International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 04 | Apr 2019 www.irjet.net p-ISSN: 2395-0072

ASSESSMENT OF WATER QUALITY INDEX ALONG HIGH POTENTIAL POLLUTION ZONES OF MUTTAR RIVER, KALAMASSERY

Anuparna L[1], Eldho Alias[2], Megha Clara Jose[3], Merin Thomas[4], Prof. Devika Venu[5]

[1,2,3,4]*Under Graduate Students, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India*
[5]*Professor, Mar Athanasius College of Engineering, Kothamangalam, Kerala, India*

Abstract – *The use of groundwater has increased significantly in the last decades due to its widespread occurrence and overall good quality. The present study has been undertaken to determine the physico-chemical characteristics of surface and groundwater in and around kalamassery dumping yard. Various water samples were taken at nine different locations. The samples are analyzed for physic-chemical parameters. The results were compared with drinking water standards of Bureau of Indian Standards (IS:10500-1991).Further the groundwater quality for drinking purpose at selected locations in the study area was determined using drinking water quality index (WQI) system. Eight water quality parameters has selected for evaluation of water quality. A data set of nine groundwater samples collected from the study area in and around kalamassery dumping yard is used to develop the water quality index (WQI*

Key Words: **WQI, DO, TDS, Iron, Parameters**

1. INTRODUCTION

In most of the developing cities in India, solid wastes are being dumped on land without adopting any acceptable sanitary land filling practices. Precipitation, that infiltrates the solid waste disposed on the land, mixes with the liquid already trapped in the crevices of the waste and leach compounds from the solid waste. The leachate thus formed contains dissolved organic and inorganic compounds. In course of time, the leachate formed diffuses into the soil and changes the physic-chemical characteristics of water.

Enormous amount of solid waste produce in and around Kalamassery yard dumped into solid waste land fill site at Kalamassery. This municipal solid wastes are inevitable byproducts of human and small scale industrial activity, which are disposed through dumping. The land fill site nearer to Kalamassery is an open dumpsite. This open dump is unsightly, unsanitary and smelling and attracts scavenging animals, rats, insects, pests, etc.. Surface water percolating through the waste, dissolves out and leaches harmful chemicals, and is carried away from the dumpsites in surface or subsurface runoff. These chemicals are insidious and lead to the phenomenon of bio-accumulation and bio-magnification. These chemicals may cause environmental problems, if the leachate migrates into the ground water. The people in and around the dumping site are depending upon the ground water for drinking and other domestic purposes.

Public health being the major concern, the ground water should be free from physical and chemical hazards. The degree of contamination of water was analyzed by conducting analysis of various physical and chemical parameters in the water samples, along the stretch of Muttar river. Samples were collected around three zones, first zone being the Dumping yard, and two other high potential zones of pollution we identified during the site investigation, being the FACT Water Treatment Plant and the Fishmarket. Three samples were collected from each zone.

The Periyar river flows through Kalamassery. It is a region of industrialization with several factories manufacturing chemicals, and fertilizers, as well as IT companies.

2. WATER QUALITY INDEX CALCULATION

Water Quality Index provides a single number that expresses overall water quality at a certain location and time, based on several water quality parameters. The objective of water quality index is to turn complex water quality data into information that is understandable and usable by the public.

For this the samples are tested for desired parameters. The weightage is given to the parameters according to the purpose is given higher weightage than the less important one. Quality rating or sub index (q_n) was calculated using the following expression.

$$q_n = 100[(V_n - V_{io})/(S_n - V_{io}) \quad \ldots\ldots(1)$$

where,

q_n =quality rating for the n^{th} water quality parameter

V_n =Estimated value of the n^{th} parameter at a given sampling station.

V_{io} =Ideal value of n^{th} parameter in pure water.(i.e, 0 for all other parameters except the parameter Ph-7 and DO-14.6mg/L)

S_n =Standard permissible value of the n^{th} parameter.

Unit weight was calculated by a value inversely proportional to the recommended standard value S_n of the corresponding parameter.

$$W_n = K/S_n \quad \ldots\ldots(2)$$

Where,

W_n= unit weight for the n^{th} parameters

K = Constant of proportionality

S_n =Standard permissible value of the n^{th} parameter.

The overall Water Quality Index was calculated by using the following equation:

$WQI = \sum q_n W_n / \sum W_n$……(3)

Water quality index and its descriptions are given in table 1

Class	WQI Level	Water quality status
I.	<50	Excellent
II.	50-100	Good water
III.	100-200	Poor water
IV.	200-300	Very poor water
V.	>300	Water unsuitable for drinking

2.1 WQI RATING

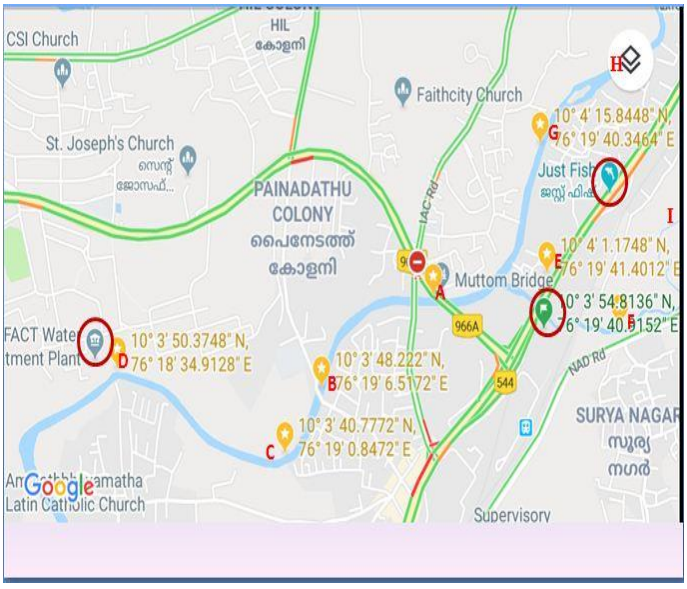

Fig.1.Map showing the various station from where water samples have been selected.

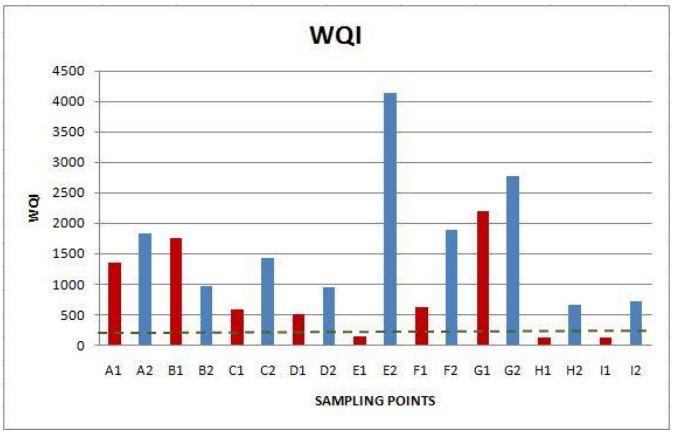

Fig.2. Graphical representation of WQI at various stations.

2.2. RESULT

Water Quality Index of samples at various stations:

Sample name	WQI	Water Quality Status
A1	1249.923	Unsuitable for drinking
A2	1829.989	Unsuitable for drinking
B1	1764.679	Unsuitable for drinking
B2	968.232	Unsuitable for drinking
C1	584.249	Unsuitable for drinking
C2	1413.49	Unsuitable for drinking
D1	509.297	Unsuitable for drinking
D2	949.748	Unsuitable for drinking
E1	139.078	Poor water
E2	4127.66	Unsuitable for drinking
F1	626.77	Unsuitable for drinking
F2	1877.44	Unsuitable for drinking
G1	2188.138	Unsuitable for drinking
G2	2777.817	Unsuitable for drinking
H1	121.354	Poor water
H2	644.583	Unsuitable for drinking
I1	130.494	Poor water
I2	711.506	Unsuitable for drinking

3. CONCLUSIONS

The quality parameters and the Water Quality Indices were estimated. Following are the conclusion drawn from the study.

Water Quality Analysis shows that:

- All the physio-chemical parameters in samples from all the sampling points were found to be within permissible limits as per WHO, IS10500, BIS, ICMR standards except for iron and turbidity.
- Iron was found in excessive quantity at the following stations(Ground water):

STATIONS	IRON CONTENT
Ganapathy temple (B2)	1.9
Cemetery Of St. Pious Xth Church (C2)	2.2
Near FACT (D2)	2.5
Near Dumping Yard (E2)	5
Decathlon (A2)	4.3
Kendriya vudyalaya (F2)	3.6
Sports ground Kalamassery (G2)	2
Parali's Fancy Chicks (H2)	2
R F Motors (PVT) - (I2)	2.2

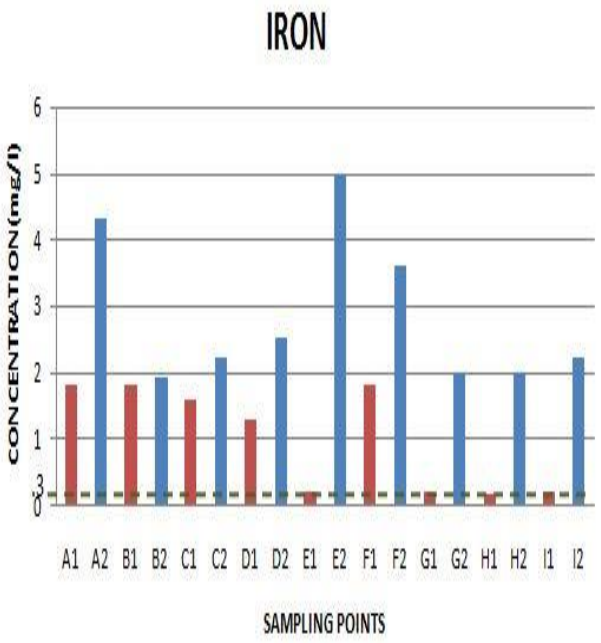

Fig.3.Graphical representation of variation of iron in surface and ground water

- Iron content was higher in ground water compared to surface water. The possible reason for this being the interaction of water with the laterite soil.
- After analyzing the data collected from the local people and the geological point of view, the ground water aquifer may be laterite, this might also be a possible reason for the higher iron content.
- According to WQI values, water in these regions were found to be unsuitable for drinking as iron was a dominating factor.
- By comparing with the cost, the municipality can come up with the idea of the rapid sand filter for the treatment of ground water in and around the dumping yard.

ACKNOWLEDGEMENT

We express our deep gratitude to **Almighty**, the supreme guide, for bestowing his blessing upon us in our entire endeavor.

We express our sincere thanks to **Dr. Solly George**, Principal, Mar Athanasius College of Engineering, Kothamangalam for giving us the opportunity to carry out this project and for the facilities offered throughout the project.

Also, we thankfully remember **Prof. Binoy Elias** (Head Of the Department of Civil Engineering) for his timely corrections and prosperous guidance.

We wish to express our deep sense of gratitude to **Prof. Devika Venu** of the department of Civil Engineering who supervised us throughout this project. Her overall guidance and direction has been responsible for the completion of the project.

We would also like to thank all the **staff members of the environmental laboratory** for all the cooperation and help given by them.

We also like to thank all the **staff of departmental of civil engineering** for their valuable help and suggestion.

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