Jr. of Industrial Pollution Control 37 (3)(2021) pp 15-18

QUALITY OF GROUND WATER EVALUATION INSTONE QUARRY AREA

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Key words : Stone quarry, Ground water quality, Control measures.

ABSTRACT

Stone quarrying is a small scale labor oriented industry which has provided jobs to many people but at the same time it has brought a host of environmental pollution problems in the vicinity. The study is carried out to understand the ground water quality in the stone quarry area. The various parameters studied are pH, Temperature, Turbidity, Total dissolved solids, Total hardness, Calcium, Magnesium, Alkalinity, Chlorides, Fluorides, Sulphates, Phosphates and Nitrates. The present study aims to understand physico-chemical characteristics of ground water in the stone quarry area and its public utilization.

INTRODUCTION

Natural water resources are subjected to pollution comprising of organic and inorganic constituents. The store quarrying industry greatly contributes as a major source of water pollution which eventually becomes hazardous to various envirmnmetal attributes. The environmental impact of mining\ quarrying activities is very complex and it not only destroys the existing vegetation but also affects the surface and ground water quality. The wastes from industry like gases, dust, solutions, and variety of minerals such as tailing containing trace and toxic elements pollute water environment. Similarly Hire Khan *et al.,* (2002) studied the ground water quality of iron ore mining area in GAO and reported that the ground water in mining area have low pH due to pyretic rocks at the bottom. In few cases of accumulation of water

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in the pits, the water becomes turbid leading to the contamination of ground water. The present study is an attempt to look in to the possibilities of ground water pollution due to stone quarrying activity.

MATERIALS AND METHODS

To evaluate the nature of ground water in the study area, water samples has been collected from different sites in selected quarry locations of Bangalore District. The samples were collected in 5-litre plastic containers, which were thoroughly washed twice with the water to be analyzed. Determination of various physico-chemical parameters like pH, electrical conductivity, turbidity, alkalinity, hardness, Total dissolved solids , nitrates, phosphates, sulphates, fluorides, chlorides etc., has been carried out within 6 hours after bringing the samples from the laboratory using Standard procedures (APHA, 1985). Water quality index has been calculated to determine the overall quality of the ground water of the particular site. The index used is based on Tiwari *et al*. (1986) and Yazdandoot *et al*. (2000).

RESULTS AND DISCUSSION

Physical parameters

To evaluate the nature of ground water in the stone quarry area physical parameters were analyzed as per Standard Procedures (APHA, 1985). They had no odour and taste. The range of temperature measurement for the ground water samples investigated is found to be in the range of 21° C to 37° C. Turbidity of all the samples is found to be within the range of permissible limits. Turbidity in water is caused by suspended matter such as clay, silt, and finely divided organic and inorganic matter (Table 1).

Chemical parameters

The results of the chemical parameters analyzed are given in Table 1 and are compared with water quality standards of BSI.

pH and Electrical conductivity

The pH of the water samples ranged between 5.9 - 8.3 and are found within the permissible limits except for few which showed acidic nature. The conductivity values ranged between 850-3300 µmhos/cm, wherein few samples showed the values beyond the permissible limits. Higher values suggest the presence of high amount of dissolved inorganic substance in ionized form. The samples collected from quarry sites showed higher electrical conductivity values probably due to the input of large amounts of salts and silts (Table 1).

Total dissolved solids

All the sites except few showed a high concentration of Total dissolved solids. It is reported that high TDS content limits or determines the use of ground water for any purpose (Nordestron, 1987). Water with high dissolved solids generally id of inferior palatability and may induce an unfavorable physiological reaction in the transient consumer. The TDS values ranged between 550 to 2700 mg/L of which few samples showed the values exceeding the permissible limits (Table 1).

Table 1. Physico-chemical characterization of ground water in stone quarry area

SL	Code	pH	EC	TDS	TUR	Alk	TH	Fl	Ch	SO_4	PO_4	NO_3
1.	N1	7.5	1550	990	01	250	450	0.58	219	190	2.9	2.16
2.	N2	7.8	1600	1050	01	240	490	0.50	239	168	3.6	1.98
3.	N3	8.0	1500	980	01	210	430	0.55	249	185	3.4	1.73
4.	S1	7.2	1400	950	ND	190	410	0.42	250	186	3.2	1.64
5.	S2	7.5	1350	920	01	200	360	0.48	240	180	3.4	1.56
6.	S3	7.4	1280	840	ND	180	340	0.51	229	167	3.0	2.12
7.	E1	8.0	1250	810	ND	170	310	0.60	219	172	2.8	1.74
8.	E2	8.1	1220	840	ND	190	340	0.58	229	163	2.4	1.82
9.	E3	7.9	1300	880	01	210	350	0.54	240	169	2.6	1.69
10.	W1	7.7	1480	970	01	230	410	0.56	230	190	3.5	1.85
11.	W2	7.6	1450	950	01	200	430	0.54	219	193	3.2	1.89
12.	W3	7.4	1400	930	ND	210	400	0.46	209	156	3.1	1.74

Note: All Parameters are expressed in mg/L except pH- Units, EC- µmhos/cm

Total hardness

The presence of carbonates and bicarbonates of calcium and magnesium, sulphates, chlorides, nitrates, influence the ground water to become hard. The hardness in the analyzed samples range between 370 to 1500 mg/L of which few samples exceeded the limits (500ppm) (Table 1).

Chlorides

Chloride concentration of all the samples analyzed is found to be well within the permissible limits. The high chloride content may harm metallic pipes and structure. Excess of chloride in ground water imparts salinity in water and affects human consumption (Table 1).

Alkalinity

Alkalinity of ground water is due to the presences of carbonates, bicarbonates and hydroxides. Alkalinity in the analyzed samples range between 80 to 280 mg/L. In the study area all the samples showed the values well within the limits except few and fit for consumption (Table 1).

Fluorides

The concentration of fluorides present is well within the permissible limits. Fluoride ions have a dual significance in water supplies. High concentration of fluoride causes dental fluorosis, while concentration less than 1.0 mg/L results in dental caries. The water samples in the study area can be considered as safe for drinking since the samples have fluoride content less than 1.5mg/L (Table 1).

Sulphates

Sulphates ions originate in natural water due to oxidation of sulphite ores

or gypsum and other sulphur bearing ores. However ingestion of water containing high concentration of sulphate can have laxative effects, which is enhanced when sulphate is consumed in combination with magnesium. Sulphate values in all the samples analyzed is well within the limits (Table 1).

Nitrates

Nitrates are believed to occur in ground water mainly due to leaching from soil organic matter, leaching of fertilizers applied to soil, while leachates from refuse dumps and industrial discharge also contribute to presences of nitrate. In excessive amounts it contributes to the illness of infant methemoglobinemia or blue baby syndrome. The concentration of nitrates in the analyzed ground water samples are well within the permissible limits (Table 1).

Water quality index (WQI)

Water quality index reveals some interesting and important information about the quality of ground water in the study area. A Water Quality Index may be defined as a rating reflecting the composite influence of the over all quality of a number of quality characteristics or water quality parameters. The recommended limit of WQI for drinking water is 100. WQI of all sites except few have been found to be below. Therefore it can be said that the quality of ground water in the study area is satisfactory for drinking purposes.

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