

Status of ground water quality in Bhopal city

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ABSTRACT

The concentration of cations and anions in ground water of Bhopal city was studied during March 2008. The concentration of various cations like Sodium (9.7 mg/L to 79 mg/L), Sulphates (12 mg/L to 372 mg/L) and Potassium (5 mg/L to 45 mg/L) was found. At 50% of the location the total hardness values of ground water exceeded the values prescribed for drinking water (IS 10500).

The concentration of the anions like Fluoride (0.76 mg/L to 1.24 mg/L), total alkalinity (120 mg/L to 360 mg/L) were observed whereas the Nitrate (5.2 mg/L to 42 mg/L) Chloride (24 mg/L to 306 mg/L) and Ammonical nitrogen (0.03 mg/L to 0.62 mg/L) were found.

Key words: Ground water, Cations, Anions.

INTRODUCTION

Population is increasing many fold progressively and there is great demand of water in all major sectors namely irrigation, industrial and domestic purpose. Under the prevailing hydrological condition the availability of fresh water resources is more or less constant. Ground water for construction activities/improper drainage system, the need of ground water quality assessment is essential.

To evaluate the water quality with references to its use the ground water samples were collected during March 2008. Selection of these locations was based on the use of ground water and then vicinity to the population sources. Sampling location and other relevant details are furnished in table 1. Analysis result of collected water samples and the data is presented in table 2.

MATERIAL AND METHODS

Bhopal city is situated between 23°35' N latitude and 77°23' E longitude. Topography of the city

is generally flat but there are several hills in the city. The area of the city is 285 Sqkm. with maximum and minimum altitude 625 m and 490m above sea level. The urban population of the city is about 20 lakhs.

Ground water samples were collected in LDPE carbuoy. The primary preservation of the samples were carried at the site followed by analysis in the laboratory. pH was recorded with the help of handy digital pH meter on the site. The standard methods as prescribed in APHA were adopted for analysis of ground water during study¹⁻².

RESULTS AND DISCUSSION

The minimum and maximum pH were recorded as 6.91 & 9.41 at new Arif Nagar and Kotra respectively. Kotra Sultanabad is the only station where the pH value exceeded the drinking water standard (6.5 to 8.5). The conductivity of the monitored samples in the city ranged from 210 μ S to 132 μ S at Arera Colony and Bhanpur respectively. It is an indication of the availability of various ions.

The concentration of various cations like Sodium (9.7 mg/l to 79 mg/l), Sulphates (12 mg/l to 372 mg/l) and Potassium (5 mg/l to 46 mg/l). The values of total hardness was found in the range of 144mg/l to 978 mg/l at professors colony and Bhanpur respectively. At 50% of the locations the total hardness values of ground water exceeded the values prescribed for drinking water (IS 10500).

The concentration of the anion in the ground water that is Fluoride (0.76 mg/L to 1.24 mg/L), total alkalinity (120 mg/L to 360 mg/L) were also found in higher range where as the Nitrate (5.2 mg.l to 42 mg/L) Chloride (24 mg/L to 306 mg/L) and Ammoniacal nitrogen (0.03 mg/L to 0.62 mg/L) were found marginally high at Bhanpur, Rasalkhedhi and Bairagarh.

Findings

The alkalinity of the ground water was found on higher side at 06 locations whereas pH was found well within the prescribed limit except at one location i.e. Kotra Sultanabad. The tube well where the higher pH was dug near a domestic drain. The chloride the concentration at the M.P. Agro Industries where the organic manure is made from the MSW and Raslakhedi have exceeded the desirable limit of drinking water. The higher chloride content in the water leads to undesirable taste.

Presence of high concentration of chloride in these locations may be attributed to the *Patra Nalla* and the dumping of municipal solid waste in this area.

The presence of Nitrate and Ammoniacal-nitrogen of the ground water. In the city most of the domestic drains/sewage line are not properly lined/maintained which may be contributing to the sewage pollution in the ground water.

Excess fluoride in the water many cause the molting of teeth, gastroenteritis and damage of lever. During the study, at 80% locations the fluoride concentration were found on higher side. There is no well defined pollution source for fluoride was observed in these areas. It may be due to the natural geological formations. At Raslakhedi and Bhanpur the concentration of Nitrates was observed in higher side. The agriculture activities around the source might have contributed to the higher concentration of nitrate in the ground water.

Total hardness (includes Calcium and Magnesium ions) combine with ions of fatty acid in soap to form soapsuds. Presence of more hardness in water, the more soap will be required to form leather. The high value of hardness has a laxative effect.

Table 1: Sampling locations of ground water monitoring in Bhopal city

S. No.	Area	Sampling site	Depth of Boring	Distance from river/drain in meter	Major activity
1.	Bhanpu	M.P. Agro industries	155	10	Solid waste dumping water
2.	Raslakhedi	Village	60	250	Agriculture
3.	Arif Nagar	Near Boundary wall of Uninon Carbide	70	20	Residential area
4.	Arera Colony	E-1 area	80	-	Residential area
5.	Kotra Sultanabad	Near temple	120	25	Residential area
6.	T.T. Nagar	Near hanuman temple	110	-	Mix type
7.	Prof. Colony	Sagar appt.	90	-	Residential area
8.	Bairagrah	CRP	130	30	Residential area
9.	Ah. Palace	Near flag house	180	-	Residential area
10.	Barkehdi	Near school	50	10	Residential area

Most of the places ground water use for drinking purpose.

Table 2: Analysis of ground water quality in Bhopal City

S. No.	Location	pH	Conductivity	T-Hardness	Alkalinity	Chloride	Fluoride	Nitrate	Amm-N	Sulphate	Sodium	Potassium
1	Bhanpur	7.12	1321	978	360	306	0.97	42	0.62	372	79	6.2
2.	Raslakhedi	7.01	1150	928	304	286	1.24	38	0.59	336	66	5.7
3.	Arif Nagar	6.91	560	392	270	110	1.14	10	0.31	95	30	4.4
4.	Arera colony	8.42	210	160	120	30	1.09	5.2	0.07	29	9.7	4.0
5.	Kotra Sultanabad	9.41	1020	640	320	166	0.89	22	0.21	115	27	6.1
6.	T.T. Nagar	7.72	590	208	168	88	0.91	09	0.07	31	21	4.0
7.	Prof. Colony	7.32	330	144	120	44	0.76	07	0.03	12	11	4.0
8.	Bairagrah	7.40	1080	504	412	126	0.81	15	0.50	120	52	5.8
9.	Ahemdabad Palace	7.86	350	152	148	24	1.02	11	0.19	15	10	4.0
10.	Barkhedi	7.22	620	176	232	60	0.76	13	0.40	34	23	4.4

All the values in mg/l except pH and Conductivity

CONCLUSION

Perusal of the data and observation reveal that the ground water in Bhopal city is having high

concentration of Hardness, Sodium, Chloride, Sulphates and Nitrate. The use of groundwater source located nearby the drains should be stopped or the water should be allowed for use after proper treatment.

REFERENCES

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