The International Journal of Engineering And Science (IJES)
||Volume||4 ||Issue||2||Pages||01-03||2015||
ISSN: 2319 – 1813 ISBN: 2319 – 1805

Analysis Of Groundwater Quality By WQI

S. Shenbagarani[1] Y.M.Siddaramaiah[2] and S. Deepa[3]
[1]*Assistant professor, PSNA CET,Dindigul,* [2]*Professor, PSNA CET,Dindigul,* [3]*Lecturer, PSNA CET,Dindigul*

ABSTRACT

Municipal Solid Waste (MSW) describes the stream of solid waste generated by households, commercial establishments, industries and institutions. Improper disposal of MSW has serious repercussions for the environment and human health. One of the serious problems is ground water contamination. Asian countries are facing municipal solid waste management problems due to the rapid growth in solid waste generation rate and open dumping practices. As water percolates through MSW, it makes leachate that consists of decomposing organic matter combined with iron, mercury, lead, zinc and other metal, which is the cause for the Groundwater contamination in the nearby areas of the dumpsite. So there is a need for Groundwater analysis around the dumpsite to know to what extent Groundwater has been contaminated. The present work aims to calculate the Water Quality Index(WQI) in order to know the status of the groundwater quality around the dumping site.

Keywords: *Groundwater, Contamination, Solidwaste, Dumpsite.*

Date of Submission: 14 January, 2015 Date Accepted: 10 February, 2015

I. INTRODUCTION

Water is essential for life. Water covers majority of earth's surface a very small percentage is available as fresh water that human can use. Groundwater is one of water resources. As Ground water provides drinking water to the people and it contains over 90% of the fresh water resources, the quality of ground water is of paramount importance. In recent years the risk of groundwater pollution has become one of the most important environmental concerns, particularly in developing countries, where most of the landfills have been built without any sound engineering design such as engineered liners and leachate interception and collection system [1]. Unless properly treated, leachate that seeps from a landfill can infiltrate and contaminate the underlying groundwater.

Threats to the groundwater from the unlined and uncontrolled landfills exist in many parts of the world, particularly in the under-developed and developing countries where the hazardous industrial waste is also co-disposed with municipal waste and no provision of separate secured hazardous landfills exists. Even if there are no hazardous wastes placed in municipal landfills, the leachate is still reported as a significant threat to groundwater [2].

II. STUDY AREA

The study area lies between Latitude N 10°21'35'' – 10°22'27'' and Longitude E 77°56'57''– 77°58'05'' is located in the East of Tamilnadu in India covering about 8 Sqkm area in Dindigul and particular in the murugapavanam area and location includes aarya bhavan. The wastes from various parts of the city has been collected and dumped in the dumping site. The site is non-engineered landfill, looks like a huge heap of waste. Trucks from different parts of the city collect and bring waste to this site and dump the waste in irregular fashion. Residential areas are nearer to the dumpsites. Due to lack of legislation and proposed management practice, all the waste generated was only dumped at this site.

III. MATERIALS AND METHODS

A. Sampling and testing protocol

In an effort to study the extent of the groundwater contamination 12 sampling sites were selected near the dumpsite from where the samples were taken. The samples were collected in one litre capacity polythene bottles. Prior to the collection, bottles were thoroughly washed and rinsed with sample to avoid any possible contamination in bottling and every other precautionary measure was taken. All the samples were analyzed for selected relevant physico-chemical parameters, heavy metals. The testing process was performed according to the procedures mentioned in the Standard Methods for Examination of Water and Wastewater [3]. Various physico-chemical parameters examined in groundwater samples includes, pH, Electrical conductivity(EC), Total Dissolved Solids(TDS), Total hardness(TH), Calcium(Ca), Magnesium(Mg), Chloride(Cl), Zinc(Zn), Cadmium(Cd), Nickel(Ni), Iron(Fe), Copper(Cu), Chromium(Cr), Lead(Pb).

B. WQI

The concept of Water Quality Index (WQI) to represent gradation in water quality was first proposed by Horten [1]. WQI indicates a single number like a grade that expresses the overall water quality at a certain area and time based on several water quality parameters. WQI reflects a composite influence of contributing factors on the quality of water for any water system [2]. WQI a well known method as well as one of the most effective tools to express water quality that offers a simple, stable, reproducible unit of measure and communicate information of water quality to the policy makers and concerned citizens. It thus, becomes an important parameter for the assessment and management of ground water [3,].

Three steps are followed to calculate WQI. In the first step each of the parameters has been assigned a weight (wi) according to its relative importance in the overall quality of water for drinking purpose. A maximum weight of 5 has been assigned to nitrate due to its major importance in water quality assessment [3]. In the second step, the relative weight is calculated from the following equation

$$W_i = w_i / \sum w_i \qquad (1)$$

where Wi is the relative weight, wi is the weight of each parameter and n is the number of parameters. Calculated Wi values of the parameter are given in Table 1.

In the third step, a quality rating scale (qi) for each parameter is assigned by dividing its concentration of each water sample by its respective standard according to the guidelines laid down in the BIS and the result multiplied by 100.

$$q_i = C_i – C_{io} / S_i – C_{io} \text{ x } 100 \qquad (2)$$

where Ci is the concentration of each chemical parameter in each water sample in mg/L, Cio is the ideal value of the parameter in pure water and Si is the Indian drinking water

standard for each chemical parameter in mg/L according to the guidelines of the BIS. For pH, Cio is 7 and qi = (Ci – 7)/(Si - 7)×100. In the case of the remaining parameters the ideal value is 0.

Table 1 calculated weight for each parameter

Parameter	Weight
Dissolved oxygen	0.17
Ph	0.11
Biochemical oxygen demand	0.11
Total phosphate	0.10
Nitrates	0.10
Turbidity	0.08
Total solids	0.07

For calculating the WQI, the sub index (SI) is first determined for each parameter, which is used to determine the WQI as per the following equations.

$$SI_i = W_i \text{ x } q_i$$
$$WOI = \sum SI_i$$

SIi is the sub index of the ith parameter.

IV. RESULTS AND DISCUSSION

WQI for each parameter is given in table 2 and WOI values are classified into five types as given in table 3 and the water quality is analyzed based on the WOI of each parameter and of the sample location.

Table 2. WQI for each parameter

S.NO	Parameter	WQI
1	pH	90
2	Dissolved oxygen	14
3	Biochemical oxygen demand	53
4	Total phosphate	59
5	Nitrates	57
6	Turbidity	79
7	Total solids	24

Table 3. water Quality based on WQI

WQI	Quality
90-100	Excellent
70-90	Good
50-70	Medium
25-50	Bad
0-25	Very bad

The WQI is used to classify the quality of water as good or bad. The range of WQI for the water quality classification is given in Table 3.[3]WQI for each location and its classification based on the WQI is given in table 4. It is understood that 50% of the samples are classified under medium quality and remaining 50% are classified under bad quality. The quality of water is not good because of the presence on the dumping site near the sampling points. The presence of dumpsite deteriorates the groundwater quality as the leachate from the dumpsite percolates into the ground and contaminates the groundwater. Also WQI for total solids and dissolved oxygen is too low which makes the water not suitable for domestic purpose.

Table 4. WQI for each location

SAMPLE NUMBER	WQI	QUALITY
S1	47	Bad
S2	55	Medium
S3	59	Medium
S4	49	Bad
S5	58	Medium
S6	59	Medium
S7	45	Bad
S8	48	Bad
S9	51	Medium
S10	48	Bad
S11	49	Bad
S12	55	Medium

V. CONCLUSION

From the WQI one can easily judge the quality of water around the solid waste dumping ground. The deterioration of groundwater quality is because of the contaminants present in the leachate which percolates into the ground from the dumping ground. The result of analysis of groundwater samples show that leachate constitutes a serious threat to the local aquifer.

REFERENCES

[1] T.A. Kurniawan, Landfill Leachate: Persistent Threats to Aquatic Environment, SciTopics

[2] S.Shenbagarani, “Analysis of Groundwater Quality near the Soild Waste Dumping site”. IOSR-JESTFT 2013,

[3] G.Srinivas Rao and G.Nageswararao,”Assessment of groundwater quality using WQI”,Arch,Environ.Sci 2013, vol. 7, pp 1-5.