Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 5, Issue 02, February -2018

# Analysis of ground water quality of kalburagi district : using water quality index

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**Abstract :***The present study deals with the physico- chemical parameters of seasonal fluctuations of Ground water quality analysis in Gulbarga district ,Karnataka ,India*
*Research findings for fluoride asses in drinking water reveals that in the period of 2015 to 2016 most of all the samples were found to be exceeded the WHO 1995 drinking water standards it effects on the Human health*
*It is said that water was found on Earth approximately 3 billion years ago. Groundwater quality is an important issue to assure from its safe and stable use. However, describing quality conditions is generally difficult considering spatial variability of pollutants and a wide range of indicators (biological, physical and chemical substances) which can be measured. In this research, groundwater quality of Gulbarga District, Karnataka located in southern part of India. I have been selected around 35 study sites and analysed the quality of water. A groundwater threat is now posed by an ever increasing number of soluble chemicals from urban and industrial activities and from modern agricultural practices. Nevertheless, landslides, fires and other surface processes that increase or decrease infiltration or that expose rock and soil surfaces interacting with downward-moving surface water, may also affect the quality of shallow groundwater.*

***Keywords*:** *Groundwater. Fluoride, Seasonal fluctuation, Health issues,Rocks, pollution etc.*

## Introduction;

Water intended for human consumption must be free from organism and chemical constituents that may be hazardous to human health. With increased consumption of water, it plays important resources for all kinds of life in this planet. The quality of water depends on a large number of individual hydrological, physical, chemical and biochemical factors. Chemical parameters are the most important indices, which characterizes the quality of water.

Quality of ground water is equally important to its quantity owing to the suitability of water for varies purposes ,water quality analysis in an important issue in Ground water studies, variation of Ground water quality in an area is a function of Physical –chemical parameters that are Greatly influenced by Geological formation and Anthropogenic activities ( Belkhiri et al 2010)

The hydrochemical study reveals the quality of water that is suitable for drinking ,Agricultural and industrial purposes and helps in understanding the change in quality due to rock .water interaction or any type of anthropogenic influence ( Kelly 1940 ; Wilcox 1948)

Water was created three billion years ago (Beck, 1985). Earth is said to be a water planet and 70.8% of earth's surface is covered by water. Its reserve is definite and the same water is being used in time and recycled. The self purification capacity during recycling is a prominent phenomenon. Only one percent of earth's water passes the cyclic path and is referred as hydrological cycle (Gupta *et al.*, 2000). The water in the hydrosphere is distributed to an extent of about 97.5% in the oceans as salt water and remaining 2.7% is distributed over the continents as fresh water and as polar ice caps.

Groundwater is an important national asset and one of the earth's renewable resources which occurs as a part of hydrological cycle. It is primarily stored in aquifers, which are geological formations of permeable structured zones of rock sand or gravels (Mehta and Trivedi, 1990). The quality of groundwater depends on the quality of soil through which it percolates. Most of the bacteria, organic compounds and biocides are filtered out during percolation (Beck, 1985). The groundwater pollution is difficult to detect and it is more difficult to control and may persist for decades (Singh *et al.*, 2001).

The present work had the objective of understanding the fluoride and anthropogenic constituents of ground water related to its suitability for domestic use .

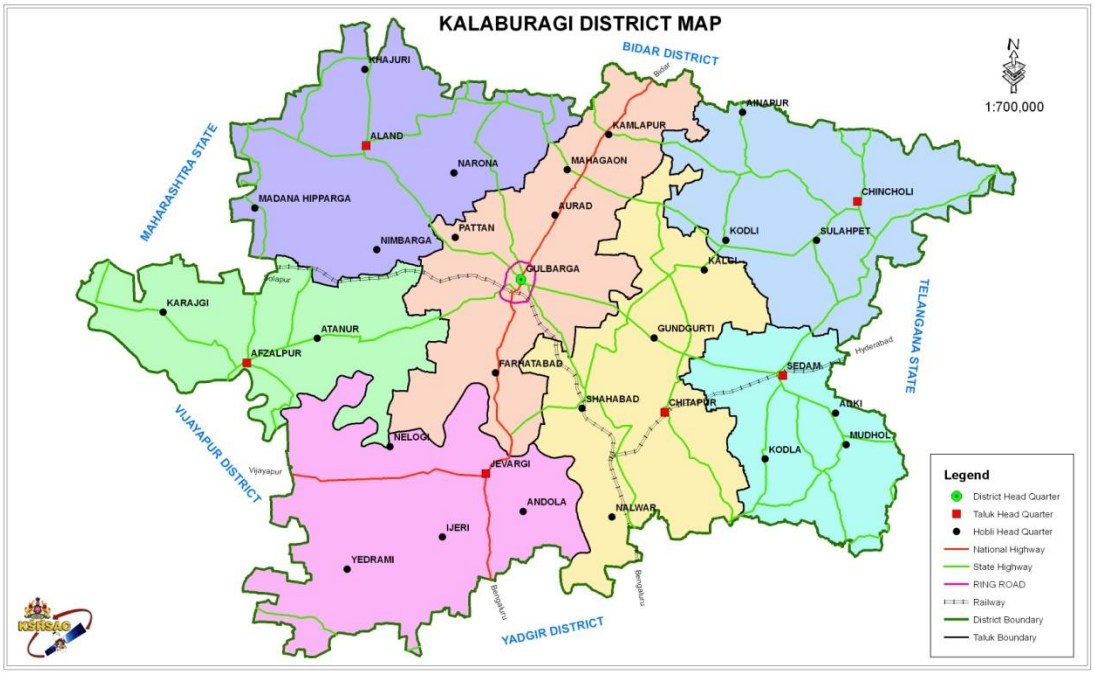
*PROBLEMS IN THE STUDY AREA:*

There are three main sources of Ground water pollution .these includes natural resources ,waste disposal activities ,industrial waste dumping ,spills ,leaks ,non point sources activities such as Agricultural management practices .

The ground water quality is in around Gulbarga District potable . all the people used in domestic purpose .The Agricultural communities utilized the ground water for farming in there lands ,but today the scenario is completely different ,in many part of Gulbarga district ground water usage is obsolete. Therefore water quality monitoring is necessary in Gulbarga district.

*STUDY AREA*

Gulbarga district lies in the northern part of Karnataka between 16°11' –17°45' N. latitudes and 76°03' - 77°30' E. longitudes, with a geographical area of 16,174 sq. km. Gulbarga is one of the chronically drought prone district in North Karnataka. The district is bounded by Bidar district in the north, Bijapur district in west, Raichur district in south and Andhra Pradesh in the east. Gulbarga is the district headquarters. The district comprises of 7 taluks namely, Aland, Afzalpur, Gulbarga, Chincholi, Chittapur, Sedam, Jewargi.




*MATERIALS AND METHODS :*

Ground water samples were collected in polythene bottles . Date, time of collection and source of water and locality of the area were recorded properly .from each of the sampling site, were collected for physic-chemical Analysis ,Temperature and PH determined were determined immediately at the sampling station . samples were taken to the laboratory as early as possible and kept for further analysis .usually 2=liters of samples were sufficient for analysis of physic-chemical parameters .Analysis caused for out for various water quality parameters ,using standard methods ( APHA –AMERICAN PUBLIC HEALTH ASSOCIATION .17$^{TH}$ Ed .1989)

As there are several sampling designs available, only one design has been chosen for the study area such that for a given sample size and for a given budgetary constraint will have a smaller sampling error. For the present investigation

probability sampling design was selected. Probability sampling design is also known as random sampling or chance sampling has an equal chance of inclusion of every item of an object in the sample. Random sampling (Bisht, 1978) ensures the law of statistical regularity, which states that the sample should represent the composition and characteristics of the whole region as the object under consideration. This may be the reason why random sampling is considered as the best technique of selecting a representative samples.

Water samples from the sampling localities were collected from the bore wells . Initially the water was allowed to run for 15 minutes in order to flush out stationary water. Further, the sample bottles were also flushed with water before the samples were collected. As water is dynamic in nature and during sampling it enter the new environment from its natural environment, its chemical composition may not remain same but may tend to adjust itself according to its new environment (Sawyer, 1978) and its content alters at very different rates particularly with organic materials. Therefore, as soon as the collection of water, temperature and pH were measured immediately. The other parameters of water such as dissolved oxygen, total dissolved solids, and electrical conductivity were analyzed in the spot. The remaining parameter were analyzed in the laboratory. Hence, the water was carried to the laboratory in suitable inhert bottles. The samples were analyzed using various analytical method of (APHA, 1995; BIS, 1998; NEERI, 1998.

**PH :--**

The PH value of the water source is a measures of the hydrogen ion concentration in water and indicates whether the water is acidic or alkalinity . most of the biological and chemical reactions are influenced by the pH of water system .in the present study all the ground water samples have pH values between 6.0-8.5 , while WHO is between 7.0-8.5.the sampling stations of in the month of march and may they have lower value of PH than the permissible limits , if the PH is beyond the permissible limits ,it damages the mucuos membrane of cells.

The pH values in the present investigation varied from a minimum of 7.0 (S7) to a maximum of 8.7 (S34) in premonsoon. During monsoon, it ranged between 7.12 (S18) to 8.7 (S32) and in post monsoon, it ranged between 7.5 (S6 and S31) to 8.8 in S32 (Table 9). The recommended - value of pH for drinking purposes is from 6.5 to 8.5 (BIS, 1998). The data obtained reveals that the pH in all the water samples analyzed are all well with in the permissible limits except in (S44 and S42, which showed the slight increase in the water pH than the permissible limits. Similar observations were made by Narayana and Suresh 1989, Gill *et al*., (1993), Mehta and Trivedi (1993), Mittal *et al*., (1994) in their studies

Colour (Col)

In natural water, colour may occur due to the presence of humic acids, fluvic acids, metallic ions, phytoplankton, weeds and industrial effluents. In some highly coloured industrial wastewater principally colloidal or suspended matter contributes the colour. The intensity of sewage colour is due to strength and condition of the sewage. Colour developed by dissolved solids, dissolved gases, decomposition of vegetarian organic matter, microorganisms, excess of iron and manganese etc. Colour less and above the tolerance limits causes repellant in the consumers (Abbasi, 1998).

In the present investigation, colour values varied from a minimum of 3-31 HSU in the all the study areas monsoon season and 2.1-119 HSU in post-monsoon season. The mean values 17 HSU The BIS acceptable limit for colour is 25 Hazen units. In the present study, BIS (1998) acceptable limits for drinking water (5.0 to 25.0 Hazen units)

Turbidity (Tur)

It is responsible for the light to be scattered or observed rather than straight transmission through the sample. It is the size, shape and refractive index of the suspended particulate matter rather than the total concentration of the matter present in the water samples. The size of the suspended matter varies and it ranges from colloidal to course dispersion, depending upon the degree of turbulence and also from pure inorganic substances to those that are highly organic in nature. It decreases the light penetration, limits the production of phytoplankton, which in consequence decreases the photosynthetic activity and depletion of oxygen content. It is the resistance of water to the passage of light. In natural water, it is caused by suspended matter like clay, silt organic matter, phytoplankton and other microscopic organisms and is the expression of tyndall effect. It

restricts the light penetration in water, resulting in reduced primary production. Under flood conditions and soil erosion, great amounts of topsoil are washed into receiving streams. Groundwater is less turbid since, sand is a good filtering media.

In the present study, the turbidity values ranged between 1.5 to 7.1 jan 2014 and may 2014 in the bellowed table. mean valued showed 3.74 NTU respectively . The BIS (1998) acceptable limit for turbidity is 25 NTU. In the present study,the mean values shown permissible limits with reference to the BIS standards .

Electrical conductivity (EC):-

Electrical conductivity is a measure of water's capacity to carry electric current. It is directly proportional to its dissolved mineral matter content. Several factors influence the conductivity, such as temperature, ionic mobility and ionic valences. It is the overall concentrations of ions present in the water which influences conductivity. In turn the conductivity becomes an indicator of dissolved ions present in any water sample. Pure water is a poor conductor of electricity and such substances are called electrolytes. Its value depends on concentration and degree of dissociation of the ions as well as migration velocity of the electric field.

In the present study, the values of electrical conductivity ranged between the minimum of 241 μmhos/cm (S31) and a maximum of 3650 μmhos/cm (S6) in premonsoon season (Table 10). Similarly, S31 has recorded the lowest electrical conductivity in monsoon (214 μmhos/cm) and also in postmonsoon (230 μmhos/cm) and maximum values recorded in S6 (3547 μmhos/cm and 3715 μmhos/cm respectively for monsoon and postmonsoon seasons) (Table 10). Owing to the fact that during post –monsoon season the dissolution of salts, minerals and other soil constituents increases due to increase in the ground water table (Shivashankaran, 1997, Basavarajappa 2002 and Gupta et al., 2009).

Total dissolved solids (TDS):-

TDS is commonly found in carbonates, bicarbonates, chlorides, sulphates and nitrates of calcium, magnesium sodium, potassium, iron and manganese mineral containing rocks. A high content of dissolved solids elevates the density of water, influencing osmoregulation of fresh water organisms, reduces solubility of gases (oxygen) and utility of water for drinking, irrigation and industrial purposes.

Many dissolved substances are undesirable in water. Dissolved minerals, gases and organic constituents may produce aesthetically displeasing colour, taste and odour. Some dissolved chemicals may be toxic. The dissolved solids increases with depth and with the time and water has traveled in the ground.

In the present study TDS values ranged from a minimum of 580mg/l to a maximum of 1754 mg/l inThe TDS values have exhibited an increasing trend in April and May month. Groundwater chemistry changes as the water flows through the subsurface and the increase in geological environment and dissolved solids and major ions. Chebotarev (1985), Ramababu and Somashekara Rao, (1986) and Joseph (2001) expressed the dissolution of soil particles are responsible for increase in TDS concentration in groundwater. Above the permissible limit (1500 ppm), TDS causes gastrointestinal irritation (Shankar and Muttukrishnan, 1994).

Chemical Parameters::::::::::

Dissolved oxygen (DO):-

The amount of oxygen dissolved in water is referred as DO. It is an important parameter represents the quality of water. It is an index of physical and biological processes occurred in water. DO values varies are varying a according to the physical and chemical activites The DO values of study area are above the permissible limits of WHO ( 6ppm) The ranges of DO have been found in between premonsoon season 5.1-5.35mg/l and 4.8-5.3 in the monsoon season .

In the present study, the values of DO varied from a minimum of 2.0 mg/L (S49) to a maximum of 7.5 mg/L (S8) in premonsoon season (Table 12) and in monsoon season the minimum of 1.8 mg/L (S26) and maximum of 7.0 mg/L (S9). In postmonsoon season the concentration of DO varied from a minimum of 1.8 mg/L (S26) to a maximum 6.8 mg/L (S8) (Table 12). The lowest values were not acceptable for drinking purpose and can be used for irrigation and other purposes in consideration with the dissolved oxygen alone.

Total hardness (TH):-

Hardness in natural water comes mainly from the leaching of igneous rock and carbonate rocks (dolomite, calcite and limestone). Water containing the soluble salts of calcium and magnesium such as chlorides, sulphates and bicarbonates is called hard water (Ramaswamy and Rajaguru, 1991). Generally hard water originates in the areas where thick topsoil and lime stone formations are present. Soft water originates in the areas where the topsoil is thin and limestone formats are absent. The hardness in water is derived largely from contact with the soil and rock formation. The ability to dissolve the ions is gained in the soil where $CO_2$ exists in equilibrium with carbonic acid. Under low pH condition, the basic materials particularly limestone formations are converted to soluble bicarbonates.

The hardness values shown ranges from 132.0mg/l to 228.0mg/l .the values for samples from all sampling stations were below the permissible limits.

In the present study total hardness values varied from a minimum of 145 mg/L (S49) to a maximum 1260 mg/L (S6) in premonsoon season and minimum of 112 mg/L (S31) to a maximum of 1330 mg/L (S6) in monsoon season. In postmonsoon season the values ranged between 141 mg/L (S49) to 1442 mg/L (S6) (Table 21). The Station 6 has been recorded the highest value of the total hardness among all the seasons.

Calcium ($Ca^{2+}$) :-

Calcium is found abundant in all natural waters and its source lies in the rocks from which it is leached. Its concentration varies in natural waters depending upon the nature of the river basin. Calcium is important micro-nutrient in an aquatic environment. Water receives the calcium leached from the rocks and deposits like limestone, dolomites, calcite, gypsum, amphiboles, feldspar, and industrial waste are also important sources of calcium (Mishra and Saxena, 1989)..

Present investigation, reports that calcium values ranged from minimum of 63 to a maximum of 156mg/l.the lowest was recorded in the month of jan .the mean values recorded as 101 mg/l The BIS (1998) acceptable limit for calcium 200 mg/l.

In the present study, reports that calcium values ranged from minimum of 50 mg/L (S30) to a maximum of 621 mg/L (S6) in premonsoon season, 38 mg/L (S30) to 737 mg/L(S6) in monsoon season and 30 mg/L (S20) to 568 mg/L (S32) in post monsoon season (Table below).

Magnesium ($Mg^{2+}$):-

Magnesium is a necessary constituent of chlorophyll without which no ecosystem could operate. The concentration above 500 mg/l of magnesium reduces the utility of water for domestic use and imparts water an unpleasant taste and renders it unfit for drinking purpose. High amount of magnesium has been proved to be health hazardous if present in excess quality in drinking water (Agarwal and Raj, 1978; Schroeder et al., 1960). High concentration of magnesium proves to be diuretic and laxative.

In the present study, the values of magnesium values ranged from 40 to 90mg/l The acceptable limit for magnesium is 100 mg/l and in the present study 8.33% of the water samples in all the sampling stations crossed the permissible range.

In the present investigation, magnesium values varied from a minimum of 5.8 mg/L (S39) to a maximum of 184 mg/L (S30) in premonsoon season and a minimum of 4.2 mg/L (S39) to a maximum of 180 mg/L (S30) in monsoon season. In postmonsoon season, the values of magnesium ranged between 5.7 mg/L (S46) to 185 mg/L (S30) (Table 23)

Chloride ($Cl^-$):-

Chlorides occur in natural water in varying concentrations. The chloride content increases as the mineral contents increases. It is commonly found in soils and rocks. The primary source of chloride is sedimentary rocks and saline water intrusion and the minor sources are igneous rocks. High concentration of chloride makes water unpalatable and unfit for drinking and other purposes.

The chloride concentration serve as an indicator by sewage. Chloride in water are subjected to laxative effects . in the present analysis , chloride concentration was found in the range of 112.0mg/l to 467.6mg/l , the study areas chloride level is above

and below the permissible limits of WHO (200ppm ) which indicates high concentration of chloride present in chittapur taluka shahabad s1 and Tengali S2and S6 Khajuri & Attur S7 remaing station indicates that below the permissible limits .

Fluoride (F-):-

Fluoride is widely dispersed in nature and is common constituent of most soils, rocks, plants and animals. Due to its high electronegativity, it forms only fluorides and no other oxidation state are found (Hem, 1992)..

Robinson et al. (1996) had reported the main source of fluoride in ordinary soil that contains clay minerals. Natural concentration of fluoride in groundwater depends on the availability of fluoride in rocks and minerals encountered by the water as it moves along the flow path. The distribution of fluoride in groundwater depends on number of factors, such as amount of soluble and insoluble fluorine in source rocks, rainfall, vegetation, redox potential, pH and ion exchange process. Fluorides are more common in groundwater than in surface water. The main sources of fluoride in water are various fluoride bearing rocks. Fluoride occurs in traces in many waters but higher concentration is observed in groundwater. The highest natural level of fluoride in groundwater was 2800 ppm (WHO, 1994). High concentrations of fluorides have been reported in India in the states of Tamil Nadu, Andhra Pradesh, Kerala, Karnataka, Gujarat, Rajastan, Punjab and Bihar (Pathak and Badre, 1999).

Fluoride ions have dual significance in water supplies. High concentration of fluoride causes dental fluorosis (disfigurement of the teeth). At the same time, concentration less than 0.6 ppm results in dental caries and dental mottling (Rao et al., 1994). Hence, it is essential to maintain fluoride concentration between 0.6- 1.2 ppm in dinking water (WHO, 1994).

In the present investigation, fluoride values varied from a minimum of 0.12 mg/l to a maximum of 1.68 mg/l .all the samples were shown above the permissible limits it cross the limits

*Table No A*: Average result of the physical –chemical parameters of different sites in Gulbarga District surrounding villages

| **Sample No.** | **AT** | **pH** | **EC** | **TDS** | **DO** | **Alk** | **$Mg^{++}$** | **$Cl^{-}$** | **$F^{-}$** | **TH** | **$Ca^{++}$** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $S_1$ | 30 | 7.78 | 897 | 479 | 4.4 | 46 | 46 | 61 | 1.84 | 304 | 113 |
| $S_2$ | 29 | 7.45 | 1380 | 737 | 4.7 | 50 | 55 | 205 | 1.54 | 456 | 228 |
| $S_3$ | 24.5 | 7.7 | 2030 | 1091 | 3.3 | 40 | 67 | 348 | 1.13 | 540 | 262 |
| $S_4$ | 23.5 | 7.93 | 1793 | 960 | 4.8 | 56 | 23 | 243 | 3.5 | 164 | 67 |
| $S_5$ | 25 | 7.65 | 953 | 508 | 3.5 | 38 | 28 | 88 | 1.68 | 270 | 151 |
| $S_6$ | 24 | 7.17 | 3625 | 1952 | 5.5 | 60 | 144 | 863 | 0.35 | 1330 | 737 |
| $S_7$ | 24 | 7.46 | 1921 | 1028 | 4.8 | 48 | 108 | 365 | 0.66 | 770 | 323 |
| $S_8$ | 22 | 7.67 | 1456 | 779 | 6.9 | 55 | 62 | 200 | 0.88 | 476 | 218 |
| $S_9$ | 20 | 7.23 | 2804 | 1505 | 7 | 50 | 119 | 572 | 0.87 | 964 | 474 |
| $S_{10}$ | 31.5 | 7.37 | 2320 | 1241 | 5.4 | 48 | 78 | 469 | 0.78 | 678 | 354 |
| $S_{11}$ | 28.5 | 7.65 | 650 | 347 | 3.9 | 33 | 30 | 54 | 1.23 | 240 | 113 |
| $S_{12}$ | 28 | 7.44 | 3294 | 1756 | 6.4 | 46 | 103 | 764 | 0.97 | 906 | 480 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $S_{13}$ | 32 | 7.49 | 1662 | 889 | 5.5 | 44 | 79 | 341 | 0.87 | 540 | 214 |
| $S_{14}$ | 30 | 7.67 | 1487 | 795 | 3.8 | 45 | 62 | 235 | 2.33 | 378 | 123 |
| $S_{15}$ | 27 | 7.58 | 2788 | 1488 | 5.3 | 63 | 96 | 673 | 1.14 | 650 | 256 |
| $S_{16}$ | 28 | 7.76 | 1453 | 776 | 4.5 | 45 | 74 | 246 | 1.47 | 516 | 212 |
| $S_{17}$ | 29 | 7.36 | 1955 | 1044 | 5.2 | 52 | 85 | 327 | 1.36 | 566 | 214 |
| $S_{18}$ | 26 | 8.12 | 807 | 429 | 3.7 | 42 | 26 | 37 | 1.69 | 228 | 119 |
| $S_{19}$ | 26 | 8.15 | 690 | 368 | 3.2 | 35 | 23 | 44 | 1.43 | 238 | 140 |
| $S_{20}$ | 27.5 | 7.8 | 1108 | 591 | 3.8 | 46 | 40 | 153 | 0.55 | 390 | 222 |
| $S_{21}$ | 31 | 7.6 | 2749 | 1460 | 6.5 | 52 | 76 | 601 | 1.48 | 642 | 329 |
| $S_{22}$ | 33.5 | 7.9 | 1693 | 902 | 5.7 | 41 | 86 | 317 | 1.15 | 612 | 258 |
| $S_{23}$ | 32 | 7.9 | 1828 | 441 | 4.5 | 45 | 31 | 75 | 0.8 | 336 | 208 |
| $S_{24}$ | 30.5 | 7.93 | 1551 | 830 | 6 | 48 | 72 | 225 | 0.094 | 614 | 305 |
| $S_{25}$ | 29 | 7.8 | 1525 | 812 | 5.2 | 58 | 76 | 207 | 1.42 | 418 | 102 |
| $S_{26}$ | 27 | 7.7 | 1880 | 1003 | 5.2 | 47 | 50 | 341 | 2.51 | 384 | 178 |
| $S_{27}$ | 23 | 7.97 | 1368 | 725 | 4.7 | 39 | 24 | 215 | 4.53 | 208 | 109 |
| $S_{28}$ | 23 | 8.1 | 930 | 496 | 3.2 | 50 | 32 | 77 | 0.67 | 298 | 163 |
| $S_{29}$ | 26 | 7.8 | 1071 | 568 | 4.1 | 48 | 35 | 103 | 2.16 | 256 | 109 |
| $S_{30}$ | 24 | 7.5 | 2529 | 1349 | 6.5 | 33 | 167 | 663 | 0.86 | 1086 | 401 |
| $S_{31}$ | 22 | 7.8 | 266 | 133 | 2.8 | 34 | 10 | 21 | 0.29 | 112 | 69 |
| $S_{32}$ | 22 | 7.6 | 2114 | 1127 | 6.1 | 44 | 56 | 48 | 0.2 | 886 | 535 |
| $S_{33}$ | 21 | 8.1 | 997 | 526 | 3.4 | 48 | 19 | 73 | 4.14 | 130 | 50 |
| $S_{34}$ | 30.5 | 7.7 | 1489 | 795 | 4.6 | 51 | 60 | 225 | 1.79 | 464 | 214 |
| $S_{35}$ | 28 | 7.4 | 1824 | 973 | 5.1 | | 69 | 325 | 0.71 | 542 | 258 |

***Table B: Average value of the some study sites Pre Monsoon for the year:2014-15***

| parameters | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Temp | | | | | | | | | | |
| PH | 7.12 | 6.78 | 7.38 | 7.7 | 6.72 | 6.78 | 7.2 | 6.78 | 8 | 7.5 |
| EC | 1880 | 2107 | 1278 | 956 | 1980 | 1910 | 2250 | 1265 | 980 | 1910 |
| TDS | 1410 | 1520 | 692 | 580 | 1528 | 1610 | 672 | 675 | 612 | 1520 |
| Turbidity | 1.8 | 6.4 | 3.2 | 3.4 | 5.6 | 6.4 | 3.6 | 1.5 | 5.3 | 3.6 |
| DO | 14.5 | 9,37 | 14.4 | 13.24 | 7.65 | 7 | 14.05 | 8.2 | 9.42 | 7.23 |
| TH | 362 | 408 | 292 | 280 | 393 | 410 | 318 | 309 | 370 | 400 |
| Calcium | 48 | 40 | 18 | 6.8 | 102.4 | 112 | 110 | 118 | 130 | 128 |
| Magnesium | 23.4 | 36.1 | 27.7 | 76 | 83 | 55.6 | 81 | 20 | 27.328 | 41.13 |
| Chloride | 96.5 | 234 | 213 | 112.2 | 156.8 | 114.7 | 467.6 | 250 | 298 | 420 |
| Flouride | 2 | 1.5 | 2.2 | 1.7 | 1.8 | 1.2 | 2 | 2.1 | 2.2 | 1.9 |
| Alkalinity | 300 | 250 | 350 | 240 | 340 | 360 | 530 | 400 | 370 | 520 |

**ATMOSPHERIC TEMPERATURE**

Gulbarga district lies in the northern plains of Karnataka and has semi – arid type of climate. Dry climate prevails for most part of the year. December is the coldest month with mean daily maximum and minimum temperatures being the mean value of premansoon season has 28.5$^{o}$C & monsoon 24$^{o}$ C in the month post mansoon is 26.5 $^{o}$C respectively.

**Result and discussion;**

Recently, due to climatic changes and demographic pressure, there is an increasing demand for water resources. India is one of those very few countries in the world, which are facing an extremely severe water scarcity problem. The available information indicates that groundwater resources have been severely over exploited and in most cases it has exceeded safe yield level.

Physico-chemical parameters

Water analysis was carried out, by taking 12 parameters, which are very essential to know the water qualities for drinking purpose. The parameters are differentiated as physical and chemical. The physical parameters includes colour, turbidity, pH, electrical conductivity, total dissolved solids, while chemical parameters includes dissolved oxygen, total hardness, calcium, magnesium, Fluoride ,Akalinity. chloride. The standard values of various physico and chemical parameters for drinking water as per BIS and WHO are presented.

**CONCLUSION :**

- In this study area ,an attempt has been made to identify the pathway and contamination of major ions ,nutrients in the groundwater of some of talukas of Gulbarga Districts and Sarrounding area .The prominent sources of Polluntants and natural agencies that are responsible for contamination in the study area are Domestic/ Muncipal sewage and over exploitation of Ground water to meet the demand for fresh water are the prominent causes for

decreasing quality of Ground water . Hence ,the following reccomendation need to minimize or reduce the further deterioration of Ground water quality in the present investigation.

- The study revealed that the Gulbarga District and Sarrounding talukas .Comprising lack of adequate sanitary and drainage facilities .Therefore ,an attention of concerned authorities must be made to take appropriate steps in providing the necessary facilities to supply safe drinking water to the people of this area.

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