

# Quality Analysis of Ground Water In Greater Guwahati

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**Abstract :** Guwahati, which is a geo-morphologically alive city, is in a state of disarray at present in the context of groundwater availability and demand. The elements of this project are to assess and report the quality of groundwater in greater Guwahati which include areas in the outskirts of the city. In the present investigation, the city has been divided into five zones viz. east, west, north south and central. The water quality characteristics have been assessed based on the collection of the water samples at different zones along with the civic survey. Since water quality plays an important part in the livelihood of the people, any degradation of the water quality may impact significantly.

**Keyword:** Groundwater, water quality, civic survey.

## 1. INTRODUCTION

Groundwater is the water located beneath the earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer where it can yield a usable quantity of water. The quantity and quality of water is vital to human health, aquatic life and well as to the socio-economic well being of the people. Hence careful assessment of physico chemical and trace elements quality of water has attracted considerable attraction of various research workers.

The ground water quality has been a major cause of concern in all the developing cities with Guwahati as no exception in this regard. The quality of ground water is seriously affected by the presence of harmful elements like Lead, Arsenic, Fluoride, Chloride etc. As such effort should be made to enhance drinking water quality as safe as practicable. With this concern to have quality drinking water a small attempt has been made to evaluate the status of quality of drinking water in Greater Guwahati.

## 2. STUDY AREA

The city Guwahati is situated on the Southern Bank of the mighty river Brahmaputra with a latitude of  $26^{\circ}10'45''N$  and longitude of  $91^{\circ}45'0''N$ . In the study the city is divided into four zones viz. North, East, South and West.

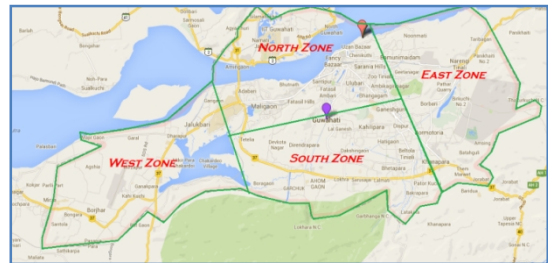


Figure 1. Map showing the zones of Guwahati

## 3. COLLECTION OF SAMPLES

The project relates to the ground water quality assessment of different regions of the Greater Guwahati. Therefore, samples were collected from tube wells and open wells at different zones of the. Three samples from each zone have been collected for testing. Samples were also collected from different household wells.

## 4. OBJECTIVE OF STUDY

The aim of the study is to determine the groundwater quality of the various regions of the city and to analyze and compare the quality of water. The study also includes organizing proper surveys to determine how the ground water quality affects the people as they use it for domestic purposes. So the main objectives of the study are

- a) To determine the water quality of greater Guwahati divided into zones
- b) The importance of groundwater for the people residing in the city
- c) To carry out water quality tests on the water samples taken from different parts
- d) To compare the ground water quality of the different regions
- e) To carry out surveys regarding the use of groundwater
- f) To determine the affect the people if the quality of ground water quality degrades
- g) To discuss the reasons for the degradation of ground water quality.

**5. METHODOLOGY**

To understand the groundwater quality of the study area, necessary tests were conducted on the samples that had been collected from the five zones. The water quality tests that had been carried out on the samples so as to determine whether the chemical compositions of the groundwater areas per standard is maintained are as follows:

- a) Calcium
- b) Chloride
- c) Hardness
- d) Alkalinity
- e) Acidity
- f) Iron
- g) Turbidity
- h) pH

Civic survey was also conducted on the areas of greater Guwahati. The main objective of the civic survey was to determine

- a) The usage of groundwater in day to day activities.
- b) The quality of ground water based on people’s opinion.
- c) Any difference in the quality of groundwater in comparison to earlier times.
- d) Is filtering necessary for drinking purposes.
- e) Is there a need to improve the water quality.

**6. RESULTS AND DISCUSSION**

Table 1:- Test results for all the zones								
NORTH ZONE								
Sam ple	Chori de	pH	Hard ness	Calci um	Turb idity	Iron	Alkali nity	Aci dit y
Site 1	355.88	6.56	286	59.31	4.8	0.43	196	112
Site 2	433.86	6.19	306	71.34	6.2	0.29	72	114
Site 3	299.95	6.85	272	74.54	5	1.02	218	158
EAST ZONE								
Site 1	97.96	5.8	126	36.87	8	0.38	22	70
Site 2	31.99	6.46	154	12.82	19.8	2.16	20	78
Site 3	42.99	7.09	114	33.66	1	0.53	68	132
WEST ZONE								
Site 1	397.87	6.25	258	68.93	3	0.23	178	90
Site 2	419.86	6.02	374	117.83	2	0.19	68	104
Site 3	265.91	6.79	378	140.28	3	0.33	392	214
SOUTH ZONE								
Site 1	7.99	6.24	40	8.81	4.2	3.59	146	100
Site 2	17.99	7.11	50	6.41	4	0.19	56	106
Site 3	11.99	5.92	60	23.24	3.5	1.06	106	92

**6.1. Interpretations of the test results**

Necessary interpretation of all the test that have been conducted for the zones viz. east, west, north and south have been shown in bar diagram as follows.

**a) Chloride Content**

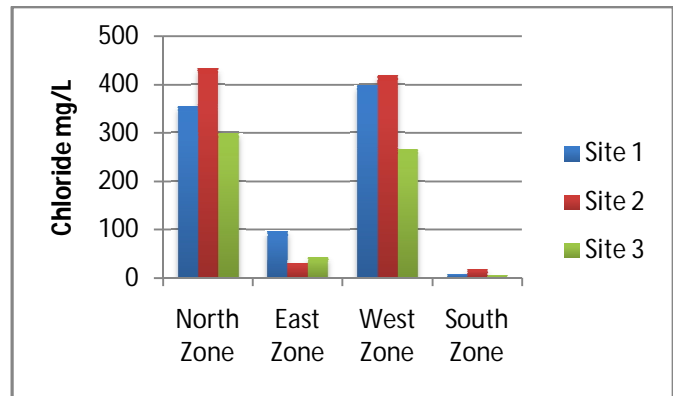


Figure 2. Bar diagram for chloride content in all the zones

The bar chart is laid out so as to compare the different levels of chlorides present in different zones of the city. As per Indian Standards the Chloride content of water should not be more than 250 mg/L. This has been specified in the IS 10500 Drinking Water – Specifications. In the study the chloride content of the east and the south zone have been found to be within the specified limit whereas in the north and west zone the chloride content have been found to be above 250mg/L with a maximum of 433.8mg/L in the north zone.

**b) pH**

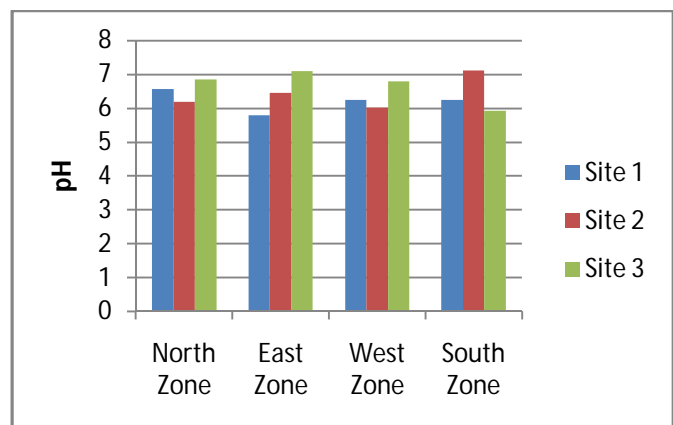


Figure 3: - Bar diagram for pH in all the zones

pH is a measure of the acidity or basicity of an aqueous solution. Generally the pH of surface waters ranges from pH 6.5 to 8.5. In the study the pH all the zones have been found within the range of 5.8 to 7.09.

#### c) Hardness

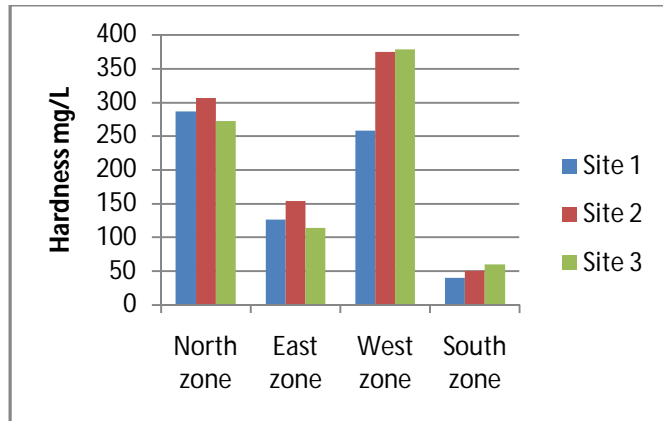


Figure 4: - Bar diagram for Hardness in all the zones

As per Indian Standards the hardness of water should not be more than 300 mg/L. This has been specified in the IS 10500:- Drinking Water – Specifications. In the study the hardness in the west zone has been found to cross the limit with a maximum of 378mg/L whereas in the north, east and south zones the hardness limit have been found to be within the limit.

#### d) Calcium Content

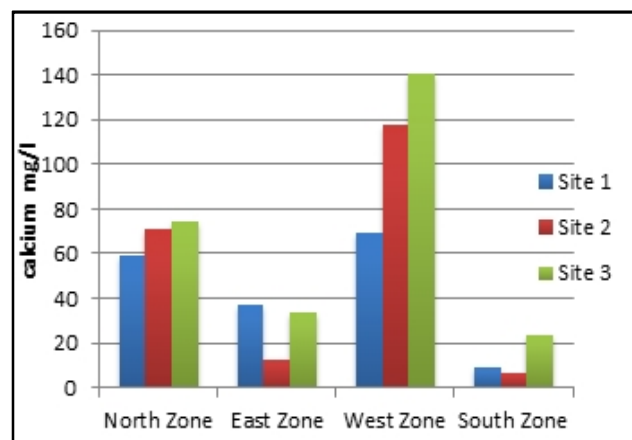


Figure 5: - Bar diagram for Calcium in all the zones

Calcium is naturally present in water. Calcium is a determinant of water hardness, because it can be found in water as  $\text{Ca}^{2+}$  ions. As per Indian Standards the calcium content of water should not be more than 75 mg/L. This has

been specified in the IS 10500:- Drinking Water – Specifications. In the study the calcium content in the west zone has been found to be very high with a maximum of 140.28mg/L whereas in the north, east and south zone the calcium content have been found to be within the limit as per Specification.

#### f) Turbidity

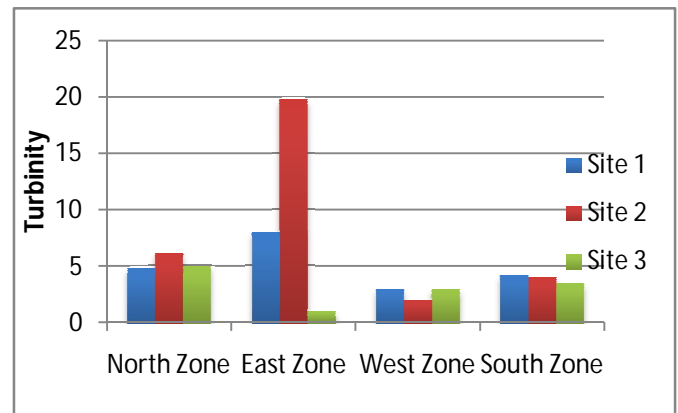


Figure 6: - Bar diagram for Turbidity in all the zones

Governments have set standards on the allowable turbidity in drinking water. In India, systems that use conventional or direct filtration methods turbidity cannot be higher than 10 Nephelometric turbidity units (NTU) at the plant outlet and all samples for turbidity must be less than or equal to 0.3 NTU for at least 95 percent of the samples in any month. Many drinking water utilities strive to achieve levels as low as 0.1 NTU. The study reveals that in the East zone the turbidity has crossed the limit with a maximum of 19.8 NTU.

#### g) Iron

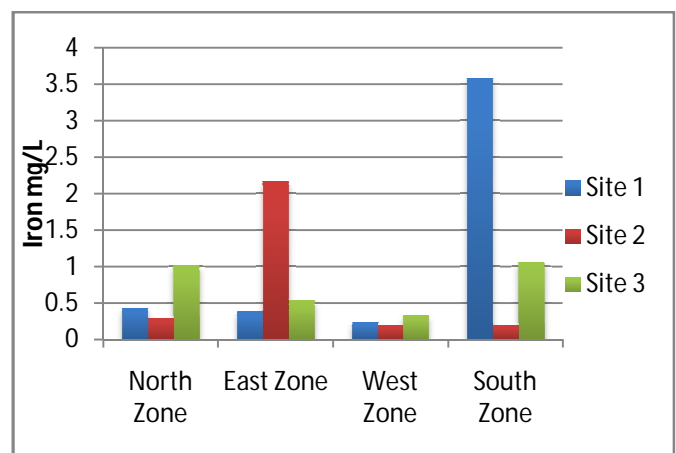


Figure 7: - Bar diagram for Iron content in all the zones

As per IS 10500-1991, desirable iron content is 0.3mg/L with a permissible limit of 1.0 mg/L. As per the test results, the iron content in the East and South zone has crossed the maximum tolerable limit.

#### h) Alkalinity

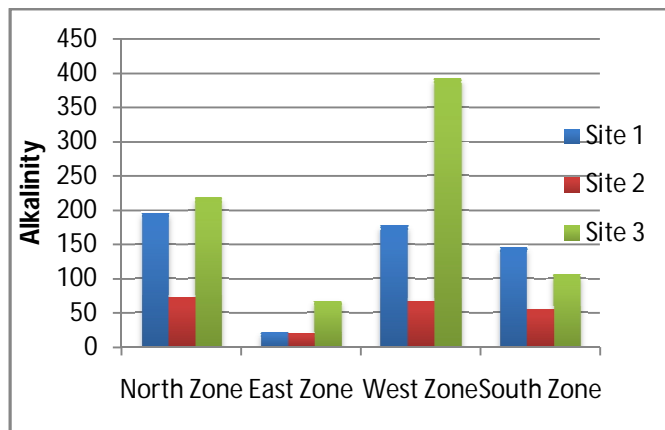


Figure 8: - Bar diagram for Alkalinity in all the zones

As per IS 10500-1991, the desirable alkalinity is 200 mg/l with a permissible of 600 mg/L. From the results obtained the alkalinity in all the four zones have been found to be within the safe limits.

#### i) Acidity

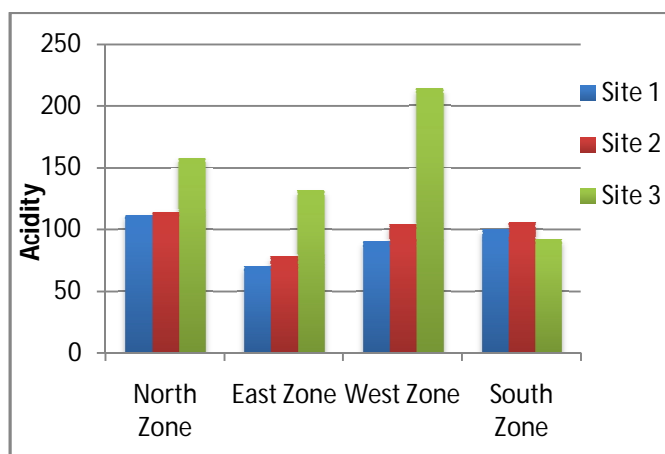


Figure 9: - Bar diagram for Acidity in all the zones

The acidity in all the zones viz. east, west, north and south zones have been found to be safe and within the permissible limit.

## 7. CONCLUSION

The impact of trace element in drinking water is generally cumulative and as such prolonged use of such water may be hazardous to human health. Therefore measurement of the necessary parameters should be analyzed periodically to maintain within the permissible limit.

Hence it is crucial that the water sources be properly protected from potential contaminants and necessary treatment should be done for future use of water in the region.

Conclusive Points from the various Results: -

- The pH of the underground water system of different parts of Greater Guwahati is in the safe zone of 6.5-8 Units. Ph values outside the range of 6.5 to 8.5 can lead to high dissolved concentrations of some metals for which there are drinking water standards and potential health effects.
- The Chloride level in the North Zone and West Zone is at the brink of the permissible limit. As a result in those zones chlorine levels should be scrutinized frequently. Chlorine by-products have adverse effects on human health and pose a greater risk of developing bladder and rectal cancers than people who drink unchlorinated water.
- The Iron Content in the areas of East Zone and South Zone are found to be a higher side. This may lead to minor health related problems.
- The Alkalinity and Acidity levels in all the parts of greater Guwahati are within the permissible limit.
- The Hardness level of water in the East zone and the South zone is found to be satisfactory. However Hardness levels in the north zone is in borderline and in the west zone it is beyond the permissible limit.
- The Calcium content of all parts except West Zone is satisfactory. The high calcium content in the West zone may increase the hardness of water.
- Turbidity Levels in the East zone is on a higher side. Thus the amount of suspended particles is more and a filtration process is mandatory.

## SCOPE FOR FUTURE STUDY

The above study is good enough to estimate the qualities of ground water. But the sample space and the tests are inadequate to come to a definite conclusion about the quality of the ground water of Guwahati city. The tests for some of the alarming element like Arsenic, Lead, Fluoride, Phosphorous etc. are missing from our study. As a result

there is a scope for more detailed and rigorous estimate of the quality of ground water in Greater Guwahati and to improve the standards of ground water.

## 8. REFERENCES

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