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FEASIBILITY STUDY OF GROUNDWATER SOURCES FOR ROYAL EMRAN HOUSING IN GRESIK

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ABSTRACT

Water plays a role in the creation of everything we produce, and cannot be replaced although it can be renewed but is very limited. Local residents usually get clean water sources in the form of groundwater / wells. Based on the Minister of Health Regulation No. 2 of 2023, the standard quality of clean water products has 3 parameters. The first parameter is the physical test which includes color, odor, turbidity, amount of dissolved solids, and temperature. The second parameter is a chemical test which includes pH, Iron (dissolved), Manganese (dissolved), Chromium (dissolved), Nitrate, and Nitrite, the last is Microbiological Parameters which include Total Coliform and *E-Coli* bacteria.

In the research entitled "Feasibility Study of Groundwater Sources for Royal Emran Gresik Housing". This research uses qualitative research methods. In this study the sampling method is conical to SNI 6989.58.2008. Sampling was carried out four (4) times for two weeks. Stages of sampling according to SNI 6989.58.2008. This study aims to determine the quality and quantity of groundwater, aquifers, well discharge, and also chemicals present in groundwater. Research using the storet method provides the results of information that the water samples tested are proven safe as a clean water source needs not for consumption, and for now one well point can meet the needs of Royal Emran Gresik Housing residents, but for future clean water needs groundwater sources certainly cannot meet the needs of clean water for all residents of Royal Emran Gresik Housing, if the entire housing land is densely populated, followed by population growth.

Keywords: Groundwater quality and quantity, aquifers, well discharge, groundwater chemicals.

Introduction

Water is a non-biodegradable natural resource that can be renewed due to its continuous availability in nature as long as it is not excessive. Water is also a very important component of human life. Indonesia has an abundant supply of water, but over the years clean water has become scarce and an emergency.

Gresik district has a geographical location between 112°-113°BT and 7°- 8°LS, including in the lowland category with an altitude of about 2-12 meters above sea level, but there is one area that has an altitude of 25 meters above sea level, the area is Panceng sub-district. The local residents usually get clean water sources in the form of groundwater / wells. Based on the Regulation of the Minister of Health No. 2 of 2023, the standard quality of clean water products has 3 parameters. The first parameter is physical test which includes color, odor, turbidity, amount of dissolved solids, and temperature. The second parameter is a chemical test which includes pH, Iron (dissolved), Manganese (dissolved), Chromium (dissolved), Nitrate, and Nitrite, the last is Microbiological Parameters which include Total Coliform and E-Coli bacteria, but because researchers will only carry out physical and chemical tests because they are felt to be sufficient as daily clean water needs not for consumption.

The use of water that does not meet the requirements can lead to health problems. Negative pressure on the body can be caused by using air that does not meet expectations. Such health problems can manifest as communicable or non-communicable diseases. Waterborne diseases, or infectious diseases, are diseases that spread slowly through the air. (waterborne disease). Royal Emran Gresik Housing has 1,050 housing units, 1 well with a well depth of 100 meters, a total filter of 40 meters, a water intake debit of 120 m3 / day and a permit validity period of 3 years. To improve the quality of the company in the Royal Emran Gresik Housing environment, the need for clean water is one of the most important factors in supporting the various clean water needs of local residents to include washing, bathing to latrine needs and so on. This greatly impacts the availability of clean water sources, which are in a residential environment that generally uses groundwater sources.

Research Methods

This study uses a qualitative method by taking samples from three residents' houses consisting of two samples, namely tap water samples and borehole water samples in the residents' yard, and one sample of the main water source. This research uses a storetical research method in which this research refers to the comparison of the results of water testing samples.

In this study the method of taking while conical in SNI 6989.58.2008. Sampling was carried out four (4) times for two weeks. Stages of sampling according to SNI 6989.58.2008 "How to Test Storet Water Samples".

Table 1. Point Coordinates CPT

POINT	UTM COORDINATES
S-1	112^0 29^0 15 "E
S-2	7^0 19'30 "S
S-3	7^0 19'25 "S

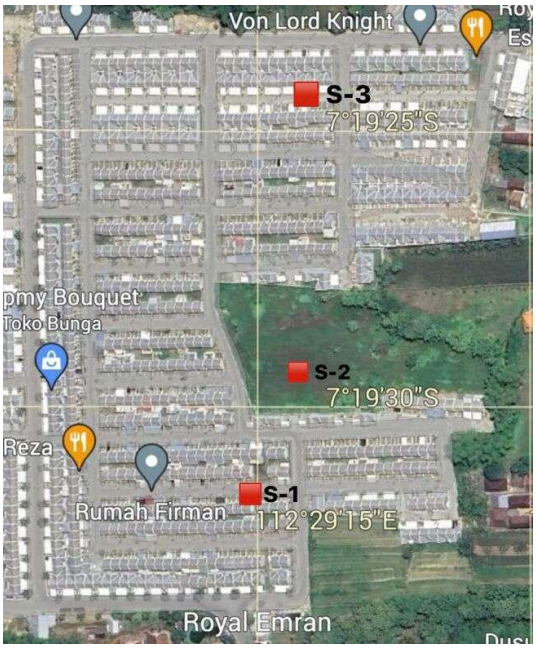

Figure 1: Location of CPT Points

Results and Discussion

Based on the results of observations of the Royal Emran Gresik Housing well water source samples for eleven days at the ITS Environmental Engineering Laboratory. The results obtained in the samples that observers took varied greatly for chemical parameters and physical parameters in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No. 2 of 2023. Laboratory results for the five parameters are presented in the following table:

Table 2: Test measurement of physical parameters

No.	P. Physics	Sat	MOH RI No. 2/2023	Results	Analysis Method
1.	Color	PtCo Unit	10	75,3	Spectrophotometry
2.	Smell	-	Odorless	Odorless	Organoleptic
3.	Turbidity	NTU Scale	<3	143,00	Turbidimetry
4.	Total Dissolved Solids (TDS)	Mg/L	<300	442,00	Gravimetry
5.	Temperature	^{0}C	Air temperature ±3 C^0	2,7	Thermometer

Table 3. Chemical Parameter Measurement Test

No.	P. Chemistry	Sat	Permenkes RI No.2/2023	Results	Analysis Method
1.	pH	-	6,5-8,5	7,7	pH Meter
2.	Iron	Mg/L Fe	0,2	9,5	Spectrophotometry

3.	Manganese	Mg/L Mn	0,1	0,44	Spectrophotometry
4.	Chromium	Mg/L Cr^{6+}	0,01	0,000	AAS
5.	Nitrate	Mg/L NO N_{3-}	20	1,06	Spectrophotometry
6.	Nitrite	Mg/L NO - N_2	3	0,047	Spectrophotometry

In the test results above, the results of the ITS Environmental Engineering Laboratory have been shown using several paid laboratory methods of Rp. 600,000 / sample to determine the quality of clean water with three chemical, biological and physical parameters, in this analysis the researcher uses one water sample taken at the point of the resident's groundwater source, namely, well water located next to the Royal Emran Gresik Housing swimming pool.
In addition to using laboratory analysis methods, researchers also conducted field analysis using three tools, namely the TDS meter, pH meter and Air Thermometer. The following manual field results are presented in the following table:

Table 4. Manual Measurement Test

Sample Point	**Water Type**		**Parameters**					
		pH		Temperature	TDS	Turbidity	Color	Smell
Block A02	Drill	7,2		3,12	323,00	Clear	Clear	No
	Faucet	7		3,15	319,00	Clear	Clear	No
Block J37	Drill	7,2		3,08	317,00	Clear	Clear	No
	Faucet	7,1		3	316,00	Clear	Clear	No
Block H05	Drill	7,5		4,01	424,00	Yellow	Yellow	No
	Faucet	7,3		4	347,00	Yellow	Yellow	No

The data above is the result of analysis from laboratory analysis and also using the storet method, which is taking several water samples from different points to be

analyzed using several methods for comparison. In addition to clean water data, researchers will present some data obtained from developers.

PT Satria Eka Perkasa is a property company where the office is located on Jalan Raya Meduran No.251-B RT.000 RW.000, ROOMO, ROOMO Village, Manya sub-district, Gresik Regency, East Java Province, when running the Royal Emran Gresik Housing development project, PT Satria Eka Perkasa provides a clean water source to fulfill the daily needs of clean water that will be used by local residents, where this well has the following qualifications:

1. Depth 100 meters
2. Discharge generated 120m^3 /day or equivalent to 120,000 liters/day
3. Depth of aquifer tapped 60m.bmt to. 100m.bmt
4. Pipe crest Ø - inch: length-meter
5. Crest pipe strainer Ø - inch: length-meter
6. Position of sill pipe filter -m.bmt to m.bmt
7. Up pipe Ø 5 inch; 60 meters long
8. Filter pipe up Ø 5 inch; 40 meters long
9. Pipe filter position rises 60 m.b.m. to 100 m.b.m.
10. Total filter 40 meters
11. Type of submersible pump
12. Pump capacity 2.2 KW
13. Pump position 60 meters
14. Suction pipe diameter Ø 2 inch: length 60 meters

Domestic water demand
= 30 ltr/person/day
Non-domestic water demand (5%)
= 5% x A
Water loss (15%)
= (A+B) x 15%
=4.725 ltr/person/day
Total water demand :
A+B+C = 36,225 ltr/person/day
In a family of 4 people
36.225 ltr x 4 people = 144.9 ltr/day/house
The Royal Emran Housing Well can produce 120,000 liters of water a day:

Required discharge
= 144,9 x 200
= 28,980 liters/day

Rounding= 29,000 liters/day (200 houses)

So the need for clean water for 800 residents of Royal Emran Gresik Housing is 29,000 liters a day.

So it can be concluded that for a while, Royal Emran Gresik Housing can meet the clean water needs of 800 active residents of Royal Emran Gresik Housing by utilizing one point of well water source that is currently used.

So for now a single point source of well water can pump

$$\text{Discharge} = \frac{V}{t} = \frac{29.0000}{3.600} = 8.055 \text{ lt/det in a day}$$

While Royal Emran Gresik Housing has a building of **1,050** housing units, houses that are actively occupied are around **200** units, the criteria for active people living in Royal Emran Gresik Housing are 800 people. With the following calculations:

Required discharge

= 29 m^3 /day/200houses

$$\frac{Jumlah\ unit\ keseluruhan}{unit\ aktif} = \frac{1.050}{200} = 5{,}25$$

The amount of clean water required for the needs of all residents of Royal emran Gresik Housing. **If** all housing units are active.

Overall required discharge

= 5,25 × 29

= 152.25 m^3 / day (all needs)

In the old borehole / well groundwater exploitation permit letter, it is written that the permitted water withdrawal rate is 120m^3 in one day, while Royal Emran Gresik Housing requires a well water source of 152.25 m^3 / day, it can be concluded that for the future period of time if all housing is actively occupied, it requires 2 well points as a clean water source requirement.

Conclusion

1. From the results of the analysis that researchers conducted using two research methods, namely the storet method with manual tools and the ITS Environmental Engineering laboratory method, the groundwater content of Royal Emran Gresik Housing has a fairly high chemical substance in the form of Fe, Mn, and also a fairly high pH, but because the needs required are as clean water needs not for consumption, the quality of groundwater sources in Royal Emran Gresik Housing is quite safe as a fulfillment of clean water quality standards not for consumption, in accordance with the Minister of Health Regulation. RI No. 2/2023 from the point of view of research using laboratory methods, then from the point of view of research using the storet method or a method commonly called the comparison method, it can be concluded that the groundwater quality standards have also proven to be quite good for use as a source of groundwater needs for local residents but it is also not recommended for consumption.
2. For now, one well point can meet the needs of residents of Royal Emran Gresik Housing, but for future clean water needs, groundwater sources will certainly not be able to meet the needs of clean water for all residents of Royal Emran Gresik Housing, if the entire housing land is densely populated, followed by population growth.
3. From the results of the research that researchers observed. Residents can consume the water channels in each resident's tap by boiling first to bring up the froth that contains dissolved solids, iron, and manganese.

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