

Assessment Of Ground Water Quality In Gajanan Colony, Ahmednagar. By Water Quality Index (WQI)

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ABSTRACT

A water quality analysis was carried out in Ahmednagar city. Different parameters were analyzed that are pH, alkalinity, turbidity, TDS, total hardness and chlorides. The sampling sites showed that the physicochemical parameters were within the water quality standards and the quality of water was found to be fit for drinking. Water is an essential natural resource for sustaining life and environment but over the last few decades the water quality is deteriorating due to its over exploitation. Water quality is essential parameter to be studied when the overall focus is sustainable development keeping mankind at focal point. Groundwater is the major source of drinking water in rural as well as in urban areas and over 94% of the drinking water demand is met by groundwater. Assessment ground water quality is necessary as it controls its usability for drinking purpose. The study was carried out by the physico-chemical and biological analysis of ground water quality.

Groundwater is used intensively for irrigation and industrial purposes. People around the world are using ground water as a source of drinking water and even today, more than half of the world's population depends on it for India. Different properties were analysed & compared during the course of the project.

Some of the properties analysed are as follows :

- Total Dissolved Solids
- Sodium-Potassium Content
- Determination of pH
- Determination of chloride
- Conductivity
- Turbidity
- Hardness
- Alkalinity

In developing countries like India, most of the population are untreated ground water for various purposes as they do not have access to good quality water.

INTRODUCTION

The project was based on testing the quality of water. Water is a prime need for human survival and industrial development.

1.1 Study Area:

The investigated area situated Gajanan Colony, Aanand Nagar, Navnagapur, Dist. Ahmednagar, Maharashtra. It is near about 80.00 Sq Km.

The investigated area situated Gajanan Colony, Aanand Nagar, Navnagapur, Dist. Ahmednagar, Maharashtra. It is near about 80.00 Sq Km. The whole area can be obtained in a single toposheet E43C12. It receives moderate rainfall 200mm to 300 mm rainfall with dry climatic condition. The area contains basaltic rock foundation. Ground water in the study area is totally saline occurrence under water table to semi-confined condition.

1.2 Materials and methods

Water samples are collected from different bore wells, wells, handpumps in investigated area. These samples were collected as per the standard methods for sampling. We use plastic bottles 1.0 litre capacity with stopper were used for collecting samples. Each bottle was washed with distilled water. Then we used marker pen for labeling on bottles. Then we used map for locating the bore wells at a distance of 50 meter. Then we collect water samples then conduct laboratory test on water samples. Samples analyzed for pH, turbidity, TDS, Hardness, chloride, alkalinity, conductivity, sodium and potassium. pH was measured by digital pH meter micro processor based model no; LPV 2550t.97,2002 make HACH USA. Electrical conductivity (EC) and total dissolved solids (TDS) were measured with digital EC-TDS analyzer model No: CM 183, make Elico, India. Turbidity was measured by using Nephelometer model No: 2100 Q-01 make: Hach USA.

1.2.1 Water quality index (WQI) Estimation

The water quality index (WQI) is regarded as one of the most effective ways to communicate water quality. The water quality index (WQI) is a mathematical instrument used to transform large quantities of water quality data into a single number which represents the water quality level [9]. The objective of the index is to turn complex water quality data into information that is understandable and useable by the public. In a number of national wide studies, water quality of different natural resources has been assessed on the basis of calculated water quality indices.

WQI of groundwater were calculated using the methods proposed by Horton [11] and modified by Tiwari and Mishra [12]. According to the role of various parameters on the basis of importance and incidence on the overall quality of groundwater, the rating scales were fixed in terms of ideal values of different physico-chemical parameters.

For calculating WQI, the following four equations were used:

$$1. \text{Quality rating, } Q_n = 100 \left[\frac{V_n - V_i}{V_s - V_i} \right]$$

Where

V_n : Actual amount of nth parameter

V_i : The ideal value of this parameter,

$V_i = 0$ Except for pH, $V_i = 7.0$ for pH

V_s : Recommended standard of corresponding parameter.

2. Assigned Unit Weight (W_n) for various parameters is inversely proportional to the recommended standard (S_n) for the corresponding parameter.

$$W_n = K / S_n$$

Where K: Constant

$$\sum W_n = 1$$

$$n = 14$$

3. Sub indices, $(SI)_n = (Q_n)W_n$

4. The overall WQI was calculated by taking geometric mean of these sub indices.

$$n = 14$$

$$WQI = \text{Anti log}_{10} \left[\sum_{n=1} W_n \log_{10} Q_n \right]$$

$$n = 1$$

On the basis of a number of water pollution studies following assumptions for suitability of water for human consumption are made on the basis of WQI values are rated as follows:

0-25 = Excellent,

26-50: Good,

51-75: Bad (Moderate Contaminated),

76-100: Very bad (Excessively

Contaminated)

and above 100 : Unfit (Severely Contaminated).

WQI is valuable and unique rating to depict the overall water quality status in single term that is helpful for determine the treatment for water.

1.3 .RESULTS AND DISCUSSION:

1.3.1 pH

pH is a measure of the hydrogen ion concentration in water and indicates the acidity and alkalinity of water. The standard values of pH for drinking water is between 6.5-9.0 while that of WHO standards is between 7.0- 8.5.High value of pH may results due to waste discharge, microbial decomposition of organic matter in the water body.



1.3.2 TOTAL DISSOLVED SOLIDS

The total dissolved solids (TDS) observed in the study area is found to be between 300-1610 mg/L. It is in the standard range of 500-2000 mg/L. Generally, the higher TDS causes gastro-intestinal irritation to the human beings, but the prolonged intake of water with the higher TDS can cause kidney stones and heart diseases. High TDS is usually due to the influence of anthropogenic sources such as domestic sewage, industrial waste, septic tanks, agricultural activities and influence of rockwater interaction.



1.3.3 CONDUCTIVITY

Conductivity is a measure of water's capability to pass electrical flow.This ability is directly related to the concentration of ions in the water.This conductive ions come from dissolved salts and inorganic materials such as alkalis,chlorides,sulfides and carbonate compounds.Conductivity is formally defined as the reciprocal of resistivity,which is worth elaborating on.Conductivity is usually measured in micro-or millisiemens per centimeter(uS/cm or mS/cm).



1.3.4 TURBIDITY

The turbidity in the present area of study was found to be Nil.Turbidity can be measured using either an electronic turbidity meter or turbidity tube. Turbidity is usually measured in nephelometric turbidity units (NTU)



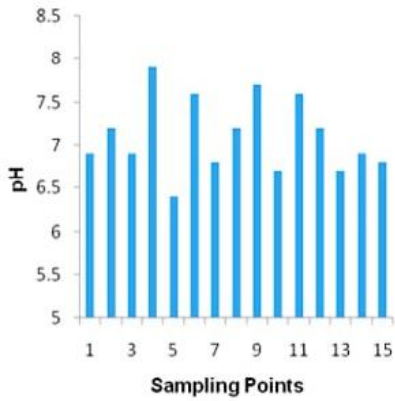


Fig 1: Variation of pH

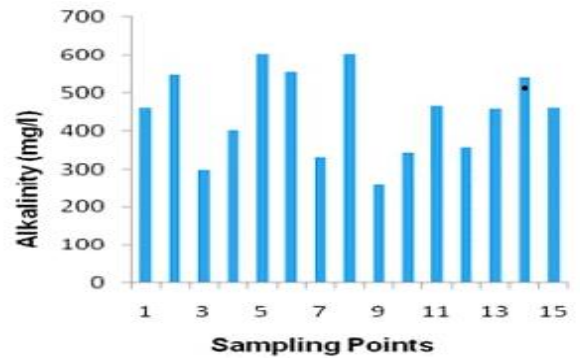


Fig 2: Variation of Alkalinity

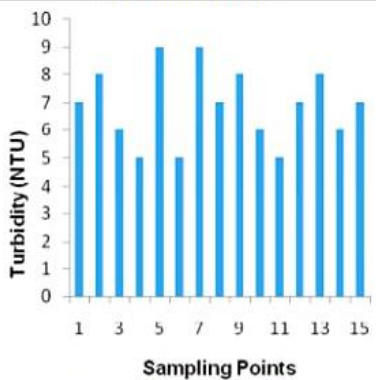


Fig 3: Variation of Turbidity

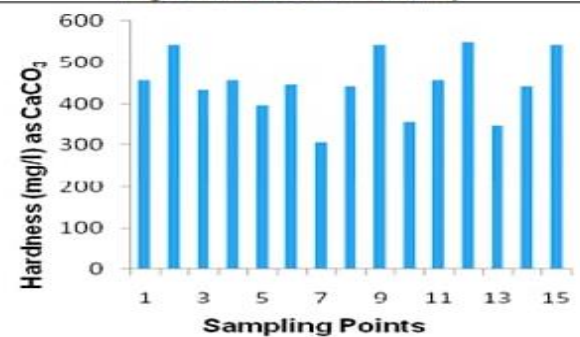


Fig 4: Variation of Hardness

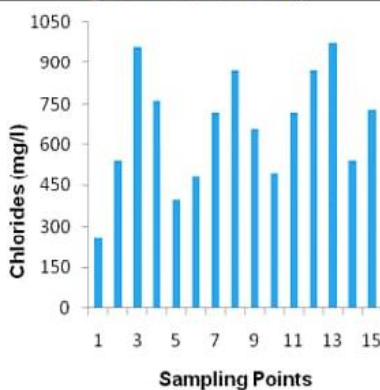


Fig 5: Variation of Chlorides

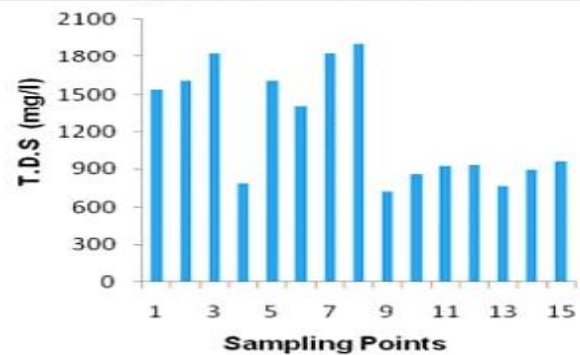


Fig 6: Variation of T.D.S

1.3.5 TOTAL ALKALINITY

Alkalinity value in water indicates the presence of natural salts in water. The alkalinity is mainly due to the bicarbonates. Alkalinity is a measure of the water's ability to neutralize acidity. An alkalinity test measures the level of bicarbonates, carbonates and hydroxides in water. Alkalinity is the capacity of water to resist the changes in pH that would make the water more acidic. In the present study the alkalinity values are under the reasonable limit of 30- 400 mg/L as per WHO standards in Ahmednagar city.

1.3.6 CHLORIDE

Chloride in ground water from both natural and anthropogenic sources, such as runoff containing road deicing salts, the use of the inorganic fertilizers, landfill leachates, septic tank effluents in coastal areas. Chloride content of the ground water samples obtained from the study area was found to be in the range of 251-680 mg/L. It was well within the standard range of 250-1000 mg/L. Determination of Chloride content in water should be performed by titration with silver nitrate (AgNO₃) as a titrant.

1.3.7 TOTAL HARDNESS

Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water. The total hardness is an important parameter of water quality assessment and conveys if the water can be used for domestic, industrial or agricultural purposes. The hardness is caused due to the presence of excess of Ca, Mg and Fe salts. The maximum total hardness value

LITERATURE REVIEW

2.1 OPENING REMARK:

Review of related literature helps the researcher to understand the topic better. The researcher can collect all the relevant information on the research topic. The review is always helpful in finding out what were their methods used, what were suggestions given for further research. The review of related literature certainly makes new researcher well equipped with previous background of the topic and area of research. It makes researcher more critical and provides sound foundation and deep insight into the problem.

A careful review of the research journal, books, thesis and other source of information on the problem to be investigated is one of the important steps in planning of any research study.

2.2 REVIEW OF PREVIOUS RESEARCHERS:

1) Assessment of groundwater quality in terms of water quality index. (June 2017) "SUMAN K. DHAKA & NARENDRA BHASKAR".

Ground water is being severely affected by industrial growth in study area.

2) Ground water quality assessment using water quality index (WQI) in Liaquatnagar Town, Karachi (22 June 2017) (ADHAN KHAN).

Groundwater quality of Liaquatnagar town is not suitable for drinking purpose.

3) Analysis of GAUHAR MOHD ground water quality using water quality index: A case study of greater Noida (Region), Uttar Pradesh, India. (20 Sep 2016) "MOHD SALEEM, ATHAR HUSSAIN & GAUHAR MAHMOOD."

4) Analysis of ground water quality of Aligarh city (india using water quality index) (KHWAJA M.ANWAR & VANITA AGRAWAL) (Sep 2014).

The present study of the underground water samples reveals that about 50% of the area under study comes under moderately polluted category and there is marked variation in ground water quality.

5) International journal of quality assessment of ground water at Agra district, India (Aug-2014)

The ground water quality analysis of Agra city is found to be fit for drinking purpose.

6) Assessment of ground water quality using water quality index (8April 2013)
“G.SHRINIVAS RAO AND G.NAGESHWAR RAO”

To know the ground water quality of selected areas in ‘GVMC’. We have identified 14 open wells and 32 borewells and 2 reservoir after analysis of various physico-chemical parameters, we observe that the range of water quality index (WQI) are observed at sampling 2,3.

7) Assessment of physical-chemical drinking water quality in Logone valley (SABRINA SORLINI) (May 2013).

This paper describes a survey carried out in Logone valley to assess the physical-chemical quality of different types of water sources used by village people for human consumption.

3) CONCLUSION:

The ground water quality analysis of Gajanan colony from Ahmednagar is found to be not fit for drinking purposes. The different values of the parameter under consideration were found to be 7-7.5 for pH, 200-400 mg/lit for alkalinity, 300mg/lit for hardness, 500-1200mg/lit for total dissolved solids.

4) ACKNOWLEDGEMENTS:

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5) REFERENCES:

- 1)GroundWaterQualityStudiesOfRasipuram TalukTamilnadu,India(27March2013)
- 2)AnalysisOfGroundwaterQualityUsingWaterQualityIndex,(U.P),INDIA(14July2016)
- 3)AnalysisOfDrinkingWaterOfDiferentPlacesAReview,India,(Jun2012)
- 4)AnalysisOfGroundWaterQualityOfAligarh City(India)UsingWaterQualityIndex(sep2014)
- 5)AssessmentOfGroundWaterQualityUsingWaterQualityIndex(8April2013)
- 6)AnalysisOfGroundWaterQualityUsingWaterQualityIndexInU.P,India(20SEP2016)