

# Groundwater Quality Assessment for drinking around the Lake of Kurukkupatty

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**Abstract**— Due to humans, industrial activities and Development of Urbanization the sewage and various contaminant disposals are more in near the water bodies (River, Lake, Ponds, etc.). This contaminated surface water can influence to affect groundwater characteristics this is the serious problem nowadays. So, the analysis of water characteristics and checking its quality are very important to preserve eco system from pollution. The assessment of the groundwater quality was carried out to the KURUKKUPATTY Lake habitation in SALEM district (Tamilnadu). The present work is aimed to assessing the water quality for drinking purpose Near to the KURUKKUPATTY Lake habitation in SALEM district. The ground water samples of all the selected stations (6 main sample stations and 4 control sample stations) from near to the Lake bank were collected for a physiochemical analysis. To find out the present water quality status, following are the 13 parameters have been considered Viz. pH, Temperature, Colour, Taste And Odour, Turbidity, Electric Conductivity, Total Dissolved Solids, Dissolved Oxygen, Alkalinity, Calcium, Magnesium, Total Hardness, Chloride. The obtained results are compared with Indian Standard Drinking Water specification IS: 10500-2012. The study of physiochemical characteristics of this groundwater sample suggests that the evaluation of water quality parameters as well as water quality management practices should be carried out periodically to protect the available water resources. The excess amount of contamination will be reduced by providing the suitable remedial measures and treatment; it depends on the available water quality and purpose of using this water by people.

**Key words:** Kurukkupatty Lake, Contaminated Surface Water, Groundwater Quality Assessment

## I. INTRODUCTION



Fig. 1.1: Project Area

The KURUKKUPATTY Lake is located in Kurukkupatty panchayat near Tharamangalam town at Salem district (Tamilnadu). The survey No. 17 and 82/1 area of 16.92 and 13.695 hectares around total of 30.615 hectares (75.651 acres) and depth of this lake is approximately 10 to 12 meters. The Quantity of this lake is approximately  $3.367 \times 10^6 \text{ m}^3$ . In my

Project Area of KURUKKUPATTY Lake Rainwater is the main source for Surface and groundwater table improvement. Here, some of the places sewage water and contaminated pollutants were dumping into the lake body. So, some surface water samples were collected and tested its physical characteristics. That sampling result shows the surface water was more contaminated and it's also affect the groundwater source of this area. For the conformation if it's polluted or not some groundwater samples was collected from the bore wells at near to Lake habitation and tested physical and chemical parameters in the Laboratory.

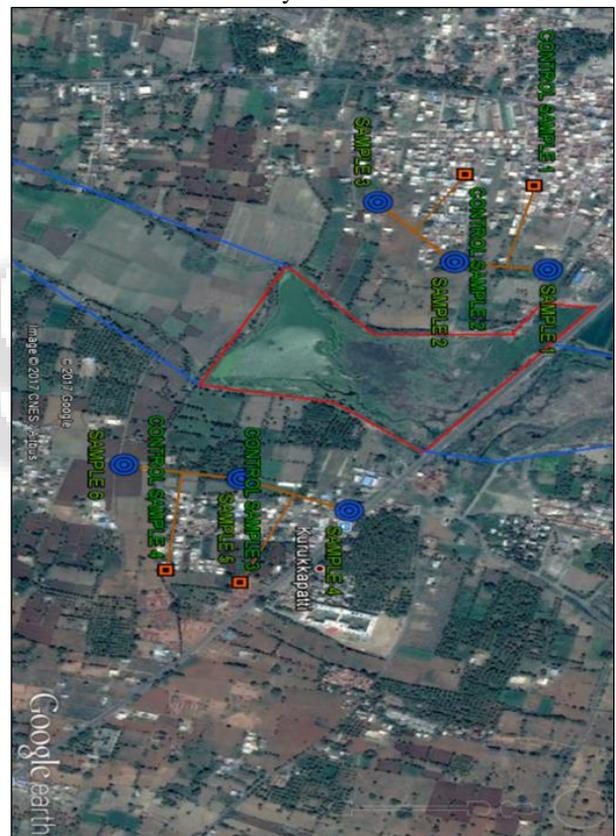


Fig. 1.2: Base Map

The Main samples 1, 2, 3, 4, 5 and 6 are collected 150m away from the Lake bank and CS1 (Control Sample 1,2,3,4.) was collected in between first two main sample, CS2 was collected in between the main sample 2 and 3 Similarly CS3 and CS4 was collected in between the main samples of 4, 5, and 6. These Control samples were approximately collect 150 to 200m away from the main samples. Then collected samples were tested in laboratory and the obtained results were compared with Indian Standard Drinking Water specification IS: 10500-2012. The study of physiochemical characteristics of this groundwater sample suggests that the evaluation of Groundwater quality should be needed periodically, for protect the water resources.

II. MATERIALS AND METHODOLOGY

A. Need for the Present Study



Fig. 2.1: various waste dump at Lake



Fig. 2.3: Sewage discharges into Lake.

In Northern part of Tamilnadu (Salem) the main water source is Rainfall, these sources of water gets only in the Rainfall season, Otherwise the water demand can be fulfilled by Open wells, lakes, Groundwater (bore or tube well), Overhead tanks, and etc. Above from this list source the groundwater is the most usage by people in their everyday activity. Some of the places people can use groundwater for drinking purpose. So, the ground water quality is very much important for to avoiding unnecessary diseases come through by this groundwater. If the quality of groundwater is good we can use this water for fulfil the demand for that people who depend to use groundwater for their drinking purpose. In my project area of the Kurukkupatty lake habitation at both sides of the Lake Bank some of the places sewage water are discharging into the Lake, also some micro industrial wastage, house hold wastes, plastic wastes, pharmacy wastes, street shop wastes, daily shop wastes and etc., dump in near to the Lake and it's are influencing to pollute the surface water of this lake and we know this surface water is the main source for to increase groundwater table. When rainwater flow on this lake the surface water gets polluted by these wastes and its flow through into soil or percolated into soil and reach groundwater; then groundwater also gets pollute. So the ground water quality assessment is very important for preserve water quality and it's should monitored periodically for reducing the pollution of groundwater source.

B. Surface Water Pollution and Result of Testing Parameters

Surface water pollution is an acute problem in all the Towns, Urban and industrial areas. Dirty water is the biggest risk and

continuous to threaten both quality of life and public health. Water is known to contain large number of chemical, organic and mineral properties and its play a significant role in composition, distribution and abundance of aquatic organisms. In this case three surface water samples were collected and tested in laboratory. After completing the Physical parameter tests, the result shows the sewage discharge and dumping of various wastes near to that Lake Body could make contaminated the surface water of this lake already. And it results shows most of the parameters not in adequate standard limit recommended by IS 10500:2012.

C. Discussion of Surface water Quality Parameters

The surface water sample physical characteristics test could be compared with Bureau of IS 10500:2012.

Parameters	Permissible Limit	Average Obtained Limit
p <sup>H</sup>	6.5 – 8.5	7.8
Temperature	20° C	25.34° C
Colour	Unobjectionable	Objectionable
Taste And Odour	Unobjectionable	Objectionable
Turbidity	5-10 NTU	33.40
Total Dissolved Solids	500 – 2000 mg/l	2798.3mg/l
Electric Conductivity	1000mS/cm <sup>2</sup>	1165.2

Table 2.1: Test results compared with IS standards

This test result shows the surface water quality could be more caused by the surrounding environmental contaminates and it leads to affect groundwater source. So, completions of this groundwater quality assessment check it needs to require some physiochemical analysis for this groundwater samples.

D. Groundwater Pollution and Result of Testing Parameters (Minerals)

We know water can contain number of chemical properties and its play a significant role in composition, distribution and abundance of aquatic organisms. In our case samples were collected and tested in laboratory for to know these chemical properties. After completing tests for three month December, January and February, we realised most of the places in our project area were contaminated by the surrounding environment and waste dumping. The chemical parameters we took for analysis are high in some places and these values are not available in the INDIAN STANDARD Recommendation limits.

The test result are shown below here most of the parameters not in required standard limit recommended by IS 10500:2012.

CRITERIA	RECOMMENDATION STANDARDS	HEALTH AFFECTIO N
p <sup>H</sup>	6.5-8.5	Aesthetic
TEMPERATUR E	5 -35 ° C	Health
COLOUR	5Hz – 25Hz	Visible tint
TASTE AND ODOUR	Unobjectionable	Rotten egg

TURBIDITY	5 – 10 NTU	Health
ELECTRIC CONDUCTIVITY Y mS / cm	1000	Taste
TOTAL DISSOLVED SOLIDS mg/l	500 – 2000	Taste
DISSOLVED OXYGEN mg/l	5-6	Health
ALKALINITY mg/l	200	Aesthetic
CALCIUM mg/l	75	Health
MAGNESIUM mg/l	0.1	Health
TOTAL HARDNESS mg/l	300	Health
CHLORIDE mg/l	200	Health

Table 2.2: Health Affection Criteria by WHO.

E. Discussion of Parameters

By the above test result following graphs was plotted for the chemical parameters took for water quality assessment and it was compared with the desirable and permissible limits recommended by Bureau of IS 10500:2012.

The values of all parameter’s minerals range were not same at all the stations in all these three duration; it’s slightly varied from month to month (December, January and February). Here, some of the parameter is very high; some of them have in required standard limit and some parameter are very low; they are discussed below.

1) pH:

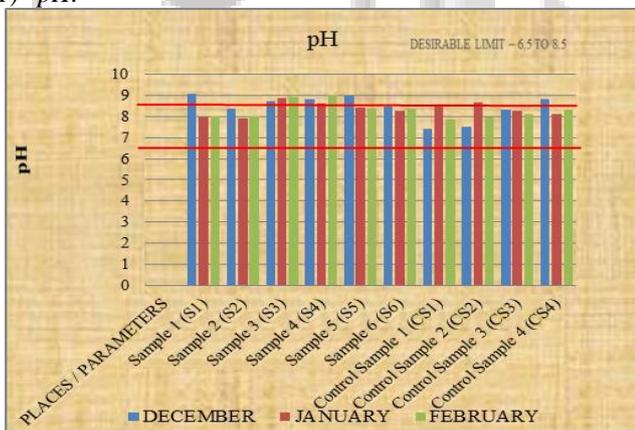


Fig. 2.4: Monthly variation of pH

From the graph most of sampling stations pH value are under the STANDARD limit (6.5 TO 8.5) and in some places (Sample 1, Sample 3, Sample 4, Sample 5, Control Sample 2 and Control Sample 4) the pH values contain alkaline (>8.5) in all three duration, particularly pH is high in First duration and considering pH as a secondary in drinking water standard recommends a pH between 6.5 and 8.5 for drinking water, the excess pH indicates the alkaline content, In our case there is no acidic level pH value in all the sampling stations. If it is below 4 it cannot be useful for drinking purpose.

According to the World Health Organization, health effects are most pronounced in pH extremes. Drinking water

with an elevated pH above 11 can affect skin, eye and mucous membrane irritation. On the opposite end of the scale, pH values below 4 also cause irritation due to the corrosive effects. WHO wants that extreme pH levels can worsen existing skin Conditions.

2) Temperature:

Temperature range of all these area has in the required standard limits (5° C - 35° C) recommended by bureau of Indian standards 10500:2012. If it is not available in the required standard limit, People who do use this water for their drinking purpose they will realize some health problems.

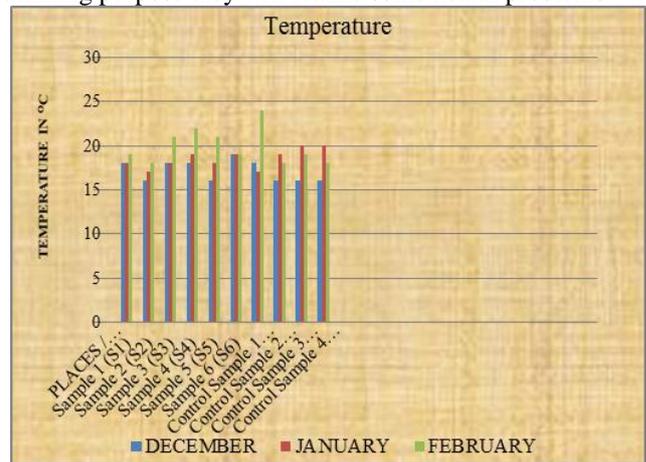


Fig. 2.5: Monthly variation of Temperature

3) Colour:

Colour of water is primarily a concern of water quality for aesthetic reason. Coloured water gives the appearance of being unfit to drink, even though the water may be perfectly safe for public use. On the other hand, colour can indicate the presence of organic substances, such as algae or humid compounds. More recently, colour has been used as a quantitative assessment of the presence of potentially hazardous or toxic organic materials in water.

In this project area of all the groundwater samples Colour is unobjectionable (Colourless). But, because of this contaminated surroundings and eco system of this area its need to analyse about biological characteristics of the water samples of this sampling stations are required.

- The desirable limit of turbidity is – 5
- The Permissible limit of turbidity is – 25
- The Unit measurement are in Hazen Unit(Hz)

4) Taste and Odour:

Taste and odour are human perceptions of water quality. Human perception of taste includes sour (hydrochloric acid), salty (sodium chloride), sweet (sucrose) and bitter (caffeine). Relatively simple compounds produce sour and salty tastes. However, detect many more tips of odour than tastes. Organic materials discharged directly to eater, such as falling leaves, runoff, etc., sources of tastes and odour-producing compounds released during biodegradation.

In this project area of all the groundwater samples the Taste and Odour are Unobjectionable for drinking purpose. But, because of this contaminated surroundings and eco system this water samples its need to analyse about biological characteristics of the water samples of all these sampling stations are required.

5) *Turbidity:*

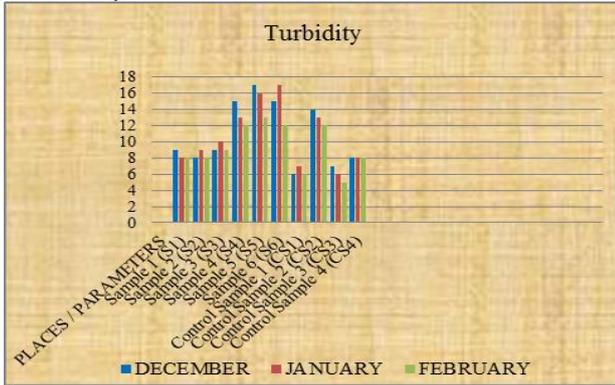


Fig. 2.6: Monthly variation of Turbidity

Turbidity is important for health and aesthetic reasons. Also, peoples can prepare to use water for drinking without turbid; if water seems turbid, peoples can't use that water for drinking purpose. So, the physical characteristics of turbidity should be check, and it can help to identify the quality easily. And this is especially problematic for immune compromised people, because contaminants like viruses or bacteria can become attached to the suspended solids. The suspended solids interfere with water disinfection with chlorine because the particles act as shield for the virus and bacteria. Similarly, suspended solids can protect bacteria from ultraviolet sterilization.

6) *Electric Conductivity:*

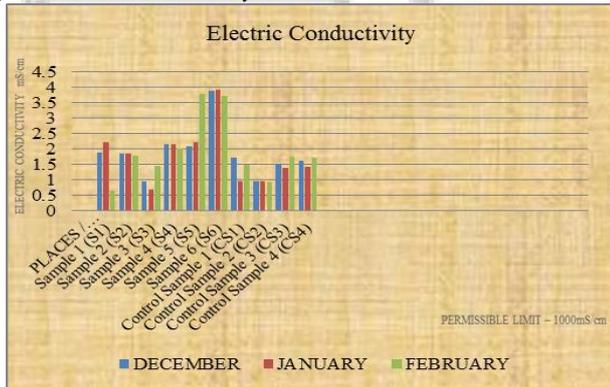


Fig. 2.7: Monthly variation of Electric conductivity

The electric conductivity range in drinking water should not be more than 1500mS/cm. In our case electric conductivity is very low compare to standard requirement by IS Recommendation and its very low at all the sampling station points.

7) *Total Dissolved Solids:*

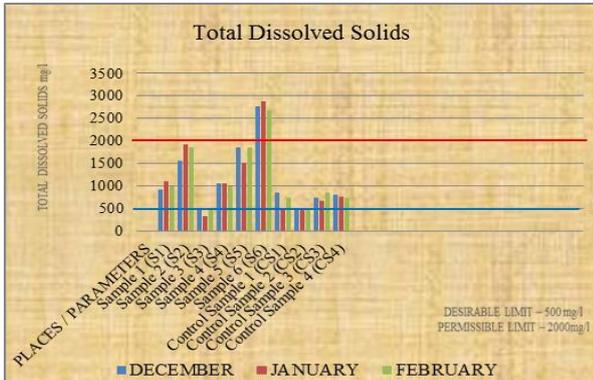


Fig. 2.8: Monthly variation of Total dissolved solids

From the graph, particularly in Sample 6, the TDS value are very high while comparing with other sample stations and control sample stations and only two places are very low to compare with desirable limit and remaining has required standard limit. Here, TDS limits recommended by Indian standard desirable limit – 500 mg/l and permissible limit – 2000mg/l. Following are some of the diseases come through excess of TDS in drinking water, TDS concentration is high in drinking water will brings cancer, coronary heart disease, arteriosclerotic heart disease and cardiovascular disease to human body and the taste of water also very poor.

8) *Dissolved Oxygen:*

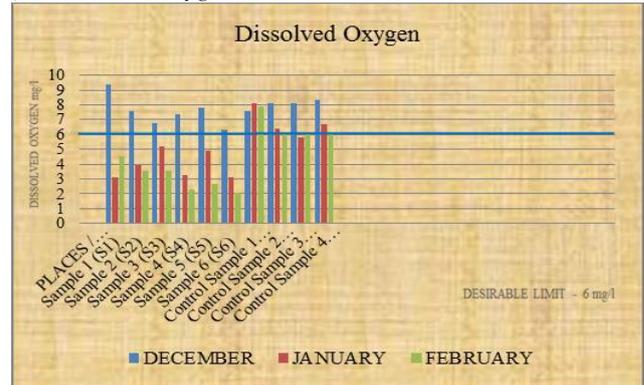


Fig. 2.9: Monthly variation of Dissolved oxygen

Dissolved oxygen is an important parameter in assessing water quality because of its influence on the living organisms in the water bodies. Required amount of dissolved oxygen in drinking water should be in 6mg/l. Dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality. If the dissolved oxygen is very low the taste of water and smell of water (odour) become worse. Total dissolved gas concentrations in water should not exceed 110%. Concentrations above this level can be harmful to aquatic life. Fish in water containing excessive dissolved gases may suffer from “gas bubble disease”. However, this is a very rare occurrence. Natural stream purification process requires adequate oxygen level in order to provide aerobic life forms. As dissolved oxygen levels in water drop below 5.0 mg/l, aquatic life will come under stress. In our case most of the places the dissolved oxygen is in more demand

9) *Alkalinity:*

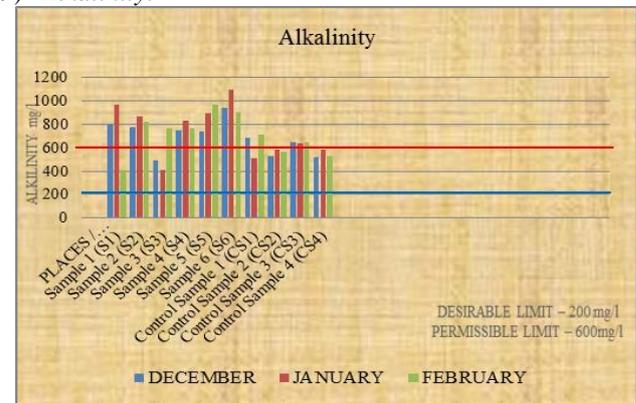


Fig. 2.10: Monthly variation of Alkalinity

According to the world health organisation, recommended limits of alkalinity in drinking water should be desirable limit – 200 mg/l and permissible limit – 600mg/l. If this limit exceeds, the following diseases will be expected. They are

skin and eye problems, headache, skin cancer, continuous vomiting etc. In our case, most of the sample station has high alkalinity. So, before using this water for domestic use it require some treatment. And the control stations of samplings alkalinity ranges may available in required standard limits.

10) **Total Hardness, Calcium and Magnesium:**

While comparing with all other parameters for drinking water quality assessment Hardness, calcium and magnesium are very high in our study area, these values are not under recommended limit of INDIAN STANDARD 10500:2012. So, before use it requires proper drinking water treatment remedial.

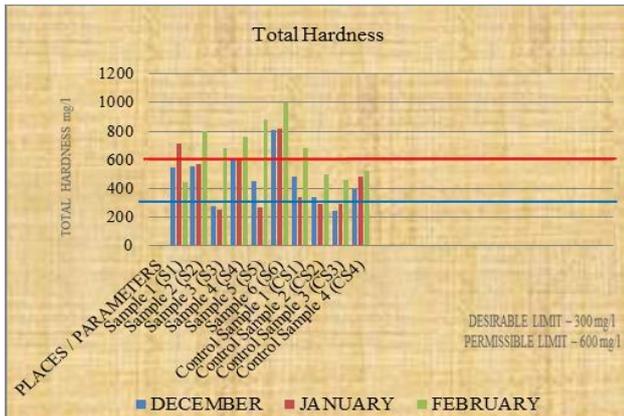


Fig. 2.11: Monthly variation of Total hardness

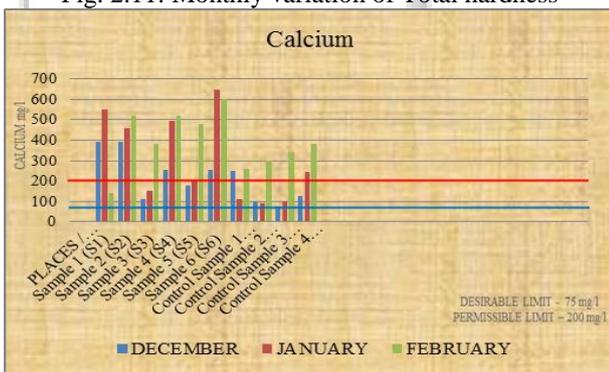


Fig. 2.12: Monthly variation of Calcium

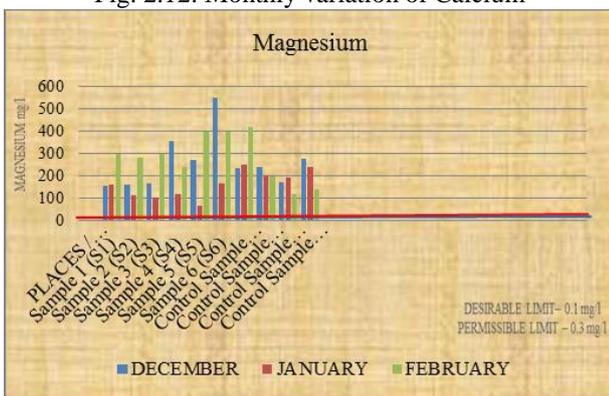


Fig. 2.13: Monthly variation of Magnesium

And excess value of these parameter leads to the following problems in human health, formation of kidney stone, liver cancer, lung cancer, chronic liver disease, skin diseases, fluoride attack in teeth, bone problems and cirrhosis etc.

11) **Chloride:**

The availability of chloride content in our study area is good at some places and it's in required standard limit. Some places

have chloride demand hence there the quality of groundwater is little low.

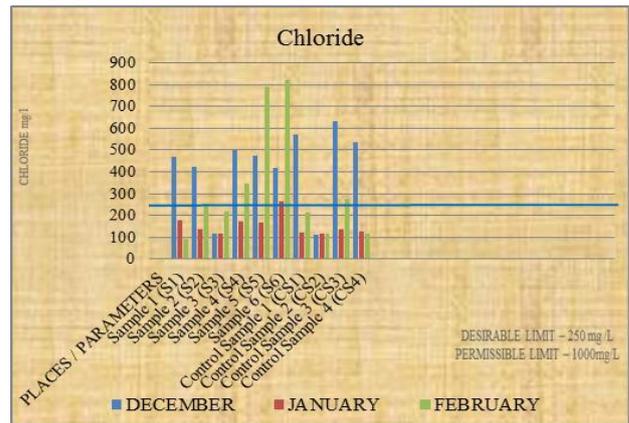


Fig. 2.14: Monthly variation of Chloride

Under IS specification desirable limit of chloride is 250mg/l and permissible limit is 1000mg/l, if the chloride is excess in water it will cause problems in kidney and cause brain damage etc.

III. RESULT AND DISCUSSION

The Physical and chemical parameters were analysed, the actual quality of water at KURUKKUPATTY LAKE banks are discussed. In order to the values of all the parameters are not same at all sample stations in all three duration, it's slightly varied from month to month (December, January and February). Here, some of the parameter values are very high, some of them available in required standard limit recommended by Indian Standard 10500:2012 and some parameter values are very low.

From the above chemical analysis were done in laboratory, groundwater quality range were found for different point stations in monthly durations (December, January and February) and that values of all the parameters are used to plot the graph to predict the chemical content present in groundwater in my project area and they are checked with the standard limits recommended by IS 10500:2012. And some of the parameters pH, TDS, alkalinity, total hardness, calcium and magnesium are high while comparing with Indian Standard limits. The Electric conductivity is available in the required Standard limit and some other parameter like Dissolved oxygen and Chloride are very low to compare with the Indian Standard recommendation. Because of the urban runoff, and leakage from landfills etc., Use of contaminated groundwater will causes hazards to public health by spreading diseases and the practice of groundwater remediation has been developed to address these issues.

To avoid the excess amount of chemical components will be reduced by providing the suitable remedial measures and treatment methods, the problems of contamination of groundwater are occur by the surrounding environment, waste dumping and urban sewage discharge into the Lake.

IV. CONCLUSION

The ground water quality assessment is very important for preserve water quality and it should be monitored periodically for reducing the pollution of groundwater and

concern to find out suitable remedies if it's polluted. Here, Groundwater quality assessment test done for the duration of three months (December, January and February). From this samples the physiochemical character of the water in these specified area are concluded. Then these result shows the groundwater partially contaminates by some excess mineral levels. If peoples can use this groundwater for drinking purpose in future they should consider some preliminary treatment for avoiding unwanted diseases and its very well safe for the environmental and peoples health condition.

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