# IMPACT OF WATER QUALITY ON GROUND WATER AROUND FOR MUNICIPAL SOLID WASTE DUMP YARD IN CHIDAMBARAM

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*Abstract :* This paper presents the physio-chemical characteristics of groundwater quality impact on municipal solid waste. The Leachate produced by waste disposal site be necessary many substances which are likely to contaminate groundwater. The impact of uncontrolled and unempirical disposal of MSW on groundwater in the dumpsite area. Groundwater quality around the yard is assessed and compared with the standards prescribed for drinking water. Seven Sample at different depth and intervals respectively depth 18–500 feet and intervals for 200m-800m. Sources were identified and analyzed in the laboratory for the period of two months. The physio-chemical parameters taken for analyzing using the standard methods are pH, TS, sulphate, turbidity, hardness, chloride, dissolved oxygen. All the samples have resulted within the permissible standards and first sample depth 18 feet exceed the permissible standards all the test results are tabulated with charts.

*IndexTerms* - municipal solid waste, physio-chemical parameters, landfill, groundwater contamination.

## I. INTRODUCTION

Waste is an Unwanted Byproduct of Human activities. Urbanization and developed living standards in cities enhance the quantity and complexity of solid waste. Most of the Cities in India are facing unplanned urban and heavy pressure of population. The Net result of this unplanned activities is generation of enormous amount of solid wastes[1]. The amount of solid waste generation is mainly depends on population, economic growth and the efficiency of a reuse and recovering system. Municipal Solid Waste is a combination of household and commercial refuse which is generated from the living public, it includes degradable(paper, textiles, food and vegetable) waste, moderately degradable (cardboard and wood) and materials of nondegradable ( leather, plastics, rubbers, metals, glass ) waste[2]. The MSW composition in most developing countries is highly degradable and mainly composed of an organic fraction with high moisture content [3]. Rapid industrialization and population explosion in India have lead to the immigration of people from villages to cities, which improved thousands of tons of MSW on a daily basis of rapid residential development and increasing urbanization have caused a extreme raise of the municipal solid waste generation and the mixture of the waste composition[4]. Top producer of MSW in Indian Metropolitan cities is due to the high density of residential and uncontrolled population, from households, offices, commercial activities, industries, and healthcare centers[5]. Solid waste management involves the activities associated by means of Waste generation, Collection, Transportation and Disposal[6]. The Management of MSW is going through a critical phase, due to the unavailability of simlarly facilities to treat and dispose of the higher amounts of MSW generated daily in metropolitan cities. Poor collection and insufficient transportation are responsible for the growth of MSW in every corner[7]. Due to unsuitable solid waste management, Waste has rising as one of the contamination sources and cause a environmental impact as well as harmful towards human health and safety , often the construction of solid waste is the most serious threat to the fragile ecosystem[8]. Ecological impacts such as land degradation, water, and air contamination are related to unsuitable management of municipal solid wastes. According to high residential growth, Poor sanitation facilities, rapid urbanization, and sudden solid waste dumping have a enormous effect on water quality and its quantity[9]. Increasing population in developing cities and its rising waste has started degrading the environment especially groundwater quality[10]. Poor management of solid waste sites contaminate groundwater normally in rainy season, which directly impacts the human health[11]. According to leaching process, Variations due to temperature, hydrology of the site, waste collection duration, material composition, and its decomposition. Untreated, improper and unexpected dumping techniques have been used as the solid waste, especially in developing countries[12]. Numbers of studies have been conducted throughout the world to assess the groundwater quality and landfill site's impact by using different approaches and methodologies[13]. Awareness about the solid waste management is necessary to reduce the harmful impact of solid waste on groundwater quality. In this present work, the influence of physio-chemical parameters of the groundwater is studied in detail by collecting the water samples around the dump yard at 200m to 800m boundaries and testing them for various parameters such as pH, TS, sulphate, turbidity, hardness, chloride, dissolved oxygen.

## II. STUDY AREA

Chidambaram town lies between 11o23,38.95"N and 79o41'12.88"Elevation 34ft and it has 56,232 population around and it harvests solid waste 14mt/day. Chidambaram municipal solid waste landfill site is located near c.thandeswaranalur area on view of 3km from chidambaram. Landfill site has 5.5 acres it may constitute an environmental impact if the leachate transfers into the groundwater. The arrangement of the wastes at the dumpyard includes both degradable (garbage or food waste and paper waste) and non-bio degradable (plastics, hazardous waste, and other metal containing substance). The arrangement of solid waste includes papers and cartons, food remnants, glass and bottles, plastic and polythene, metals and tins, textiles, rugs, and other minerals. On common municipal solid waste from the dumpsite consisted of 66.8% volatile solids, 14.2% fixed dumps, 19.0% liquid and 1.8% other compounds. The average biodegradability fraction is 0.807, carbon to nitrogen ratio of 27:1. The percentage composition of wastes contained of organic decomposable wastes 35.6%, glass 24.5%, metals 10.8%, textiles 6.9%, wood 7.6%, sludge 5.6%. The presence of bore well at the landfill sites threatens to pollute the groundwater. People around the dump yard be necessary reported that the dump yard has become a nuisance for their living. This study also focuses the possible impact of solid waste effect on groundwater quality on the physio-chemical parameters. The sample taken from an 800m radius around the dumpsite was individual for the groundwater sampling. Based on the groundwater flow direction 7 groundwater station were recognized from this area for analysis. 7 water samples were collected from the identified sampling locations. From each location, their water samples were collected for analysis on a monthly basis. Source for water samples were hand pumps.


## III. METHODOLOGY

### Sample collection

The sample is collected from 200-800m around the dumpsite was identified as a study area. Critical Sampling locations around the site were selected based on the groundwater. Samples were taken at various depths (18,25,28,30,32,30,500ft). The samples were collected using a 2-liter hand bottles that have been sterilized to avoid contamination by any physical, chemical means[14]. The collected water samples were transferred into sterile containers. After collection, The samples were immediately placed in ice coolers for transportation to the laboratory and stored in a refrigerator. The samples were collected monthly. The water quality deals with physical, chemical characteristics of water. Water quality parameters analyzed in accordance with standard methods. Where, pH, chloride, hardness, Total Solid (TS), turbidity, sulphate, dissolved oxygen (DO) of the samples were determined.

**Table 1 Sample Location Data**

| Sl.No | Source of Sample | Distance from the site (m) | Depth of sample (ft) |
|---|---|---|---|
| 1 | Bore water | 200 | 18 |
| 2 | Bore water | 300 | 25 |
| 3 | Bore water | 400 | 28 |
| 4 | Bore water | 500 | 30 |
| 5 | Bore water | 600 | 32 |
| 6 | Bore water | 700 | 30 |
| 7 | Bore water | 800 | 500 |

## IV. RESULTS AND DISCUSSION

The results of both physio-chemical and analysis are presented in tables 2 and table3. Table 2 below gives the July month results while table 3 gives the August month results.

**Table 2**

| Sl.No | Parameters | Units | Sample1 | Sample2 | Sample3 | Sample4 | Sample5 | Sample6 | Sample7 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | PH | - | 8.82 | 7.20 | 7.35 | 7.13 | 7.09 | 6.93 | 6.82 |
| 2 | Turbidity | NTU | 15.5 | 2.8 | 0.6 | 1.0 | 0.2 | 0 | 1.1 |
| 3 | Chloride | Mg/l | 1738 | 562 | 160 | 720 | 599 | 230 | 177 |
| 4 | TS | Mg/l | 4100 | 402 | 2002 | 1800 | 2099 | 500 | 799 |
| 5 | Hardness | Mg/l | 1400 | 560 | 570 | 680 | 846 | 498 | 370 |
| 6 | Do | Mg/l | 4.5 | 4.4 | 4.3 | 2.4 | 3.8 | 4.8 | 6.0 |
| 7 | Sulphate | Mg/l | 9.0 | 0.9 | 0.8 | 2.62 | 5.4 | 1.4 | 1.2 |

**Table 3**

| Sl.No | Parameters | Units | Sample1 | Sample2 | Sample3 | Sample4 | Sample5 | Sample6 | Sample7 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | PH | - | 8.83 | 7.23 | 7.38 | 7.19 | 7.12 | 6.99 | 6.87 |
| 2 | Turbidity | NTU | 16.1 | 3.1 | 0.7 | 1.2 | 0.5 | 0.1 | 1.4 |
| 3 | Chloride | Mg/l | 1750 | 572 | 178 | 740 | 618 | 256 | 200 |
| 4 | TS | Mg/l | 4112 | 416 | 2022 | 1836 | 2106 | 505 | 812 |
| 5 | Hardness | Mg/l | 1412 | 565 | 585 | 690 | 850 | 502 | 375 |
| 6 | Do | Mg/l | 4.7 | 4.9 | 4.6 | 2.8 | 5.9 | 5.1 | 6.2 |
| 7 | Sulphate | Mg/l | 9.5 | 1.1 | 0.9 | 2.78 | 5.5 | 1.7 | 1.12 |

Physic-chemical characteristics of the sample water were analyzed,

**PH:** The PH of the water range from 7.20 to 6.82 and the PH remains relatively with allowable BIS IS: 10500-2012. The around the dump yard with a 200m distance of bore water is affected. There sample1 are without permissible so it's not suitable for drinking purpose[15]. Vincent Kodznartey, et, al (2017) has also required the permissible PH value is 7.20 to 7.8 as this result also compared with our result.

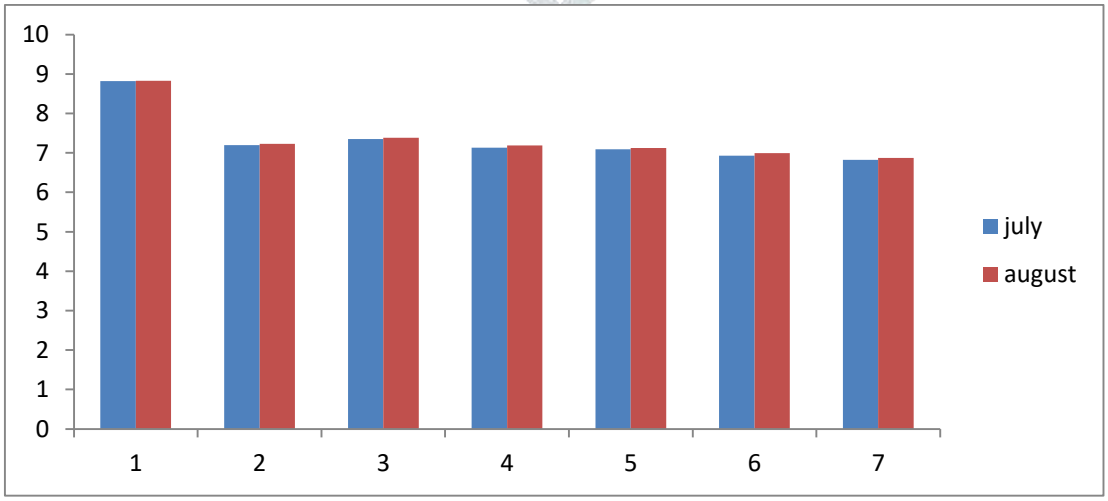


**Figure-1: ph values at sample locations**.

**Turbidity:** Turbidity (in NTU) range a permissible limit is 0 to 5. In BIS IS: 10500-2012, sample 2,3,4,5,6,7 are within the range. The sample1 above allowable standard, this an indication that there could be microbial contamination which can cause significant damage to human and turbid water is more expensive to treat [16].

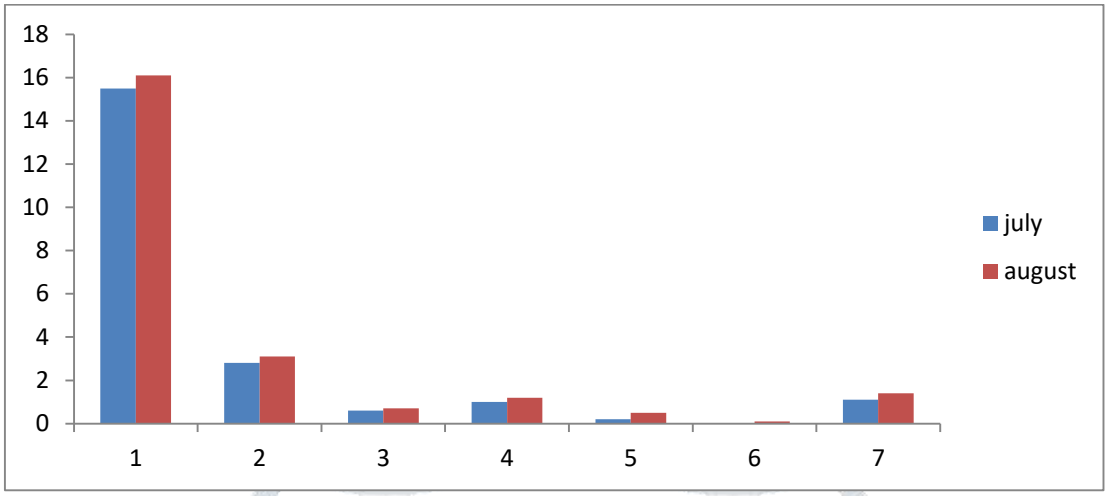


**Figure-2: Turbidity values at sample locations.**

**Total solids**: The total solids range desirable limit is 500Mg/l. All water sample fall within the allowable range. Therefore, water samples are high TS will be a problem during treatment as it may cause filter clogging [17].

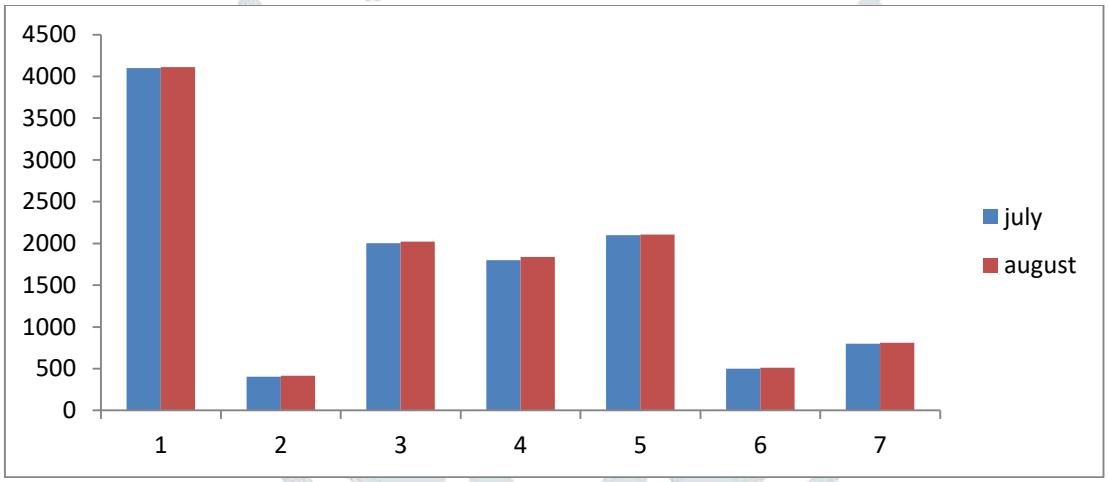


**Figure-3: total solid values at sample locations**.

**Chloride:** The chloride content desirable limit is 250Mg/l as BIS IS: 10500-1991. The sample 1,3,7 are within allowable for permissible and desirable limit [18]. So its impact on human health as high blood pressure, salty taste. So this water treated the best way of Reverse osmosis, distillation, activated carbon method.

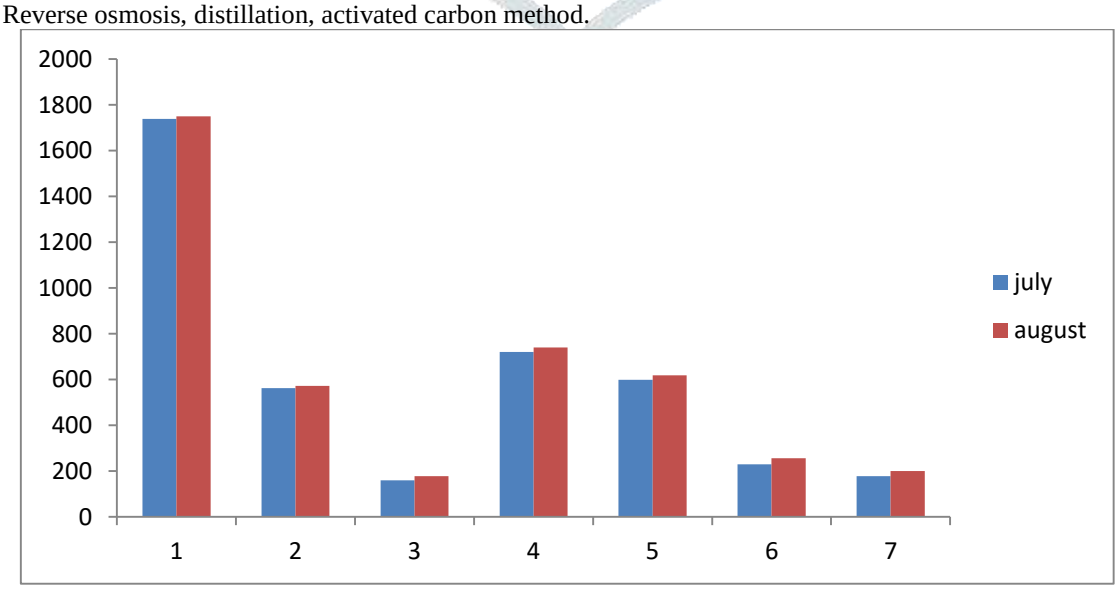


**Figure-4: chloride values at sample locations**.

**Hardness:** The water Hardness is the traditional measure of the capacity to react with soap, hard water needs substantial more soap to produce lather hardness is one of the very important properties of groundwater from utility points of view particularly for domestic purpose. The hardness within permissible limit is 600Mg/l as BIS IS: 10500-1991[19].smaple2, sample3, sample6, sample7 are within permissible limits. And sample1 sample4, sample5 are within allowable in a limit. So its impact on the scale in utensils and hot water system, soap scums. In this water, samples are treated as a way of water softener reverse osmosis [20].

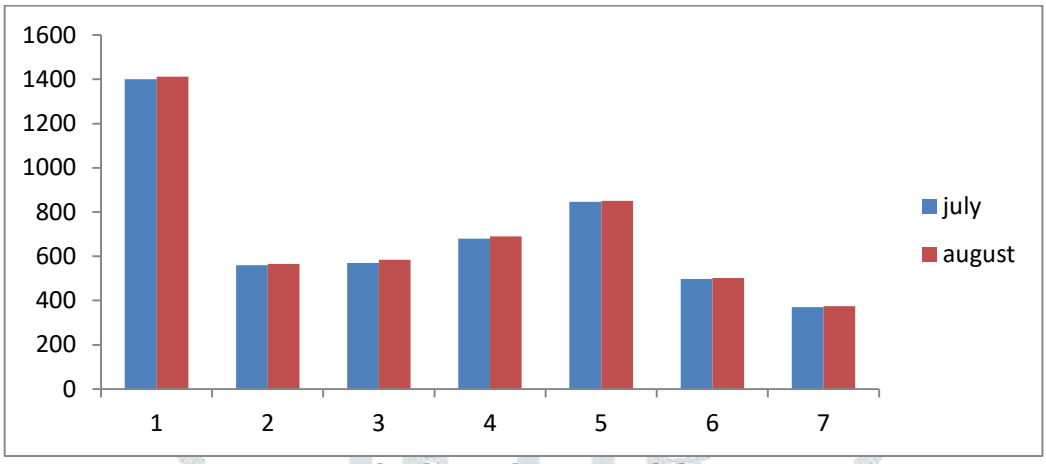


**Figure-5: hardness values at sample locations.**

**Dissolved oxygen:** Dissolved oxygen of the water range from 4.4 to 6.0. The range of permissible limit of dissolved oxygen 6 to 7Mg/l. sample7 are within the permissible limit. The other sample a low percentage of the DO. The causes of low dissolved oxygen primarily result from unnecessary algae development. As the algae die and spoil, the process consumes dissolved oxygen. This can result in inadequate amounts of dissolved oxygen available for fish and other aquatic life. Groundwater a primary source of river flow during weather conditions and base flow conditions, is naturally low in DO. During winter month when ice cover inhibits aeration from the air, groundwater inflow will underwrite to occurrences of low DO in a river [21]. During summer the cooler groundwater entry may at first lower the DO concentration, but it also tends to decrease the river temperature which improves the ability of the water to hold oxygen.

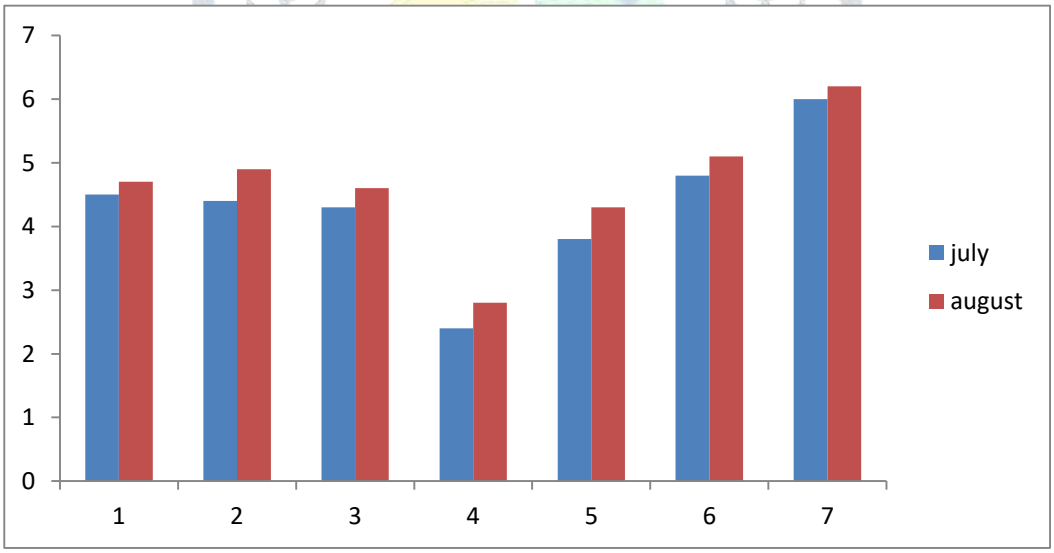


**Figure-6: Dissolved oxygen values at sample locations.**

**Sulphate:** Sulphate can be found in almost all groundwater. Source of most sulphate compounds is the corrosion of sulphories the presence of shales.sulphate is one of the major dissolved components of rain. High concentrations of sulphate in water we drink can have a laxative effect when combined with calcium and magnesium. The two maximum elements of hardness. Bacteria,which attack and reduce sulphate from hydrogen sulfide gas. As per the Indian standard, the desirable limit is 200, and the permissible limit is 400. The observed standards of Sulphate in all the sampling sites not come under both desirable and permissible limits. High concentration of sulphate can cause cathartic action and respiratory illness.

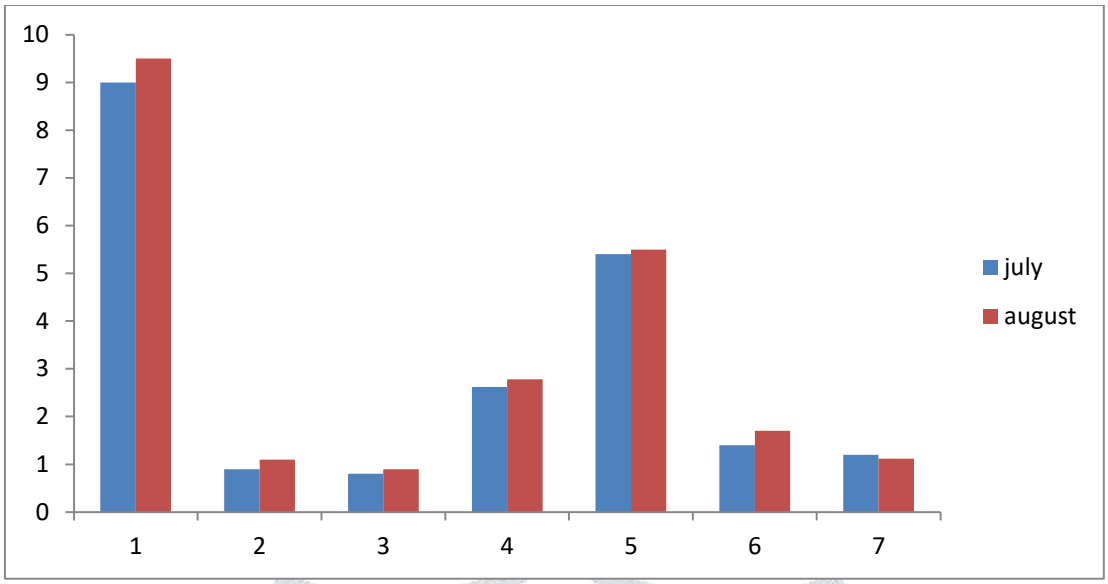


**Figure-7: sulphate values at sample locations.**

## IV. Conclusion

The present study has been involved the pollution, contaminated of groundwater quality by the impact of untreated solid waste management in Chidambaram municipal dump yard site. Water Sample is collected from near the dump yard at different distances and depth. The physio-chemical parameters analyzed in the laboratory. The samples are taken on a monthly basis in July 2018 and August 2018 respectively. sample1 have rejected all parameters (sample 1 Do and sulphate) are accessed permissible limit so the water quality is impacted. Other samples are not affected by dumping solid waste from the yard.

## V. Acknowledgment

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## VI. References

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