



## **ASSESSMENT OF GROUNDWATER QUALITY AT SAMBHAL, MORADABAD**

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### **ABSTRACT**

Underground water samples at eight different sites at Sambhal, Moradabad were collected and analysed for different physico-chemical water quality parameters following standards methodology of sampling and estimation to assess underground water quality. The estimated values were compared with drinking water quality standards prescribed by W.H.O. Ground water was found to be polluted with reference to most of the parameters studied, while it was moderately polluted with reference to other parameters. The present study suggests that people dependent on source of study area are prone to health hazards of polluted water and water quality management is urgently needed.

**Key words:** Water pollution, Physico-chemical parameter, Chemical contamination

### **INTRODUCTION**

Water is absolutely essential for healthy living. It plays an indispensable role in the life of every species that survive in this world and is required by all living organisms for their existence. Improper management and reckless use of water system are causing serious threats to the availability and quality of water<sup>1-3</sup>. The present study is aimed to assess the groundwater quality of IM2 hand pumps as well as bore wells at Sambhal, Moradabad.

Moradabad is a 'B' class city of western Uttar Pradesh having urban population more than 41 lacs. Moradabad is situated at the bank of Ram Ganga river and its altitude from the sea level is about 670 feet. It is extended from Himalaya in north to Chambal river in south. It is at 28°20', 29°15'N and 78°4', 79°E. Sambhal is the head quarter of tehsil Sambhal of district Moradabad. It is 38 km from district Moradabad, 52 km from Gajraula and about 90 km from J.P. Nagar. The total area of Sambhal tehsil is 45 km<sup>2</sup> with total population of more than 3 lacs. It is famous for mental production and seeng work. Silver foil making is also prominent.

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## EXPERIMENTAL

Underground water samples of five India mark-II (IM2) hand pump and three bore wells at Sambhal, Moradabad were collected and analysed quantitatively following standard methodology of sampling and estimation<sup>4-6</sup>. Three samples of each site were collected, estimated and the arithmetic mean of three values is reported. A blank was also run for all volumetric titrations. All the chemicals of Anal AR grade were used.

**Table 1. Details of sampling locations**

No. and name of site	Location of site	Type of source	Usage of water	Apparent water quality
<b>I</b> , Pakka Baag Pvt. Bus Stand	500 m. West to Tehsil head quarter	India Mark II	Drinking	Colourless, odourless
<b>II</b> , Govt. Hospital	500 m. East to Tehsil head quarter	India Mark II	Drinking	Colour of water turns yellow on standing
<b>III</b> , Nakhasa by pass	500 m. South to Tehsil head quarter	India Mark II	Drinking	Colourless, odourless
<b>IV</b> , Bus stand	Adjacent to site No. II	India Mark II	Drinking	Colourless, odourless
<b>V</b> , Choudhary Sarai	800 m. South-East to Tehsil head quarter	India Mark II	Drinking	Colourless, odourless
<b>VI</b> , Pakka Baag	400 m. South to Tehsil head quarter	Bore Well	Irrigation and drinking	Colourless, good in taste
<b>VII</b> , Ladam Sarai, Bhajoi Road	1 km. South-East to Tehsil head quarter	Bore Well	Irrigation and drinking	Colourless, odourless
<b>VIII</b> , Taj Milk Factory	800 m. North-East to Tehsil head quarter	Bore Well	Irrigation and drinking	Colourless, good in taste

The specification of used instruments are Century CP 901 pH meter, RI Conductivity meter and Hach 2010 (version 6.4) spectrophotometer. The estimated water quality physico-chemical parameters are pH, conductivity, dissolved solids, alkalinity, dissolved oxygen, biological oxygen demand, chemical oxygen demand, hardness, calcium, magnesium, fluoride, chloride, iron and silica as SiO<sub>2</sub>. A brief description of

sampling site is given in Table 1.

## **RESULTS AND DISCUSSION**

Site-wise estimated values of different physico-chemical parameters with their prescribed W.H.O.<sup>7</sup> standards are listed in Table 2. A critical analysis of the data revealed following facts regarding ground water quality at Sambhal., Moradabad.

Groundwater is found to be alkaline with higher values of pH and very high values of alkalinity. The observed range of conductivity is 0.339-1.950  $\mu\text{S}/\text{cm}$  and it is much higher than the desirable limit. The estimated range of total hardness is 168-700 mg/lit and the water of all the sites of study is very hard and unfit for usage. The concentration of calcium at all the sites is higher than that of magnesium and therefore, it may be suggested that hardness of water is mainly due to salts of calcium. The groundwater is enriched with calcium and magnesium as essential micro-nutrient. The amount of dissolve solids in water of bore wells is within desirable limit, however, it is much higher in water of hand pumps at all the sites except at site No. I.

The amount of dissolved oxygen in groundwater is irrelevant for the assessment of water quality, however, water samples are found to be deficient of dissolved oxygen. The observed range of biological oxygen demand and chemical oxygen demand are 10-65 mg/lit and 7-100 mg/lit, respectively. These values suggested high concentration of organic matter and presence of high amount of oxidizable inorganic chemical pollutants in groundwater of study area.

The concentration of chloride in water samples at all the sites is within desirable limit except at site No. II where it is 350 mg/lit. The observed range of fluoride is 0.07-0.36 mg/lit. Hence, the water is deficient of fluoride. The high as well as low concentration of fluoride is injurious to public health. Low concentration of silica as  $\text{SiO}_2$  in water is desirable, which is not observed at all the sites. The estimated range of iron in water is 0.02-0.80 mg/lit and the water is uncontaminated at all the sites except at site No. I and II, where it is moderately polluted with reference to this parameter.

**Table 2 : Site-wise estimated values of different physico-chemical parameters of underground water samples at Sambhal, Moradabad**

Parameter	Site No. I	Site No. II	Site No. III	Site No. IV	Site No. V	Site No. VI	Site No. VII	Site No. VIII	W.H.O. Std.
pH	7.33	7.02	7.11	7.17	7.22	7.38	7.46	7.40	7-8.5
Conductivity ( $\mu$ S/cm)	0.57	1.95	1.63	1.08	1.19	0.36	0.34	0.56	0.30
Dissolved solids (mg/L)	374.00	1287.00	1075.00	711.00	788.00	234.00	223.00	370.00	500.00
Alkalinity (mg/L)	312.00	472.00	384.00	380.00	384.00	212.00	208.00	280.00	100.00
Dissolved oxygen (mg/L)	0.90	1.80	1.60	1.20	1.00	0.60	0.60	0.80	5.00
Biological oxygen demand (mg/L)	10.00	65.00	35.00	19.00	20.00	35.00	30.00	40.00	6.00
Chemical oxygen demand (mg/L)	7.00	100.00	60.00	23.00	33.00	40.00	23.00	52.00	10.00
Hardness (mg/L)	264.00	700.00	700.00	408.00	480.00	192.00	168.00	256.00	100.00
Calcium (mg/L)	164.00	468.00	420.00	280.00	284.00	120.00	120.00	176.00	100.00
Magnesium (mg/L)	100.00	232.00	280.00	128.00	196.00	72.00	48.00	80.00	30.00
Fluoride (mg/L)	0.25	0.11	0.11	0.36	0.09	0.08	0.07	0.08	1.00
Chloride (mg/L)	39.04	350.00	164.00	119.20	56.80	17.10	12.10	47.40	200.00
Iron (mg/L)	0.67	0.80	0.35	0.42	0.46	0.02	0.08	0.03	0.50
Silica as SiO <sub>2</sub> (mg/L)	22.90	32.00	23.50	25.40	39.80	22.30	18.30	24.30	-

## CONCLUSION

On the basis of above discussion, it may be concluded that underground water at Sambhal, Moradabad is alkaline, very hard and highly polluted with reference to almost all the physical chemical parameters studied. Hardness of water is mainly due to salts of calcium and it is unfit for drinking and other domestic purposes. The water is enriched with calcium and magnesium as essential micro-nutrient. The presence of high concentration of organic matter and high amount of oxidizable inorganic chemical pollutants suggests the high level of pollution of groundwater. The groundwater is deficient of fluoride, which is quite alarming. The present study suggests that people exposed to water of sources of study area prone to health hazards of polluted water and quality management is needed in the study area.

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