}	130	152	49	112	84	154	164	150	185	162
11.	PO_4^{3-}	0.16	0.15	0.08	0.22	0.24	0.16	0.22	0.24	0.18	0.18

NOTE: All the parameters are expressed in mg/l (ppm), except pH and Electrical conductivity (μmhos/cm).

TABLE-2
Comparison of Ground water quality data with Drinking water standards (BIS, 1998)

S.No.	Parameters	BIS, 1998		Observed values	
		P	E	Range	Mean
1.	pH	6.5-8.5	<6.5->8.5	7.1-8.4	7.54
2.	EC	750	2000	480-1250	838
3.	TDS	500	1000	310-1320	814
4.	Turbidity	5	25	1.8-30.7	16.36
5.	TH	100	600	290-680	579.2
6.	Calcium	75	200	25.3-144.2	69.79
7.	Mg^{++}	50	150	25.64-126.2	111.07
8.	Alkalinity	200	600	124-560	342.5
9.	Chloride	200	600	125.2-732.4	395.4
10.	Sulphate	200	400	49-185	134.2
11.	Phosphate	0.25	0.40	0.08-0.38	0.18

NOTE: P=Permissible limit; E= Excessive limit. All the parameters are expressed in mg/l (ppm), except pH and Electrical conductivity (μmhos/cm).

the improper dumping of wastes in that site.

Generally groundwater is less turbid since sand is a good filtering media. If an aquifer receives a leachate from the domestic solid waste and industrial waste water points which may result in increasing turbidity in ground water (**Knight**, 1951).

The hardness values generally found to vary from 290-680 mg/l, only 4 samples (S_1, S_4, S_5, S_6) were found to be well within the excessive limit and rest all samples cross their excessive limit. Calcium values vary from 25.3-144.2 mg/l and it shows it was well within the permissible limit prescribed for drinking water quality standards. The water quality results for magnesium values ranges between 25.64-126.2 mg/l, the prescribed drinking water standards for magnesium is 50-150 mg/l.

The more amount of total hardness, and magnesium contents are may be due to the Ground water of the region presenting the low natural quality, in other words depth of the wells and the nature of the geological materials with which the ground water comes in contact may influences the quality of water. The Ground water chemistry is controlled by the composition of its recharge components as well as by geological and hydrological variations (**Narayana and Suresh**, 1989).

The hard water causes a toughening of some vegetables, notably beans and peas and in textile finishing. However, excess amount of total hardness, calcium, magnesium accounts an scale formation in boilers, pipelines, utensils and consume more detergents in washing process (**Ramaswamy and Rajaguru**, 1991).

Alkalinity values ranges between 124 mg/l to 560 mg/l. Only 3 samples (S_4, S_5, S_6) were found to be well within permissible limit and rest samples were found well within excessive limit. When alkalinity of water exceeds the excessive limits, it is likely to produce incrustation sediments deposits, difficulties in chlorination, certain physiological effects on human systems etc.

Chloride levels found to be 125.2 to 732.4 mg/l. Here all samples were well within the permissible limits except the samples S_7, S_8, S_9, S_{10}. These four sampling stations are to be located on agricultural field and solid waste dumping sites. The contamination of chloride in ground water is usually attributed to improper dumping of municipal excreta particularly urine contain chloride in an amount about equal to the chloride consumed with food and water. Chloride in excess imparts the salty taste to water and people are not accustomed to high chloride are subjected to laxative effect (**Raviprakash and Krishna Rao**, 1989).

The present investigation data reveals for sulphate values ranging between 49-185 mg/l and were well within the permissible limits, for drinking water standards. Sulphate in ground water takes place the break down of organic substances in the soil, However geological, hydrological and geomorphologic characteristic shows remarkable variations and also the human influences (**Alexander**, 1961).

Phosphorus is also an essential elements for sustained primary productivity in the ecosystem. The farm of phosphorus discussed here is Ortho-phosphate. Phosphorus amount in natural water is very low, domestic wastes, industrial effluent and agricultural runoff is major sources of phosphorus in water. Hence its high concentration is indicative of pollution. In the

present study the phosphate value varies from 0.08-0.24 mg/l which are well within the permissible limit for drinking water standards.

CONCLUSION

Present investigation is a step in the direction to observe the size and extent of the problem of ground water quality in Jagdishpur Industrial Area. The reason for higher values of physico-chemical parameters at certain sampling locations is due to unscientific disposal of urban solid wastes and landfill. Here the leachate perecolates through solid wastes and contaminates the groundwater. The depth of the well and nature of the geological materials which comes in contact may also influence the quality of the water. Concerned with the study area, there is no proper drainage system and due to a regular addition of large amount of sewage and detergents from the residential localities and market area the water quality is getting from bad to worse. These contain both sanitary and non-sanitary components. It can be concluded that groundwater of the study area in some localities are not suitable for drinking purpose. The need of a suitable dumping site and the proper management of solid waste in this area is suggested on the basis of present study. However, work on microbiological analysis of the water samples is also suggested.

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