Groundwater Flow Modeling Based on Contour Maps in the Lempuing District, Ogan Komering Ilir Regency, South Sumatra

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Groundwater Flow Modeling Based on Contour Maps in the Lempuing District, Ogan Komering Ilir Regency, South Sumatra

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Abstract. OKI Regency is one of the developing districts. Along with this development, the need for water continues to increase. One of the sources of water used is groundwater use. Using groundwater not in accordance with the principles of good groundwater treatment can cause negative impacts. In managing these water resources, data on groundwater potential in OKI Regency could be needed so that by knowing the groundwater potential, groundwater resources could be utilized/exploited optimally, while the negative impact of groundwater extraction could be minimized. Based on groundwater flow modelling in Lempuing District, OKI Regency has one catchment area. In Lempuing District, OKI District was contained in an unconfined aquifer composed of tuff sandstone sediment units. The groundwater flow pattern tends to follow the surface contour of an area; in the lempuing area, it has a water flow movement from north to south with variations from west to east. Based on the administrative map, the location of the catchment area is in the villages of Bumiarjo, Mulya Jaya and Suka Mulya.

Keywords : Groundwater, flow pattern, modeling, aquifer, surface countur

1 Introduction

Groundwater is water that occupies rock pores below the soil surface in the water-saturated zone (Santosa and Adji, 2014). Groundwater resources are renewable naturally because groundwater is an integral part of the hydrological cycle (Asrifah, 2012). The existence of groundwater can be found in almost all places on Earth, even under the frozen ice sheet groundwater can be found (Asdak, 1995).

The availability of groundwater depends on the presence or absence of rock layers that can store groundwater. Groundwater is in a geological formation known as an aquifer. Aquifers are formations that can store and drain sufficient amounts of water, which means that they are able to flow a well, a river and a spring (Sudarmadji et al., 2016). The amount of groundwater that can be stored in an aquifer depends on the characteristics of the aquifer as well as the extent and frequency of recharge (Linsley and Franzini, 1985).

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OKI Regency is one of the developing districts. Along with this development, the need for water continues to increase. One of the sources of water used is groundwater use. The use of groundwater that is not in accordance with the principles of good groundwater treatment can cause negative impacts. In the context of managing these water resources, data on groundwater potential in OKI Regency is needed, so that by knowing the groundwater potential, groundwater resources can be utilized / exploited optimally, while the negative impact of groundwater extraction can be minimized.

In order to obtain data on groundwater potential, complete data availability is required, due to this, this activity is limited to the groundwater system to support the carrying capacity of groundwater in OKI Regency.

The purpose of this groundwater potential mapping research is to carry out an inventory of data and complete it to get an overview of the groundwater system in OKI Regency in order to determine the potential for groundwater, in this case related to the carrying capacity of groundwater in OKI Regency.

The purpose of this research is the availability of groundwater flow system data and groundwater carrying capacity to be used as a basis for groundwater management in OKI Regency.

2 Methods

Research sites. This research was conducted in Lempuing District, Ogan Komering Ilir Regency, South Sumatera Province. The following is a map of the research location (Figure 1).

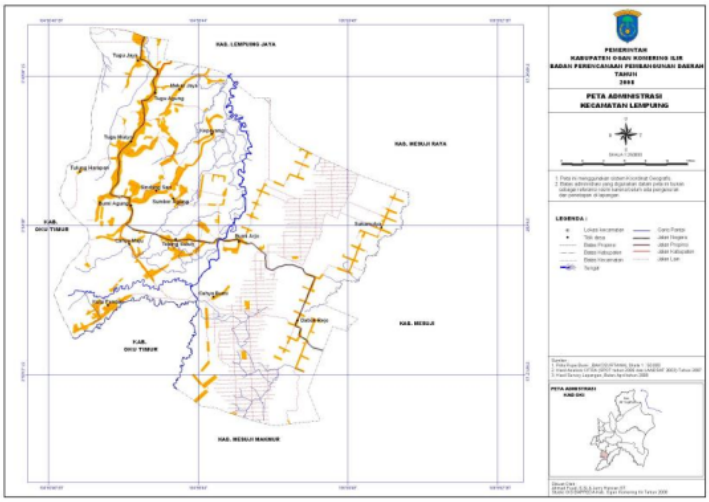

Figure 1. Administrative Map of Lempuing District

Measuring Tool. The equipment used in the measurement is the Resistivity meter model-2115 McOhm (fig. 2). This tool consists of two main components, namely: the commutator which works to convert direct current signals into alternating low-frequency currents which are then injected into the earth: and the potentiometer section which functions to measure the potential difference between two points on the earth's surface. Direct current from the DC power source flows to the commutator to then be converted into alternating current and injected into the earth through the current electrode. The value of the potential difference between two points due to injection of electric current is measured on the potentiometer through the potential electrode. In addition, other tools used are meters, and Global Positioning System (GPS).

Figure 2. Geoelectric Tool Model-2115 McOhm and its accessories (Ibrahim, 2006)

Data Retrieval Technique. Data collection techniques in this study, namely by several processes:

1. Take measurements of the subsurface using the Resistivity Meter Resistivity meter model-2115 McOhm. This measurement is carried out to determine the surface conditions below the earth's surface
2. Track coordinates using GPS
3. Processing the coordinate tracking data into a contour map using the Surfer 13 application.
4. From the contour map, the analysis process can be carried out to determine groundwater flow in Lempuing District, OKI Regency.

3 Results

In this research, firstly, conducting underground survey measurements to determine the lithology conditions of the underground rock. From the research that has been done, the results of the difference in the height of each coordinate point are obtained. In order to obtain a contour map

from Lempuing District, Ogan Komering Ilir Regency. The following is a contour map of Lempuing District (Figure 3).

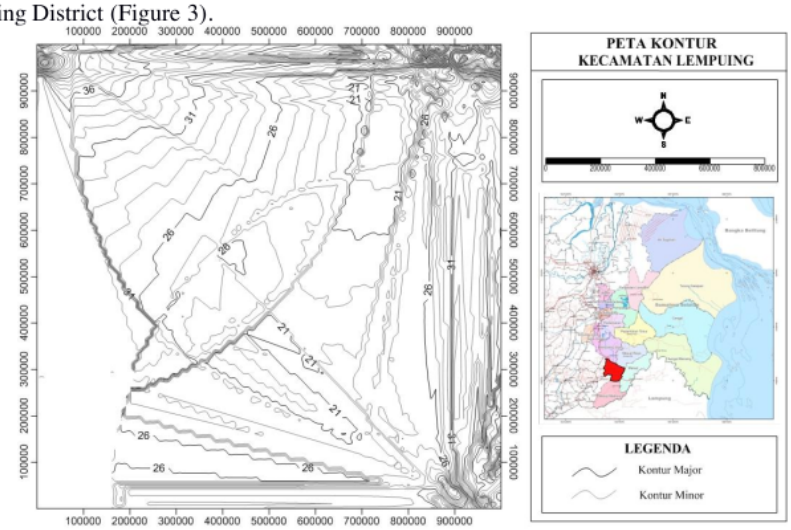

Figure 3. Contour Map of Lempuing District

So from the shape of the height difference, we can know the shape of the aquifer conditions in the study area. The following is a cross-sectional image of the aquifer in the Lempuing area, OKI Regency (Figure 4).

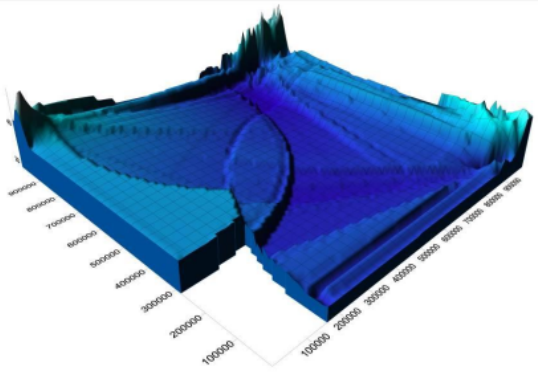

Figure 4. Map of Aquifer Conditions in Lempuing District, OKI Regency.

After carrying out physical modeling of the aquifer, the groundwater flow system modeling can be generated. The following is a groundwater modeling in Lempuing District, OKI Regency.

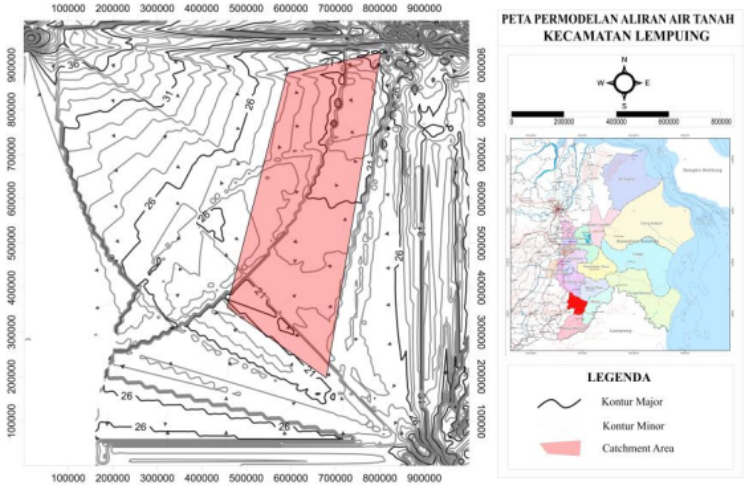

Figure 5. Groundwater Flow Model in Lempuing District, OKI District.

Based on groundwater flow modeling in Lempuing District, OKI District has 1 *catchment area*. In Lempuing District, OKI District is contained in an unconfined aquifer which is composed of tuff sandstone sediment units. The groundwater flow pattern tends to follow the surface contour of an area, in the lempuing area it has a water flow movement from north to south with variations from west to east. Based on the administrative map, the location of the catchment area is in the villages of Bumiarjo, Mulya Jaya and Suka Mulya.

4 Conclusion

From the results of this study, it can be concluded that; based on the groundwater flow modeling map in Lempuing District, Ogan Komering Ilir (OKI) District, there is 1 catchment area. In Lempuing District, there is an unconfined aquifer composed of tuffaceous sandstone deposits. Based on the groundwater modeling map in Lempuing District, Ogan Komering Ilir Regency (OKI), the movement of water flows from north to south with variations from west to east. Based on the administrative map, the location of the catchment area is in the villages of Bumiarjo, Mulya Jaya and Suka Mulya.

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