Assessment of Surface Water Quality in Machanpally(V),Mahabubnagar(Dist.) Telangana State

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Abstract **: The quality of surface water usually described according to its physical, chemical and biological characteristics. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are causing heavy and varied pollution in aquatic environment leading to deterioration of water quality and depletion of aquatic biota. Due to use of contaminated water, human population suffers from water borne diseases. It is therefore necessary to check the water quality at regular intervals. Parameters that may be tested include temperature, pH, turbidity, salinity, nitrates and phosphates. The main aim of our project is to improve the quality of the water to be used for the daily domestic purposes. However, the health concerns and maintaining some essential minerals should be our basic priority during the improvement of the quality in order to check the water quality at regular intervals to improve the quality of the water to be used for the daily domestic purposes.**

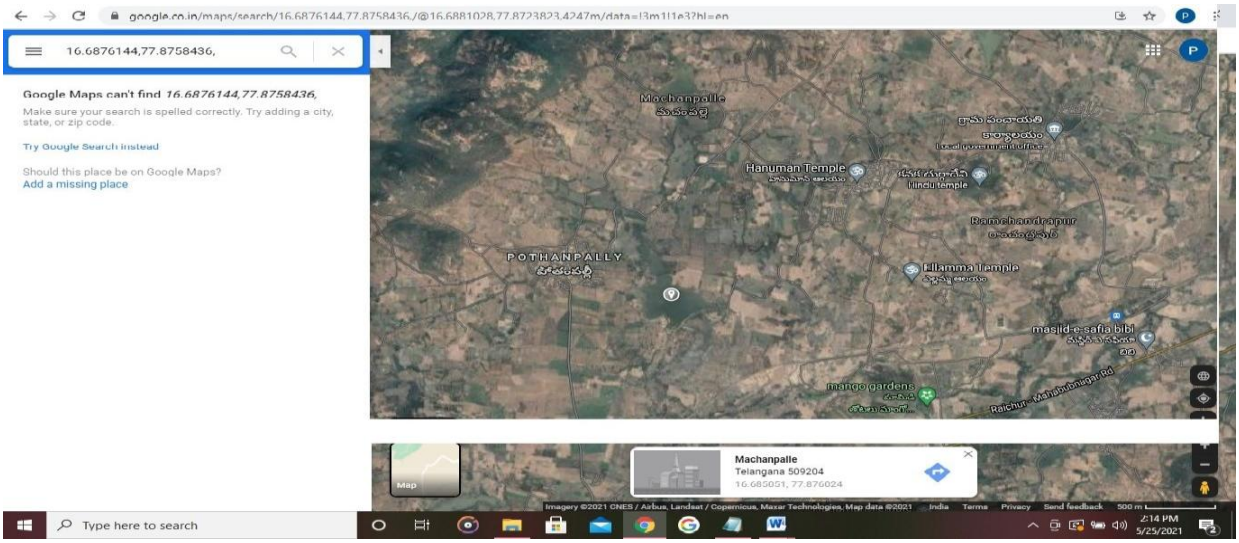
Keywords **— Water Quality, Domestic, Physical, Chemical Parameter, Health Issues.**

I. Introduction

Water is very vital for human beings and the health of its ecosystem. Thus quality of water is extremely important. The surface water quality is a very sensitive issue and is also a great environmental concern worldwide. Surface water pollution by chemical, physical, microbial and biological contaminants can cause epidemic problems, at times all over the world. Fish survival / growth and other biodiversity, conservation activities, recreational activities like swimming and boating, industrial / municipal water supply, agricultural uses such as irrigation and livestock watering, waste disposal and all other water uses are affected by the physical, chemical, microbial and biological conditions that exist in the water courses and also in subsurface aquifers. The surface water systems are naturally open to the atmosphere, such as lakes, rivers, estuaries, reservoirs and coastal waters. A natural process such as changes in erosion, precipitation, weathering of crustal material as well as any anthropogenic influences such as urban, industrial and agricultural activities, increasing rate of consumption of water resources, degrade in the quality and quantity of surface water and make it unsuitable for domestic uses. Industrial waste water, runoff over the agricultural lands and municipal sewage disposal are the most vulnerable for water pollution. The concentration of biological available nutrients in excess and concentration of toxic chemicals leads to diverse problems such as toxic algal blooms, loss of oxygen in water, fish kill loss of biodiversity and loss of aquatic plants and coral reefs.

II. Location, Sample, Parameters

Assessments of surface water quality carried out in the area of machanpally village located in mahabubnagar district in Telangana state, India. The samples are collected from different sources which water is obtained from Rainfall. The collected sample are analyzed and determined to know the suitability of drinking and irrigation purpose.



Sampling points should be selected such that the samples taken are representative of the different sources from which water is obtained by the public or enters the system. These points should include those that yield samples representative of the conditions at most unfavorable sources or places in the supply system, particularly points of suitable contamination such as unprotected sources, loops, reservoirs, low-pressure, ends of the system, etc

- p^H
- Colour
- Nitrates
- Sulphates
- Fluorides
- Chlorides
- Magnesium
- Iron
- Total dissolved solids
- Total hardness
- Electrical conductivity
- Turbidity
- Sodium
- Potassium
- Calcium
- Total alkalinity

III. Determination of Parameters

Sample collected are tested using digital pH meter. The normal range for pH in surface water system is 6.5 to 8.5 and for ground water system 6 to 8.5.It is a measure of the capacity of the water to resists a change in pH that would tend to make the water more acidic is needed to determine the conductivity of the water. The measurement of alkalinity and pH is needed to determine the corrosively of the water. The pH of pure water is 7 is considered as acidic, and with a pH greater than 7 is considered as basic. Acidic water can leach metals from pipes and fixtures, such as copper, lead and zinc. These effects aren't harmful to your health, but then can be harmful to your budget.

As per the drinking water standard values, our samples values are within the acceptable limits. So the collected water samples are safe according to pH. If the pH is less than 7 it is called as acid, if it is greater than 7 it is considered as base, it is harmful to use.

Colour is not a toxic characteristic, but is listed by the EPA as secondary parameter affecting the appearance and palatability of the water. When chlorinated, colour-causing organic matter may form chlorinated organic compounds such as trihalomethanes.Colour in drinking water can be caused by dissolved and suspended materials, and a brown shade in water often comes from rust in the water pipes. Although water can contain contaminants, which are usually removed by water treatment.

Nitrate is the highest oxidation form of nitrogen and occurs in trace quantities in surface water but may attain high levels in some ground water and is toxic when present in excessive amounts in drinking water mostly nitrates comes from industrial, agricultural chemical and fertilizers application. The most common source of nitrate concentration is a attributed to animals and human waste disposal practices and use of agricultural fertilizers. The nitrates concentration measurements, for his water samples range as per WHO 45mg/l. As per the drinking water standards, the limits of samples collected are in within limits. If samples has execess values it can cause methemoglobinemia, “Blue baby “disease. Hence, this sample water is suitable for drinking water.

The sulphate concentration range is 200mg/l that recommended by WHO. The sulphate concentration range is 200mg/l that recommended by WHO. Guidelines for drinking water however; samples have a high amount of sulphates concentration. The sulphates concentration in the analyzed sample is probably derived from oxidation of sulphate in the igneous rocks. These show as it is above threshold value it needs further treatment to make safe water for the drinking purpose. As it is above threshold value it needs further treatment to make safe water for the drinking purpose. In humans, concentrations of 500 - 750 mg/L cause a temporary laxative effect. At very high concentrations sulfates are toxic to cattle. Problems caused by sulfates are most often related to their ability to form strong acids which changes the pH. Sulphates may have a laxative effect that can lead to dehydration.

Most surface water samples have low or acceptable concentrations of fluoride (< 1.5 mg/l) according to the recommendation of WHO (1993). However, some large surface water provinces have significant concentration which cause prominent health problems presence of large amount of fluoride is associated with dental and skeletal fluorosis (< 1.5 mg/l) and inadequate amount with dental caries (< 1 mg/l). Fluorides concentration is very small in the range of 0.1ppm. which is referred by dental caries in some areas. This requires some remedial action to be done, more supply of fluorides to the water or from other sources is required.Consuming excess fluoride, most commonly in drinking water, can cause fluorosis, which affects the teeth and bones. In the body, most fluoride is contained in bones and teeth. Fluoride is necessary for the formation and health of bones and teeth.

Chlorides are very common in water system as they are added to drinking water for various health and sanitary purposes. However, chlorides levels can be increased by contamination of fertilizers, road salt, and industrial pollution as well as human and animal waste. The contaminants can cause dramatic increase in chlorides concentration of chloride is the indicator of sewage pollution and also imparts laxative effect. Atmospheric sources or sea water contamination is reason for bulk of the chloride concentration is surface water which may exceed due to base exchange phenomena, high temperature, domestic effluents, septic tanks and low rainfall. Porosity and permeability also plays a key role in building up the chlorides concentration. According to WHO recommendation, the permissible value is 250 mg/l. Chloride concentrations in excess of about 250 mg/litercan give rise to detectable taste in water and also causes of Hyperchloremia.

Magnesium is present in sea water in amount of about 30ppm. After sodium, it is the most commonly found cat-ions in oceans. Rivers contains approximately a ppm of magnesium drinking water per liter. Magnesium and other alkali earth metals are responsible for water hardness. Water containing large amounts of alkali earth ions is called hard water. This causes serious side effects including irregular heartbeat, low blood pressure, slowed breathing. As per low magnesium can weaken the bones. As per the drinking water standards the values are not permissible limits. According to this test, the water is unsafe forusage.

Iron in surface water and iron rural water supplies is a common problem; its concentrationlevel ranges from 1mg/l. while WHO recommended levels is < 0.3 mg/l. The Iron occurs naturallyin the aquifer but levels in surface water can be increased by dissolution of ferrous element. Iron does not clearly alter in pure water and oxygen are present (moist) iron corrodes.

Total dissolved solids values depend on climate, the host rock, and the residence time of the surface water in the geological matrix. Thus, it tends to be higher in arid/desert areas than in tropical areas that receive abundant rainfall. It also

enhanced in agricultural arid areas due to cyclic salting process, in which salts are concentrated and precipitated in the soil zone from irrigated water die to high evaporation rates, and then leached from the soil zone by either irrigation or rainwater and percolated, hence reaching the surface. The TDS was found to be in an acceptable range for the water samples collected from area.The possibilities of dissolution of rocky minerals are very low. However; the rest of water samples were found to passes high TDS values when compared with the tolerance limit of 500mg/l.

Water with high levels of TDS around 1000 ppm is considered unfit for human consumption. High levels of TDS are caused due to the presence of potassium, chloride and sodium and toxic ions in larger amounts. It is also undesirable to drink as it may taste salty, metallic or bitter.

Hardness is one of the very important properties of surface water from a utility point of view for different purposes. In surface water, hardness is mainly contributed by bicarbonates, carbonates, sulphates, and chlorides of calcium and magnesium. So, the principal hardness causing ions are calcium and magnesium. WHO standards given for hardness include 200mg/l.

As per drinking water standard values the surface water are not in the acceptable limits, so the water is unsafe for drinking purpose. Using hard water not only makes your skin dry but also leads to bumpy patches on the skin. These skin problems are caused by the presence of excessive minerals in the water.

Electrical conductivity is a measure of the ability of an aqueous solution to carry an electrical current that depends on the presence and total concentration of ions their mobility and waste water and water. It is a useful tool to access the purity of water. The WHO permissible limit for electrical conductivity of water is 300 µs/cm and the values of electrical conductivity in all sampling points were ranged from 449, 1035, 1574, 1870 µs/cm. these values are above WHO permissible limits.

Pure, distilled water is a poor conductor of electricity. When salts and other inorganic chemicals dissolve in water, they break into tiny, electrically charged particles called **ions**. Ions increase the water's ability to conduct electricity. Common ions in water that conduct electrical current include sodium, chloride, calcium, and magnesium. Because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increases.

Turbidity in water arises from the presence of very finely divided solids which are not filterable by routine methods. The existence of turbidity in water will affect its acceptability to consumers. There is a risk that pathogenic organisms could be shielded by the turbidity particles and hence escapes the action of the disinfectant. The threshold value that is recommended by WHO, as per drinking water standard 10500:2012 is 10NTU. This indicates that it is necessary to treat water from this sampling area before use.

Sodium is an important ion in the earth's crust. Concentration of sodium range of 200mg/l as per drinking water standards of IS 10500: 2012, sodium is a common element in the natural environment and is often found in food and drinking water. In drinking water, sodium can occur naturally or be the result of road salt application, water treatment chemicals or ion-change water softening units. Sodium levels may also vary in bottled water and carbonated water, depending on the brand. The human body needs sodium in order to maintain blood pressure, control fluid levels and for normal nerve and muscle function.

Potassium is important ion in surface water and are used to assess quality control for samples and laboratory analysis like sulphates, sodium and potassium are often useful for identifying the source of surface water. This may be useful for programs such as well head protection.

Calcium occurs in water naturally sea water contains 75mg/l calcium one of the main reasons for the abundance of calcium in water is its natural occurrence in earth's crust. Calcium is also a constituent of coral. Rivers generally contain 1-2ppm calcium but in lime areas rivers may contains calcium concentration of high as 100ppm.

IV. Result & Conclusion

The results of various samples tested tabulated below.

S.NO.	TEST PARAMETERS	UNITS	RESULTS	Acceptable limits (As per IS: 10500:2012)
1.	pH	--- ----	7.21	6.6-8.5
2.	Colour	Hazen	1.0	5.0
3.	Electrical conductivity	µs/cm	2514	200-800
4.	Turbidity	NTU	0.3	MAX 1.0
5.	Total dissolved solids	Mg/l	1690	MAX 500
6.	Total Hardness as CaCO3	Mg/l	740	MAX 200
7.	Calcium as Ca	Mg/l	196.0	MAX.75
8.	Magnesium as Mg	Mg/l	60.0	MAX 30
9.	Total alkalinity	Mg/l	420	200
10.	Chlorides as Cl	Mg/l	335	MAX 250
11.	Sodium as Na	Mg/l	230	30-60
12.	Potassium as K	Mg/l	6.2	0.72-8.3
13.	Sulphates as SO_4	Mg/l	329.2	MAX 200
14.	Nitrates as NO_3	Mg/l	13.2	MAX.45
15	Iron Fe	Mg/l	0.26	MAX 0.3
16.	Fluorides F	Mg/l	1.30	MAX 1.0

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6.	Total Hardness as CaCO3	Mg/l	740	MAX 200
7.	Calcium as Ca	Mg/l	196	MAX.75
8.	Magnesium as Mg	Mg/l	60	MAX 30
9.	Total alkalinity	Mg/l	395	200
10.	Chlorides as Cl	Mg/l	335	MAX 250
11.	Sodium as Na	Mg/l	230	30-60
12.	Potassium as K	Mg/l	6.2	0.72-8.3
13.	Sulphates as SO4	Mg/l	329.3	MAX 200
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1.	pH	------	7.2	6.6-8.5
2.	Colour	Hazen	1.0	5.0
3.	Electrical conductivity	µs/cm	1985	200-800
4.	Turbidity	NTU	0.3	MAX 1.0
5.	Total dissolved solids	Mg/l	1547	MAX 500
6.	Total Hardness as CaCO3	Mg/l	650	MAX 200
7.	Calcium as Ca	Mg/l	165	MAX.75
8.	Magnesium as Mg	Mg/l	52	MAX 30
9.	Total alkalinity	Mg/l	355	200
10.	Chlorides as Cl	Mg/l	295	MAX 250
11.	Sodium as Na	Mg/l	175	30-60
12.	Potassium as K	Mg/l	5.5	0.72-8.3
13.	Sulphates as SO4	Mg/l	332.3	MAX 200
14.	Nitrates as NO3	Mg/l	12.5	MAX.45
15	Iron Fe	Mg/l	0.21	MAX 0.3
16.	Fluorides F	Mg/l	1.15	MAX 1.0

The collected water sample-1,sample- 2,sample-3 are in acceptable limits. But some parameters have exceeded the limits. So, this samples are not suitable for the drinking purpose. As far as the TDS (total dissolved solids) is concerned, the results are not in acceptable limits.

Due to excess TDS(total dissolved solids) It is also undesirable to drink as it may taste salty, metallic or bitter. Sodium excessive in all most every Condition. Due to excess sodium we may get Hypernatremia.

The sample-1,sample-2,sample-3, are not in acceptable Limits. Due to excess calcium we may get Hypocalcaemia. Due to excess fluorides consuming commonly in drinking water, can cause fluorosis, which affects the teeth and bones.

Due to excess magnesium causes serious side effects including irregular heartbeat, low blood pressure, slowed breathing. Due to excess hardness not only makes your skin dry but also leads to bumpy patches on the skin.

Electrical conductivity results are not in acceptable limits. Pure, distilled water is a poor conductor of electricity. When salts and other inorganic chemicals dissolve in water, they break into tiny, electrically charged particles called ions. Ions increase the water's ability to conduct electricity.

Due to excess potassium most common cause of high potassium is kidney disease and Dehydration. There is a significant increase in both the sulphate content & chloride content in the set of samples.so, samples are not suitable for the drinking purpose and also causes dehydration. sample-1, sample-2,sample-3 termed as the most impure water. But after the treatment process we can use this water for multiple purpose, such as supplying drinking water, irrigating crops, and sustaining aquatic life.

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