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*by Wati Pranoto*

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**Ground Water Potencial Analisis in Saolat and Waijoi Area  
East Halmahera**

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**Abstract.** The Saolat and Waijoi areas are water prone areas in the East Halmahera region which are inhabited by 2,979 people who still have problems in the supply of drinking water. Potential surface water that meets drinking water quality standards is quite far, which is more than 10 km. Groundwater potential is the expected potential, but requires further study. Research on the potential of groundwater is carried out with a hydrological study of groundwater recharge needs to be done, so that groundwater uptake does not disturb the water balance in the ground. Meanwhile, to find out the potential groundwater point, geoelectricity is used to determine the predicted point which is predicted the groundwater potential is available. The area of blood catchment in the Saolat and Waijoi areas is 71,108,366 m<sup>2</sup> with a total built area of 1,202,747 m<sup>2</sup>. Precipitation is 187.92 mm / month with infiltration of 143.99 mm / year and groundwater recharge of 318 liters / second. This groundwater potential is very sufficient to meet the drinking water needs which until the projected year of 2.038 is 7.33 liters / second.

**Keywords:** Ground Water

**I. Introduction**

Halmahera Island is the largest land mass in the North Maluku region, but not all regions have the potential for raw water for drinking water that is easily accessible. One area that is included as a water-prone area is Saolat and Waijoi, which have limited raw water potential for drinking water. Drinking water supply in this coastal village area was carried out by constructing dug wells with a depth of 6-12 meters, but many wells were brackish, especially during high tides. The availability of surface water in the area which is inhabited by around 2,979 people is around 10 km, so that it requires a fairly long piping system. Provision of drinking water with a source of surface water (river) requires an appropriate water treatment plant and this requires special expertise in its operation and maintenance. Another potential is the potential of ground water that was studied in this study.

The Saolat and Waijoi areas have an area of 71,108,366 m. with hilly land on the back side predicted to have sufficient groundwater potential to meet the drinking water needs of the local community. The value of ground water as a source of raw water is expected to provide drinking water with quality that meets quality standards so that the community is not burdened with water treatment systems that require special technology that is quite common in the local community.



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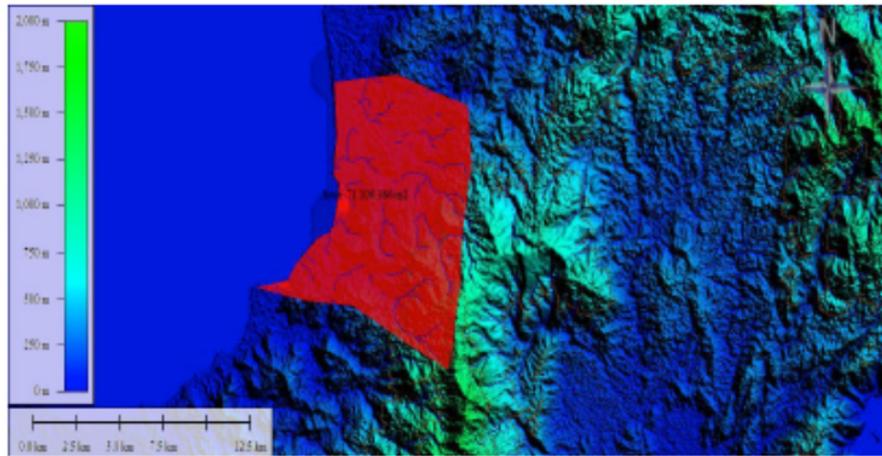


Figure 1. Cathman Area Waijoi – Saolat

## 2. Hydrological Conditions

Based on the results of the rain record of [11] last ten years (2008-2017) it is known that the rainfall in the Saolat and Waijoi areas averaged 189.2 mm / month, with the highest rainfall in May 283.4 mm / month and the lowest in September [15] 99.9 mm / month. Rain occurs only locally (uneven) with a brief duration [16] of rain and briefly dry. The average number of [12] y days in the past 10 years is 17.9 days, while the average number of rainy days per year is 215 days. The [19] imum number of rainy days occurs in December and January above 20 days while the minimum number of rainy days occurs in September under 13 days which is the driest month in the region. From the above hydrological conditions it is known that this region has more rainy days compared to dry days.

## 3. Analysis of Groundwater Potential

### 3.1 Potential Groundwater Reserves

The amount of ground water reserves can be known among other things by knowing the aquifer parameters of the area concerned obtained from drilling data, or [1] from the approach of the amount of water that fills the ground (rock) as a me [1] m for groundwater. This groundwater supply is known as groundwater recharge or recharge [1, 2]. The amount of groundwater recharge can be estimated from the amount of infiltration into the ground. The amount of recharge is calculated by the following equation:

$$Rc = \sum In \times A$$

Where :

Rc = Recharge of ground water (mm/year)

In = Infiltration (mm/year)

A = The total area of the catch (m<sup>2</sup>)

Catchment area of Saolat and Waijoi Regions, namely:

Catch Area = 71,108,366 m<sup>2</sup>

Wide area built = 1,202,747 m<sup>2</sup>

Annual Infiltration Large = 143.99 mm, then the amount of groundwater Recharge is:

Rc = 143.99 mm/year x (71,108,366 m<sup>2</sup> - 1,202,747 m<sup>2</sup>)

= 0.14398 m<sup>3</sup>/year x 69,905,619 m<sup>2</sup>

= 10,065,436 m<sup>3</sup>/year, or

= 838.79 m<sup>3</sup>/month,

= 27.56 m<sup>3</sup>/day,

= 318.93 L/sec (Recharge of ground water)

### 3.2 Geoelectric Estimation

Geoelectric study was carried out at locations predicted to have groundwater potential, in this study conducted in the village of Saolat and Waijoi villages with two test points at each location. Of the two geoelectric points, it turns out that not all points have good groundwater potential, so a drilling point will be chosen at a location suspected of having groundwater potential [3, 4, 5].

#### a. Saolat Area

Table 1. Results of Interpretation and Correlation Between Geology, Hydrogeology, and Estimation of Geoelectric Estimation at Estimates

Guess Point	Coat	Results of Interpretation			Lithology Estimates	Hydrogeology Estimates
		Depth	Prisoners Type			
GL.1	1	0.00 - 4.21	5.41	Ground Cover	Groundwater Free	
	2	4.21 - 15.36	20.13	Sand Clays		
	3	15.36 - 39.64	3.53	Clay		
	4	39.64 - 85.27	6.49	Silt		
	5	85.27 - ~	3.80	Clay		
GL.2	1	0.00 - 4.17	8.38	Ground Cover	Groundwater Free	
	2	4.17 - 13.21	22.50	Sand Clays		
	3	13.21 - 29.56	5.31	Clay		
	4	29.56 - 50.25	13.21	Sand Clays		Shallow ground water
	5	50.25 - ~	3.23	Clay		

Results Geoelectric estimation can give a picture of the subsurface of the distribution of rock layers both upright and horizontally [6,7]. Hydrogeological conditions in the area of investigation, including in the aquifer system through inter-grain space. With its availability including the local area, the aquifers are being productive [8, 9]. To be sure of the investigation of hydrogeological conditions mapped in general above, the geoelectric estimation at that location aims to find out in detail the condition of the rocks that act as aquifers at the location to be held drilling [10, 11, 12]. The rock which is expected to act as a groundwater carrier (aquifer) in the Location of Saolat Hamlet, Saolat Village, South Wasiley District, East Halmahera Regency is clay sand. From the results of the investigation of the geoelectric estimation it can be seen that the aquifer layer is thought to be at a Geoelectric (GL) 2 location with a depth between 19.56 - 50.25 meters with an aquifer thickness of 20.69 meters, thus the recommended depth of drilling at this location is 60 meters.

#### b. Waijoi Area

Table 2. Results of interpretation and correlation between geology, hydrogeology and geoelectrical estimation at the Waijoi's estimation location

Guess Point	Coat	Results of Interpretation			Lithology Estimates	Hydrogeology Estimates
		Depth	Prisoners Type			
GL.1	1	0.00 - 3.12	9.18	Ground Cover	Groundwater Free	
	2	3.12 - 9.47	27.50	Sand		
	3	9.47 - 17.50	13.27	Silt		
	4	17.50 - 34.85	18.36	Sand Clays		Shallow ground water
	5	34.85 - 75.23	10.14	Silt		
	6	75.23 - ~	5.24	Clay		
GL.2	1	0.00 - 3.18	19.11	Ground Cover	Groundwater Free	
	2	3.18 - 9.26	30.12	Sand		
	3	9.26 - 20.37	12.17	Silt		
	4	20.37 - 50.28	6.24	Clay		Akuifer Payau
	5	50.28 - 99.69	2.43	Sand Clays		
	6	99.69 - ~	4.38	Clay		

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Geoelectric estimation can give a picture below the surface of the earth about the distribution of rock layers both upright and horizontally. Hydrogeological conditions in the area of investigation, including in the aquifer system through inter-grain space. With its availability including the local area, the aquifers are being productive [13]. To be sure of the investigation of hydrogeological conditions (page 1 mapped in general mentioned above, the geoelectric estimation at that location aims to find out in detail the condition of the rocks that act as aquifers at the location to be drilled [14, 15]. Rocks that are expected to act as groundwater carriers (aquifer) in the location of Waijoi Village, South Wasile District, East Halmahera Regency is a sandy loam. From the investigation of geoelectric estimation it can be seen that the aquifer layer is located in geoelectric (GL) 1 location with aquifer depth between 17.5 - 34.85 meters with aquifer thickness is 17.35 meters, so at this location the recommended drilling depth is 40 meters.

#### 4. Conclusion

Saolat and Waijoi villages are water-prone villages where there is currently no adequate drinking water supply system. One of the potential raw water for drinking water is ground water which is based on the results of analysis and estimation with geoelectric has sufficient potential to meet the drinking water needs in these two regions. Groundwater recharge in these two regions is 318.93 liters / second so that the groundwater potential in the region is predicted to be far greater than the drinking water needs of the local community.

The aquifer position in the Saolat location is between 19.56 - 50.25 meters with an aquifer thickness of 20.69 meters, and it is recommended that drilling is carried out at GL 2 point with a well depth of 60 meters. As for the Waijoi location, the depth of the aquifer is between 17.5 - 34.85 meters with the thickness of the aquifer 17.35 meters, and it is recommended that drilling be done to a depth of 40 meters.

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