

SARI

Lapangan panas bumi "X" pada daerah sekitar Danau "Sela" merupakan salah satu lapangan panas bumi yang berada pada Provinsi Sulawesi Utara yang dikelola oleh PT. Pertamina Geothermal Energy. Penelitian ini bertujuan untuk mengetahui keberadaan komponen sistem panas bumi hidrotermal pada bawah permukaan dengan menggunakan metode gravitasi dan magnetotelurik. Pengambilan dan pengolahan data dilaksanakan pada bulan Oktober – Desember 2014 dengan luas area 5 x 5 km.

Pengolahan data metode gravitasi dilakukan dengan koreksi secara observasi dan teoritis untuk mendapatkan anomali Bouguer lengkap. Anomali Bouguer lengkap dilakukan reduksi bidang datar dengan kedalaman sumber 2200 m. Anomali Bouguer lengkap di bidang datar dilakukan pemisahan anomali regional dan residual menggunakan proses kontinuitas ke atas pada ketinggian 1600 mdpl. Interpretasi data dilakukan dengan cara menganalisis turunan kedua vertikal (SVD) dan pemodelan 2,5D gravitasi. Pemodelan ini dibuat 3 (tiga) penampang pada anomali residual dengan analisis turunan kedua vertikal gravitasi dan regional yang dikorelasikan, informasi dari geologi dan log sumur pemboran. Pengolahan data metode magnetotelurik dilakukan dengan mengatur sudut rotasi dan koreksi efek statik. Interpretasi data dilakukan pada anomali resistivitas dan penampang resistivitas yang menampilkan pola dan variasi tahanan jenis secara horizontal dan vertikal yang searah dengan fungsi kedalaman.

Hasil analisis struktur dari turunan kedua vertikal gravitasi mengidentifikasi bahwa keseluruhan jenis sesar normal. Hasil pemodelan dan interpretasi gravitasi residual (dangkal) membuktikan adanya 3 (tiga) lapisan batuan beserta nilai densitas batuan yaitu lapisan Satuan Andesit Pasca "Tdn" ($2,4 \text{ g/cm}^3$), lapisan Satuan Riolit "Tdn" ($2,5 \text{ g/cm}^3$) dan lapisan Satuan Andesit Pra "Tdn" ($2,7 \text{ g/cm}^3$). Hasil pemodelan dan interpretasi gravitasi regional (dalam) membuktikan adanya 3 (tiga) lapisan batuan beserta nilai densitas batuan yaitu lapisan Satuan Riolit "Tdn" ($2,5 \text{ g/cm}^3$), lapisan Satuan Andesit Pra "Tdn" ($2,7 \text{ g/cm}^3$) dan lapisan batuan intrusi diorit ($2,9 \text{ g/cm}^3$). Hasil persebaran anomali resistivitas membentuk keseluruhan dengan lapisan batuan konduktif dan sedikit lapisan batuan resistif ($1 - 33 \Omega\text{m}$). Interpretasi penampang resistivitas berdasarkan klasifikasi nilai resistivitas tersusun oleh 3 (tiga) lapisan batuan yaitu lapisan batuan penudung ($\leq 10 \Omega\text{m}$), lapisan batuan reservoir ($30 - 80 \Omega\text{m}$), lapisan batuan intrusi sebagai sumber panas ($\geq 100 \Omega\text{m}$). Model konseptual sistem panas bumi pada daerah penelitian tersusun oleh Satuan Andesit Pasca "Tdn" sebagai batuan overburden, Satuan Riolit "Tdn" sebagai batuan penudung, Satuan Andesit Pra "Tdn" sebagai batuan reservoir, intrusi batuan Diorit sebagai sumber panas berdasarkan informasi yang di dapatkan dari data gravitasi, magnetotelurik dan penampang geologi.

Kata Kunci: Lapangan Panas Bumi "X", Metode Gravitasi, Metode Magnetotelurik, Pemodelan 2,5D Gravitasi, Penampang Resistivitas, dan Model Konseptual Sistem Panas Bumi.

ABSTRACT

The geothermal field of "X" around "Sela" Lake is one of the geothermal field located in North Sulawesi Province managed by PT. Pertamina Geothermal Energy. This research aims to determine the existence components of a geothermal system of hydrothermal in the subsurface using gravity and magnetotelluric method. Retrieval and data processing was conducted in October – December 2014, with an area of 5 x 5 km.

Data processing in gravity method is taken by observation and theoretical corrections to obtain a complete Bouguer anomaly. Complete Bouguer anomaly carried flat surface reduction with a depth of 2200 m source. Complete Bouguer anomaly in the flat surface is taken by regional and residual anomalies separation using upward continuation process at an altitude of 1600 m msl. Interpretation of data is done by analyzing the second vertical derivative (SVD) and 2,5D modeling of gravity. This is modeling made three section on residual and regional anomalies were correlated with second vertical derivative of gravity analysis, information from geology and well log drilling. Data processing in magnetotelluric method is taken by adjusting the angle of rotation and static effect correction. Interpretation of the data is done by resistivity anomaly and section showing pattern and variation type in horizontal and vertical with same direction of the depth function.

The result of structure analysis from second vertical derivative of gravity identifying that a whole kind is consists of normal fault. The result of gravity modeling residual (shallow) and subsurface interpretation proved by 3 (three) layers of rocks with rock density value are a layer of Post "Tdn" Andesite (2.4 g/cm^3), "Tdn" Rhyolite (2.5 g/cm^3) and Pre "Tdn" Andesit (2.7 g/cm^3). The result of gravity modeling regional (deep) and subsurface interpretation proved by 3 (three) layers of rocks with rock density value are a layer of "Tdn" Rhyolite (2.5 g/cm^3), Pre "Tdn" Andesit (2.7 g/cm^3) and Intrusive rock of diorite (2.9 g/cm^3). Resistivity anomaly distribution result is formed the overall with a layer of conductive rock and resistive layers rock slightly ($1 - 33 \Omega\text{m}$). Interpretation of resistivity section based on resistivity value classification composed by 3 (three) layers of rocks are a layer of caprock ($\leq 10 \Omega\text{m}$), a layer of reservoir rock ($30 - 80 \Omega\text{m}$), a layer of intrusive rock as a heat source ($\geq 100 \Omega\text{m}$). Conceptual model of the geothermal system in the study area is composed by a Unit of Post "Tdn" Andesite as overburden rock, a Unit of "Tdn" Rhyolite as caprock, a Unit of Pre "Tdn" Andesite as reservoir rock, Intrusive rock of diorite as a heat source based on the information from data of gravity, magnetotelluric and geology section.

Keyword: *Geothermal Field of "X", Gravity Method, Magnetotelluric Method, Gravity Modeling 2,5D, Resistivity Section, and Conceptual Model Geothermal System.*