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# Assessment of Ground Water Quality in the City of Bhiwandi, Thane, India

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## Abstract:

**Bhiwandi is a town famous for its power looms. Groundwater is one of an important source of water for the people in the city. The chemical parameters of groundwater play a significant role in classifying and assessing water quality. Groundwater samples were collected from 5 stations representing the whole city during summer of year 2012 and were analysed for different physico-chemical parameters i.e. pH, Electrical Conductivity (EC), Total Dissolved Solid (TDS), Total Hardness, Total Alkalinity, Turbidity, Phosphate, Sulphate and Nitrate. The results were compared with the limits set by WHO and BIS.**

**Keywords:** Groundwater, Bhiwandi, Water Quality WHO, BIS

## 1.0 Introduction:

The earth has substantial water resources, in various forms and only a small fraction is readily accessible in river flows, surface lakes and ground water for human consumption. This has put constraints on water resources and is raising questions about limits to water availability. Serious water challenges face humanity, including the failure to meet basic human needs for safe water and sanitation. (Gleck and Palaniappan, 2010).The domestic water consumption is dwarfed by the demands of agriculture and ecosystems (Hunter et al, 2010; Data 360 2010). Locally rural people depend on groundwater as a source for drinking water and also for other domestic chores.

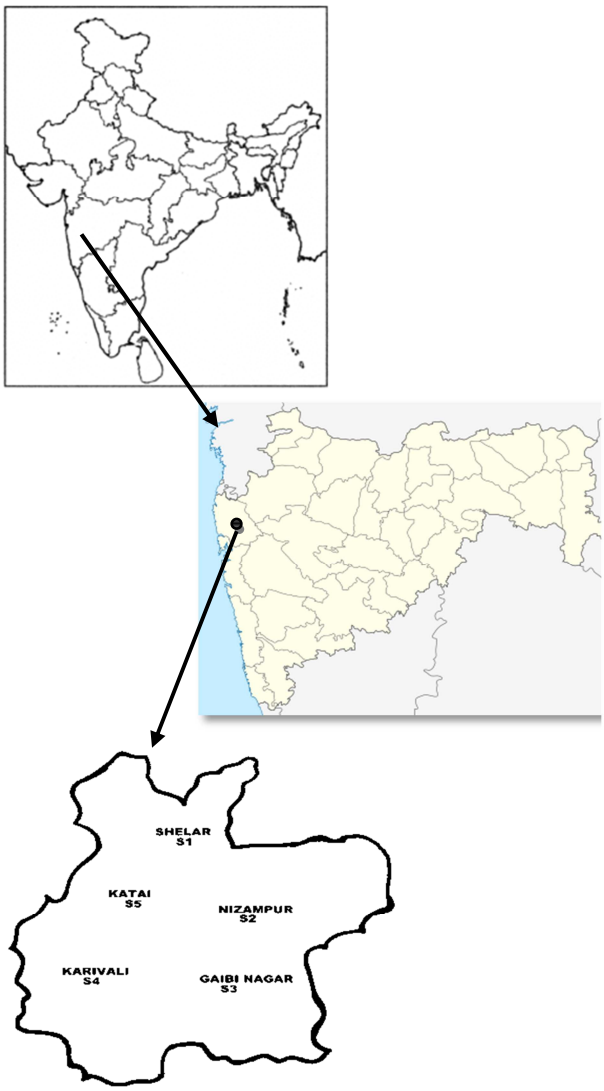
Groundwater is water located beneath the ground surface in the soil pore spaces and in the fractures of lithologic formation (Anonymous, 2009a) Groundwater is not as susceptible to pollution as surface water, but once polluted, restoration is difficult and long term (Henry and Heinke, 2005). Municipal waste, industrial wastes, chemical fertilizers, and landfill leachates have entered the soil, infiltrated to some aquifers, and degraded groundwater quality (Vasanthy et al, 2009; Ananymous, 2009b; Sirkar et al 1995).

The quality of groundwater may also vary with depth of water table and seasonal changes and is governed by the extent and composition of the dissolved salts depending upon the source of the salt and subsurface environment (Maruthi and Madhuri, 2011; Burston et al, 1993; Rajmohan 2003). In some coastal areas, intensive pumping of groundwater has caused salt water to intrude into freshwater aquifers. The physical and chemical parameters of groundwater play a significant role in classifying and assessing water quality. Hence a continuous periodical monitoring of groundwater bodies is necessary.

The city of Bhiwandi, known for its textile industry has the largest number of power looms in the India. These textile industries use various chemicals and dyes, but do not have a proper disposal system for the waste generated during the manufacturing process. The objective of the present work is to assess the quality and suitability of groundwater of Bhiwandi for consumption.

**Bhiwandi** is a city, in the district of Thane in the western state of Maharashtra, in India, located 20 km to the northeast of Mumbai and 15 km to the northeast of Thane city. The exact location of Bhiwandi is 19.296664°N 73.063121°E. The area

experiences a tropical climate. The summer months, the temperature is high (34.4ºC) while winter is mild (15ºC) the area receives an average rainfall of 3224 mm (June-September) with relative humidity of 62.5%.




Five monitoring Stations selected are as follows:

Station 1 (S1)-Shelar

Station 2 (S2)-Nizampur

Station 3 (S3)-Gaibi Nagar

Station 4 (S4)-Karivali

Station 5 (S5)-Katai

## 2.0 Materials and Methods:

The water samples extensively used for drinking purpose were collected from 5 different locations during summer 2012. High-grade Porcelain bottles were used to collect water samples. These bottles were sealed and capped till chemical analysis was done. The tests were carried out as per the standard methods (APHA 1995). 9 parameters, which are important for water quality, were selected for the analysis. The physico-chemical parameters included for analysis were pH, Electrical Conductivity (EC), Alkalinity, TDS, Total Hardness (TH), Phosphate ($PO_4^{3-}$), Sulphate ($SO_4^{2-}$), Nitrate ($NO_3^-$), Turbidity. The results were compared with BIS and WHO standard.

## 3.0 Result and Discussion:

The physico-chemical characteristics of groundwater are given along with the standard values in Table 1.

### *3.1 Colour, Odour and Taste:*

In the present study colour, taste and odour of the water samples were noted at the sampling site. All the drinking water samples were clear, colourless and odourless.

### *3.2 pH:*

The pH has no direct adverse effect on health, but alters the taste of water. The pH of ground water samples at all the sites varied from 7.11 to 8.6. According to WHO the permissible limit of pH for drinking water is 6.5-8.5 and according to BIS is 6.5-8.5. Hence, the pH values at all the stations are within the limit.

### *3.3 Electrical Conductivity (EC):*

Conductance of water is due to the presence of soluble salts and other ionic species, which act as conducting agents. It is used to measure the ability of water to carry electric current. (Abdul Jameel, 2002). Electrical conductivity of water samples ranged from 1.28 mmho/cm to 7.7mmho/cm. EC is high at site 3. The high value of conductivity may be due to ionized substances present (Aramini et al 2009)

### *3.4 Total Dissolved Solids (TDS):*

TDS indicates the general nature of water quality or salinity and is an important parameter for drinking water and other uses (Bruvold and

Pangborn 1966). The Total dissolved solids ranged from 322-1430mg/L. The presence of high values of Total Dissolved Solids in certain locations of the study area may be due to the influence of anthropogenic sources such as domestic sewage, solid waste dumping leachates of various pollutants into the groundwater (Chandra et al, 2000; Chatterjee and AlokKumar, 2008). Water having high TDS can be used after removing the excess by reverse osmosis and electrodialysis (Clarke et al 1977).

**Table 1:** Analytical data of the physico-chemical analyses of groundwater in the Study area

| Station | S1 | S2 | S3 | S4 | S5 | WHO | BIS |
|---|---|---|---|---|---|---|---|
| **pH** | 7.1 | 7.3 | 7.2 | 8.1 | 7.1 | 6.5-8.5 | 6.5-8.5 |
| **EC** | 3.85 | 1.28 | 7.70 | 2.56 | 3.85 | -- | -- |
| **TDS** | 1430 | 633 | 1200 | 322 | 1233 | 500-1500 | 500-1000 |
| **Turbidity** | 1 | 00 | 0.33 | 0.33 | 1 | 5 | 5 |
| **Hardness** | 454.2 | 149.6 | 966.2 | 133.7 | 422.2 | 500 | 300 |
| **Alkalinity** | 493.3 | 340 | 140 | 273.3 | 386.7 | -- | 200 |
| **Phosphate** | 0.10 | 0.30 | 0.10 | 0.25 | 0.35 | -- | -- |
| **Sulphate** | 98 | 22 | 84 | 50 | 86 | 400 | 200 |
| **Nitrate** | 0.153 | 0.17 | 0.41 | 0.70 | 0.59 | 10 | 45 |

The values are in mg/L except pH, EC (mmho/cm), Turbidity (NTU). WHO-World Health Organization standard, BIS- Bureau of Indian Standards.

***3.5 Turbidity:***

Turbidity is caused by particulate matter in suspension. According to BIS (1998), the desirable limit of turbidity of water is 5NTU and a maximum permissible limit is 10 NTU. The study showed that the turbidity value ranged from 0-1 NTU. Therefore, all the water sample were well within the desirable limit.

***3.6 Total Hardness:***

The total hardness of water samples ranged from 133-966 mg/L. The maximum allowable limit for drinking purpose is 600 mg/L and the most desirable limit is 300 mg/L as per BIS standards and WHO up to 500 mg/L. The total hardness is relatively high in some samples may be due to the presence of calcium and magnesium ions as bicarbonates, carbonates, chloride and sulphate ions. Hardness in water could also be from solution of carbon dioxide released from bacterial action in soil in percolating water (Sawyer and McCarty 1967). Groundwater in the area exceeding the limit may be due to the discharge of untreated effluents from the dyeing units and solid waste leachate.

***3.7 Alkalinity:***

Most of the natural waters contain substantial amounts of dissolved carbon dioxide, which is the principle source of alkalinity and this can be conveniently evaluated by acid titration. In the present study the alkalinity of water samples ranges from 140-493 mg/L. According to BIS the maximum desirable limit of alkalinity in drinking water is 200 mg/L and maximum permissible limit is 600mg/L. Hence, all the groundwater samples collected in the study area are well within the permissible limit.

***3.8 Sulphate ($SO_4^{2-}$):***

Sulphateis naturally occurring anion in all kinds of natural waters and does not affect the taste of water. Acute toxicity of sulphates in humans and animal data suggests that sulphate salts are not very toxic (Lorraine 2000). The maximum desirable limit of sulphate in drinking water is 200mg/L and maximum permissible limit is 400mg/L. In the present study, sulphates range from 18-98 mg/L. the values are within the standard limits given by BIS and WHO.

### *3.9 Nitrate ($NO_3^-$):*

Nitrate occurrence in groundwater is very common; it is mainly due to aerobic decomposition of nitrogen from organic matter like sewage, which leached out from the soil to the groundwater. Nitrate from other sources like fertilizers, industrial effluent and septic tanks also contributes to pollution. Groundwater can also be contaminated by sewage and other wastes rich in nitrates (Trivedy and Goel, 1986).The standard limit for nitrate is 45 mg/L (BIS) and 10 mg/L (WHO) in drinking water.

The concentration of nitrite content in all the samples is ranging from 0.15-0.7 mg/L. Hence, all the groundwater samples collected in the study area are well within the permissible limit.

### *3.10 Phosphate ($PO_4^{3-}$):*

Phosphate may occur in groundwater as a result of domestic sewage, detergents, agricultural effluents with fertilizers and industrial waste water. Its content in present investigation ranges from 0.1-0.35 mg/l. In the presence study area phosphate traced may be due to the use of detergents and discharge of domestic waste, untreated industrial water (Golterman 1975).

## 4.0 Conclusion:

The present study of the physico-chemical quality of water samples showed that most of the parameters were within the permissible limits of BIS and WHO. Nitrate hazard was insignificant. Analysis showed higher values of Hardness and Electrical Conductivity at site number 3. The high value of Hardness and Conductivity may be due to the release of untreated waste from the textile industries and the poor disposal system. Therefore, it is recommended that technologies like reverse osmosis, electrodialysis, filtering and boiling can be used for treatment of the water before consumption.

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## References:

1) Abdul Jameel A. (2002) Evaluation of Drinking Water Quality in Tiruchirapali. Indian J. Of Env. Health.44:108-112
2) Anonymous (2009a) Groundwater; http//en.Wikipedia.ORG/WIKI/GROUDWATER
3) Anonymous (2009b) Groundwater Foundation, sources of Groundwater contamination. http//www.groundwater.org/gi/sourceogcontain.html
4) APHA. (1995). Standard Methods for the Examination of Water and Wastewater, American Public Health Association
5) Aramini J.M., McLean M., WilsonJ., Holt J., Copes R., Allen B and Sears W 2009 (2009) Drinking Water Quality and Healthcare Utilization for Gastrointestinal Illness in greater Vancouver. Environmental and workplace Health reports and Publications
6) BIS (1998) Indian Standard Specification for Drinking Water IS10500, Bureau of Indian standards, New Delhi India.
7) Bruvold W.H and Pangborn R.M (1966) Rated acceptability of mineral taste in water. J.Appl.Psychol 50(1):22
8) Burston M.W, Nazaari M.M, Bishop K.P and Lerner D.N (1993) Pollution of Groundwater in the Covendry region (UK) by Chlorinated Hydrocarbon solvents. J.Hydro. 149:137-161
9) Chandra R., Bahadur Y., And Sharma B.K 2000 Monitoring of Water Quality of River Ramganga at Bareilly. In (Trivedy, R.K. ed) Pollution and Biomonitoring of Indian Rivers, ABD Pub. Jaipur 260-297.
10) Chatterjee C and Alokkumar De (2008) Impact of Anthropogenic Activities on Drinking Water Quality: A Case study in Raniganj Coalfield Area (W.B). Nature and Environment and Pollution Toxicology 7 (3): 451-459
11) Clark J.W., Viessman W and Hammer M.J (1977) Water supply and pollution control. 3rd edition, Harper & Row Publishers, New York
12) Data 360 (2010) Average water use per person per day. Available: http//www.data 360 org/.dsg.aspx?Data_Set_Group_Id=757.
13) Gleck P.H and Palaniappan M. (2010) Peak water limits to Fresh Water with drawl and use pnas 1004812107/PNAS/Vol.107(25):11155-11162
14) Golterman H.L (1976) Physiological Limnology p 489. Elsv. Sci. Publ. London

15) Henry G.J and Heinke G.W (2005) Environmental Science Engineering Second Edition. Prentice Hall of India Private Limited New Delhi.
16) Hunter PR, MacDonald AM, Carter RC (2010) Water Supply and Health. PluoS Med 7(11):e1000361,dol:101371/journal.pmed.100 0361
17) Lorraine Backe C. (2000) Assessing the acute gastrointestinal effects of ingesting naturally occurring, high levels of sulphates in drinking water. Clinical Laboratory Sciences 37(4):389-400
18) Maruthi Devi Ch and Madhuri T.W. (2011) Study on Groundwater Quality in Prakasam District and its Suitability for Drinking.Nature and Environment and Pollution Toxicology 10(3):481-483
19) Rajmohan N (2003) Major Correlation in Groundwater of Kanchepuram Region, South India Indian J. Env. Health, 45:1-5
20) Sirkar A.G. etal (1996) J IWWA ,oct-Dec,1996,215-220
21) Trivedy R.K and Goel P.K. (1986) Chemical and Biological Methods for Water Pollution Studies. Environmental Publications, karad, India
22) Vasanthy M, Geetha A, Jeganathan M and Anitha A (2009) A Study Of Drinking Water Quality in Ariyalur Area, Tamil Nadu, India 8 (2):253-256
23) World Health Organization. 2004. WHO Guidelines for Drinking Water Quality (3rd edition). Geneva, Switzerland.