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**PHYSICO-CHEMICAL CHARACTERISTICS OF SUBSURFACE WATER SAMPLE  
FROM SETHIATHOPE TOWN**

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**ABSTRACT**

The quality of subsurface water based on several minerals present in the earth. Subsurface water is main source for drinking water in all over the world. The shallow well water was sampled from 5 different areas in sethiathope town. These samples were collected by clean polyethylene 5 lit cans and transferred to the water assessment laboratory. In the water assessment laboratory the water samples hydrochemical parameters such as Temperature, Colour, Turbidity, Total dissolved solids (TDS), Total suspended solids, Conductivity, Hardness, Alkalinity, Acidity, Dissolved oxygen (DO), Chloride (Cl), pH, Total hardness (TH), Phosphate, etc. were assessed. These parameters differentiate with WHO, ISI and USPH.

**Keywords: Physico-chemical analysis, Subsurface samples, Awareness**

**INTRODUCTION**

Water is nature's most precious wonderful, surplus & one of the most essential need for the human and animal and other kind of living organisms, more over very essential for the nutriment of plant and animal life, environment and overall wellness of the world. Water is extremely vital for survival of lives-ecological resources for the flora

and fauna of our earth. The quality of drinking water is very essential for Mankind, it is straightly connected to human health. The characteristics of subsurface water mainly achieved from several chemical element and this diluting material, this is obtained from the earth science data of the specific zone.

Subsurface water occurs in weathered portion, connection and geological fault rocks [1]. Most subsurface water is pure and clean in nature but subsurface water can become polluted or contaminated due to various anthropogenic activities.

It can become polluted and contaminated from leaky subsurface water tanks that store gasoline, leaky landfill, or when people apply too much fertilizer, chemicals, herbicides or pesticides on their fields or lawns. When pollutants leak, seep, spread or are carelessly dumped on the ground they can infiltrate through the soil particles. Some sources are contaminated to groundwater as well, such as many industries would dump toxic wastes into ponds, river or lakes or reservoirs, swampy area, which is not realizing that the waste particles could get into someone's drinking water. Some agricultural land areas have problem with chemical fertilizer, pesticides and herbicides from farm runoff that contaminated seeps or saturated into the water table. Even sewage from residential buildings, septic tank or livestock can contaminate water with very dangerous bacteria. According to WHO review has studied that 1.2 billion people all around the universe do not use clean and safe potable water and natural biological pollution of water is responsible for eighty percent of all mankind sickness in the

developing universe [2]. Standard Quality of subsurface water is a vital factor of development and use subsurface water as drinking resource. The drinking water should be taste less and colour less free from pathogenic agents and chemical constituents, and usable for domestic purposes and healthy to human beings. The subsurface water is characterized by various quality problems [3]. A various infective microorganisms can be spreaded to human beings through contaminated water with fecal material. Bacteriological standard of potable water is mainly obtained by using "indicator organisms" which presence represents fecal pollution [4]. The physical, chemical and bacterial analysis of subsurface water find its use fullness for inland, commercial, factory, agricultural, and internal water supplies [5]. Several occupations in this state have carried out a large work on potable water quality for various uses. Subramani had investigated subsurface water quality and this suitability for potable and irrigation use in Chithar River [6]. Charu had studied the potable water quality status in Bhopal and ended that the water quality is safe and within permissible limit of drinking water recommended values given by several organizations.

## **MATERIALS AND METHODS**

### **Study area:**

Sethiathope town comes within the jurisdiction of town panchayat. Sethiathope situated towards western part Chidambaram town of cuddalore district. It is about twenty kilometers away from the Chidambaram town. This area was brought into existence in 1983. At the distance of 25 km. Sethiathope covered by this area is 25,9040sqft. and there are 75 plots of 6000sqft. There are 27 wells in the area from those 5 wells are dumped by garbage or other waste. The subsurface water is pumped from five (5) well at various locations within study area. Water sample is gathered by grab sampling method and keeps in pure clean plastic 5 liter cans. Collected water has been stored without mixing any substances in well washed bottles.

#### **Methodology:**

The obtained samples were studied for different physico-chemical parameters. Some physical parameters like pH & temperature were determined at the site with the help of digital water analyzer kit. Electrical conductivity determined by conductivity meter. Dissolved Oxygen (DO) mg/L Winkler method, Alkalinity as analyzed by titration method, Calcium (Ca) & Magnesium (Mg) Hardness as CaCO<sub>3</sub> mg/L was measured by using standard EDTA solution. Total dissolved Solids (TDS) was estimated by evaporation method. Chloride was determined by

argentometric titration method using standard AgNO<sub>3</sub> solution. Phosphate mg/L determined by Colorimetric Method. All the results are compared with standard limits recommended by WHO, WHO standard, ISI standard and USPH Standard & all parameters were analyzed by standard procedure mentioned in APHA [7, 8].

#### **RESULTS AND DISCUSSION**

The outcome of dug well sample character of sethiathope town area discussed in detail above **Table 1**. The temperature of 5 dug well observed samples was found among the values 25–25.3°C which is lower than the suitable limit. High level of subsurface water temperature decrease dissolved oxygen and also due to increased microbial activity [9]. The colour of the five well water samples was found to be clear during investigation period. The turbidity of shallow well waters ranges between 0.8–1.5 NTU. Almost water, muddiness is mainly due to colloidal and extremely fine particles. The turbidity of five well sample water was found to be within permissible limits. Total dissolved solids (TDS) value of five shallow well water ranges between 18–83 mg/lit. The total suspended solids and total solids, in five well water samples were found within the range of permissible limit. According to WHO the desirable limit of TDS is 500 and all samples were below the standard permissible limit. An increase value of TDS decrease quality for

potable, agriculture and irrigation purposes [10]. High value of TDS due to saline water intrusion and increase in salts (sulphate, calcium, carbonates, bicarbonates, sodium, potassium and other ions) [11]. Suspended and Dissolved materials tend to increase with increasing contamination and pollution of water. Water containing more than 500 mg/L of TDS is not suitable for drinking purpose. Electrical conductivity of five well water samples was found between the range 0.729 m mho/cm to 1.118m mho/cm value represent that conducting materials are not existing in high amount. It is essential parameter for finding the quality of potable and agricultural purposes. pH of five well water samples was found between the range 7.3–7.8. This value indicates that the subsurface water of the research area is slightly

alkaline in nature and all the samples were within the permissible limit prescribed by WHO. The pH is an essential parameter in water studies almost all the aquatic living things are adopted to normal pH and do not resist sudden changes. Acidity or Alkalinity is very important to estimate corrosiveness in water. Lower the pH value indicates higher corrosiveness nature of water [12]. Dissolved oxygen values of well water sample are varied between 4 mg/lit to 4.8 mg/lit. Dissolved Oxygen is one of the essential parameter that measure the extent of organic as well as biological contamination weight to a water body. Most of the water samples within the recommended limit. The minimum DO values represents pollution and contamination by organic matter, this indicates some pollution load in the water.

**Table 1: Physico-Chemical Parameters of well water**

Sr. No	Parameters	Source1	Source 2	Source 3	Source 4	Source 5
1	Temperature (°C)	25.3	25.4	25.4	25.5	25
2	Colour	Transparent	Transparent	Transparent	Transparent	Transparent
3	Total solids (mg/lit)	335	352	319	411	270
4	Turbidity (NTU)	1.5	0.8	1.4	0.8	1.4
5	TSS (mg/lit)	380	390	358	295	250
6	TDS (mg/lit)	24	18	42	83	41
7	Electrical Conductivity (mmho/cm)	0.753	0.756	0.729	1.118	0.779
8	pH	7.5	7.5	7.3	7.4	7.8
9	DO (mg/lit)	4.6	5.5	4.6	5.3	4.6
10	Total Alkalinity (mg/lit)	327	320	315	334	311
11	Total Hardness (mg/lit)	318	320	301	326	294
12	Calcium Hardness (mg/lit)	198	242	176	186	178
13	Magnesium Hardness (mg/lit)	126	74	132	138	116
14	Chloride (mg/lit)	51.88	57.99	64.22	71.89	52.48
15	Phosphate (mg/lit)	0.11	0.8	0.7	0.13	0.7

Table 2: Drinking water standards

Sr. No	Parameter	WHO Standard	ISI Standard (Permissible limit)	USPHS Standard
1	Temperature	–	–	–
2	PH	6.5-9.0	6.0-8.5	6.0-8.5
3	Conductivity	–	–	300 $\mu$ mho $\text{cm}^{-1}$
4	Turbidity	5NTU	5NTU	5NTU
5	Total Solids	500-1500 mg/lit	500-2000 mg/lit	–
6	Total dissolved solid	500 mg/lit	500 mg/lit	500 mg/lit
7	Total suspended solid	–	100 mg/lit	120
8	Alkalinity	–	200-600 mg/lit	120
9	D.O.	–	4 to 6 mg/lit	4 to 6 mg/lit
10	Total Hardness	150-500 mg/lit	300 mg/lit	–
11	Calcium Hardness	100-200 mg/lit	75-200 mg/lit	–
12	Magnesium Hardness	150 mg/lit	–	–
13	Chloride	250 mg/lit	250 mg/lit	250 mg/lit
14	Phosphate	–	–	0.1 mg/lit

The five dug well water samples alkalinity value ranges from 311 mg/lit to 334 mg/lit. The rocks containing following minerals such as carbonate, bicarbonate and hydroxide compounds that are existing in the study region [13]. The alkalinity values in water samples gives an result of natural salts existing in water. Among the results five dug well sample has total hardness values ranges from 294 mg/lit to 326 mg/lit. Similarly the calcium hardness of five dug well water samples ranges from 172 mg/lit to 242 mg/lit. The magnesium hardness of five dug well water samples ranges from 74 mg/lit to 138 mg/lit. Hardness of water samples in reduces lather formation with detergent and highly increases the boiling ratio of water. Hardness of water mainly due to amount of calcium or magnesium salts present in water. The total hardness five dug well water samples was found to be within recommended limit. Excess of Cl and Mg

indicates the hardness in water and is not good for potable.

The chlorides of five dug well water samples ranges from 51.88–71.89 mg/lit. Chlorides are essential to determine the pollution of subsurface water by waste water. The permissible limit of chloride in drinking water is 250 mg/L. Chloride values are observed from five dug well water samples were very low i.e. within the recommended limit. Chloride concentration gives a salty taste to water. The people consume high chloride content of water, it may cause a laxative effect [14].

The phosphate of five dug well water samples ranges from 0.7 mg/lit to 0.13 mg/lit. High level phosphate was found to be 0.13 mg/lit. The level of phosphate in the research area was found to be higher than recommended limit. The high level of phosphate may cause serious health hazard [15] (Table 2).

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**CONCLUSION**

The research location samples were analyzed for fifteen parameters these are vital for deciding the drinking water. The quality of water in many locations found in with in the desirable limit.

The increasing level of phosphates gives an adverse health effect. The main aim of the assessment is create awareness among the public.

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