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ASSESSMENT OF GROUND WATER POLLUTION NEAR LANDFILL SITE AT PUNE AND SUGGEST APPROPRIATE TREATMENT

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Abstract - *In the present study, assessment of suitability of ground water for domestic and agricultural purpose was carried out around Uruli Devachi landfill region of pune, Maharashtra, India. The study area covers 7 different locations of wells near the landfill site. The water samples were collected from 7 wells during summer season (Jan. & Feb.). The quality of water depends on a large number of physical, chemical factors. Hence, the parameters such as pH, Turbidity, Alkalinity, Hardness, Chloride and Sulphate were analysed. The results were compared with IS 10500 standards, 2012 (BIS) and it was observed that the groundwater quality at the study site is impaired mainly due to Turbidity, Alkalinity, Hardness, Chloride and Sulphate. This makes the ground water unsuitable for drinking purpose in these areas. Domestic activities, dumping of solid waste at the nearby composting site are the major sources causing pollution in these areas.*

Key Words: *landfill site, groundwater, pune,*

1. INTRODUCTION

Ground water is a precious natural resource. It constitutes about 30% of world's total fresh water. It is the major source of water for domestic, agricultural and industrial purposes in many countries. India accounts for 2.2% of the global land and 4% of the world water resources and has 16% of the world's population. In recent years, the increasing threat to ground water quality due to human activities has become a matter of great concern.

Municipal Solid Waste (MSW) leachate contains variety of chemicals like detergents, Inorganic chemicals, complex organic chemicals and metals. During infiltration of water by rainfall, water already present in the waste, or water generated by biodegradation cause the leachate to leave the dumping ground laterally or vertically and find its way into the ground water thereby causing contamination. To what extent this pollution has affected the water wells in the area is unknown and hence needed to be determined. The objective of the study therefore was to assess the effect of landfill pollution on groundwater quality in Uruli Devachi landfill site, Pune.

1.1 Ground Water Contamination

Any addition of undesirable substances to groundwater caused by human activities is considered to be contamination. Groundwater often spreads the effects of dumps and spills far beyond the site of the original contamination. Groundwater contaminants come from two categories of sources: point sources and distributed, or non-point sources. Landfills, leaking gasoline, storage tanks, leaking septic tanks, and accidental spills are examples of point sources. Infiltration from farm land treated with pesticides and fertilizers is an example of a non-point source. There are many different sources of groundwater contamination. Groundwater becomes contaminated when anthropogenic, or people-created, substances are dissolved or mixed in waters recharging the aquifer. Examples of this are road salt, petroleum products leaking from underground storage tanks, nitrates from the overuse of chemical fertilizers or manure on farmland, excessive applications of chemical pesticides, leaching of fluids from landfills and dumpsites, and accidental spills.

2. LITERATURE REVIEW

1. Ismail Yusoffa et al, (2013) done field and laboratory studies were undertaken to determine the likely concentrations of potential contaminants from landfill leachate to the underlying groundwater, leachate, and surface water at Ampar Tenang landfill, Selangor, Malaysia. The results clearly indicate that materials are poorly contained and are entering the wider environment. Hence full characterization of the dump contents and the integrity of the site are warranted in order to evaluate the scope of the problem and to identify suitable remediation options.

2. Chidanand Patil, et al (2013) analyzed parameters during the study period were pH, total dissolved solids (TDS), Total Hardness, Nitrate, Most Probable Number (MPN) and heavy metal such as Lead using standard laboratory procedures. The Ph ranged from 6.01 to 7.3 indicating acidic in nature in the month of Feb - March, the three borewells near landfill i.e. within 500 m. Concentrations of Hardness, TDS, Nitrate and MPN ranged from 0 to 80 mg/L, 49 to 190 mg/L, 4 to79.89 mg/L and >1600/100ml respectively. The analysis was done for four months from Feb – May. The results showed that within 500 m bore wells were contaminated by E-Coli bacteria, also nitrate concentration is above the permissible level described by WHO and Bureau of Indian

Standards for drinking water and pH were acidic in nature. The polluted water requires certain levels of treatment before use. Public nlightenment on waste sorting, adoption 5 of clean technology, using climate change mitigation strategies and the use of sanitary landfill to prevent further contamination of ground water flow are recommended.

3. METHODOLOGY

Following methodology are adopted to successfully completion of project.

1. Fixing the sampling area around the landfill site with GPS tagging.
2. Scheduling and sampling interval to analyze the ground water sample.
3. Physicochemical analysis of collected sample of ground water from predetermined wells from predefined location in the laboratory.
4. Then the samples are passing through water column in which coconut shell are used as a filter material.
5. Analysis of the result before and after filtration.
6. Summarizing all the result and drawing out the final conclusion.

3.1 Criteria for selection of Wells

For selection of groundwater quality survey location the following criteria were kept in mind:

1. Drinking or Irrigation water wells,
2. Wells closer to polluting sources i.e. landfill site, pune.

3.2 Sampling Locations and GPS tagging:-

Location map of the study area

Groundwater samples were collected from 7 wells of Hadapsar (landfill site) region (Fig.3.2) in summer season (Jan. & Feb.). The locations which were used for household and agriculture purposes were identified and mentioned in Table3.1.

Sr. No.	Source	Latitude	Longitude	Purpose
1	Well 1	18.4690668	73.9651272	Domestic
2	Well 2	18.4700208	73.9675546	Domestic
3	Well 3	18.4704527	73.9667171	Irrigation
4	Well 4	18.4716423	73.9652606	Irrigation
5	Well 5	18.4682670	73.9644681	Irrigation
6	Well 6	18.4673053	73.9693463	Irrigation
7	Well 7	18.4668961	73.9637180	Irrigation

3.3 Sample collection, transport, preservation and analysis:-

Samples were collected from Open dug wells in use for domestic or irrigation water supply. Open dug wells, which are not in use or have been abandoned, were not used for sampling. For collection of samples a weighted sample bottle was used to collect sample from an open well. From open wells the samples were collected directly in to the pre-sterilized glass bottles. The samples were transported to the laboratory. The samples were analyzed immediately for the physicochemical parameters like turbidity, pH, Chlorides, Alkalinity and Hardness. Other parameters were analyzed within a week time.

3.4 Testing parameters selection:-

The physico-chemical analysis was performed following standard methods. The brief details of analytical methods and equipment used in the study are given in the Table 2.

SR. NO	PARAMETER	METHOD	INSTRUMENT/EQUIPMENT
1	PH	ELECTROMETRIC	PH METER
2	CONDUCTIVITY		CONDUCTIVITY METER
3	TURBIDITY	TURBIDIMETRIC	TURBIDITY METER
4	ALKALINITY	TITRATION BY H2SO4	
5	HARDNESS	TITRATION BY EDTA	
6	CHLORIDE	TITRATION BY AgNO3	
7	SULPHATE	TURBIDIMETRIC	UV-VIS SPECTROMETER

4. CONCLUSIONS

During project work test of the sampling shown the greater extent of pollution as physico chemical parameter have been exceeded above permissible level such as turbidity 27.97 NTU, alkalinity 720mg/l as CaCo3, hardness 3120mg/l as Caco3, chloride 943.1 mg/l and sulphate352.5

An attempt have been made for reducing this parameter upto permissible level by using coconut shell as filter media, hence proves to an efficient and ecofriendly treatment

On other hand chloride concentration removal by using coconut shell haven't shown significant reduction. This treatment will be an effective and economical treatment.

Also from physico chemical analysis, we got the evidences for the pollution of well water of ground water possibility due to infiltration through landfill site, so through this study it is strongly recommended upgrade the existing landfill site so as to prevent future contamination of ground water.

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