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Geomagnetic Methods At Bukit Nunggal, Air  
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# Review Of The Distribution Of Granite Using Geomagnetic Methods At Bukit Nunggal Air Mesu Village Pangkalan Baru Sub-District Bangka Tengah District

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**Abstract.** Exploration is every activity that happens before the mining activity happens, it has purposes to know, predict and obtain the dimension in quality and quantity from a reserve that has economic value. From surveying at bukit Nunggal, Mesu Village, Pangkalan Baru Sub-district, Bangka Tengah District showed that there are outcrops that indicate the potential for becoming a reserve for granite. Measurement is done to know the resource estimation and it is done by an approach of geomagnetic method that is environment friendly. The geomagnetic method is passive (to measure the magnetism level or susceptibility) from the measuring point. The total of the line to know the dispersion pattern and the depth of the resource is 13 lines with the space between measurement is 10m. From the geomagnetic measurement obtained the IGRF value is 42969, inclined degree 0.424 declined degree – 21.157, susceptibility value in between -54.2nT to 56.1 nT, and the granite susceptibility value is in between 21 nT to 50nT. The anomalies map showed that there is a resource potential, and the resource dispersion is from east to west. Viewed from the topography and the residential areas, the mining activity is recommended to be done in the west area.

## 1. Introduction

Granite stone is one of igneous rock with acid properties which formed from magma that cooled down slowly under the earth surface [5]. Because it is formed under the earth surface, granite stone is categorized into plutonic igneous rock [3][5]. Geomagnetic methods is one of geophysics method that using the geomagnetic nature. This method will give a contour map that show distribution of materials susceptibility under the surface in horizontal direction. From the susceptibility then the materials can be classified by one affected by magnetism and not [4].

Geomagnetic practice can be used to know the minerals susceptibility, from the measurement using geomagnetic method total magnetic value can be obtained [2][3]. Generally geomagnetic interpretation can be separated to two which are quality interpretation and quantity interpretation. Quality interpretation is based on magnetic anomaly contour pattern which sourced from distribution of magnetized objects or geology structure beneath earth surface. Quantity interpretation purpose is to determine the shape or model from the and the depth of anomaly object or geological structure from mathematical modelling [7]. From magnetic value reading then local magnetic anomalies can be interpreted by software to identify natural resource distribution in a form of image [1].

## **2. Method**

Geomagnetic data acquisition is done using looping method. Looping method is a method using one mobile precision particle magnetometer (PPM). This method is done by with base-to-base manner which mean that the acquisition is started from point zero then ended at that same point [4]. Geomagnetic acquisition is done from north to south direction and the acquisition route is determined from west to east direction.

Geomagnetic value acquisition activity is separated into two teams which are helper team and operator team. Helper team is a team that open and find the route that has been determined from work plan map with the help of GPS and existing coordinate. Operator team is a team that do the geomagnetic data acquisition using PPM and the acquisition is repeated five times at each acquisition point for the interest of data validation or correction factor for the data that obtained at that point and the data that needed to be obtained are total magnetic value (TMV) and acquisition time.

The research location of Bukit Nunggal has an area of 114,98 hectares. Research is done with the help of work plan map based on the early field survey. Geomagnetic data acquisition is separated into two ways which are grid and random point. Grid data acquisition is done at thirteen work routes with space of each route around 100m while the random point data acquisition is done in accordance with the mining road that available around Bukit Nunggal. Grid data acquisition and random point data acquisition has same spacing at each acquisition point which is around 10m.

Total magnetic value that obtained will be corrected because the data still affected by IGRF (the International Geomagnetic Reference Field) value, declination, and inclination from geomagnetic field at the research location. IGRF, inclination and declination value can be obtained from various official website that provide the data needed like from [http://www.geomag.bgs.ac.uk/data\\_service/models-compass/igrf\\_calc.html](http://www.geomag.bgs.ac.uk/data_service/models-compass/igrf_calc.html). After every correction is done then total magnetic index (TMI) can be obtained.

Data Processing will be carried out after TMI is obtained. TMI data then will be transformed into geomagnetic anomalies map with colour gradient. In this research TMI will be processed into minimum curvate map. The minimum curvate map then will be filtered step by step from reduce to equator filter, inside this filter inclination and declination values will be included and map with regional correction is made. The last step in filter is upward continuation filter, this filter will show where area of interest is located based on the elevation that used in the filter, in this research the elevation that used are 50, 100, and 150.

## **3. Result and Discussion**

Research location is held at Bukit Nunggal area, Air Mesu Village, Pangkalan Baru Sub-Districts, Bangka Tengah Districts, Bangka Regency, Bangka Belitung Archipelago Province. This research is conducted for eight weeks, and early field survey is done to know the total area of the research from research boundary and as the basis for determining work plan map. Figure one shows the research area boundary of the work plan map based on the field observation. according to the acquisition method that used, grid acquisition method is taken at north to south direction with determined route (represented with green dots) while random point acquisition method is taken randomly following existing mining road (represented with blue line).

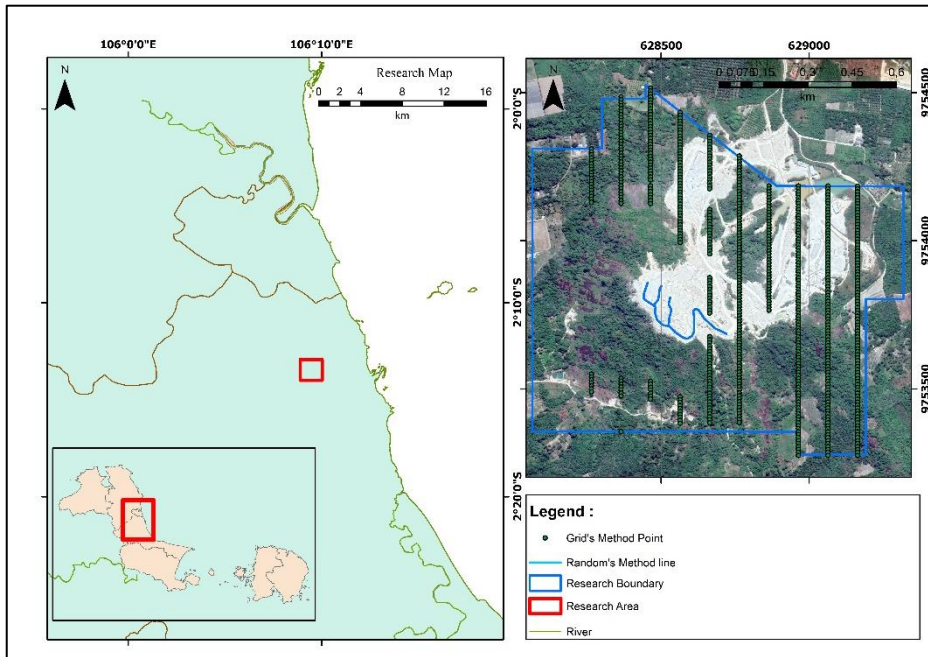


Figure 1 Research Location

### 3.1 Granite Resource Potential Zone

The zone of granite natural resources can be identified after both daily correction and IGRF processes to obtain local geomagnetic value are finished. This value is still affected by the direction of inclination and declination. To remove this effect, 'filer reduce to equator' process is necessary to be applied. This effort is subjected to define magnetic value which directly related to the magnetic anomaly source position. The result of 'filer reduce to equator' is illustrated in the form of local geomagnetic as shown by Figure 2.

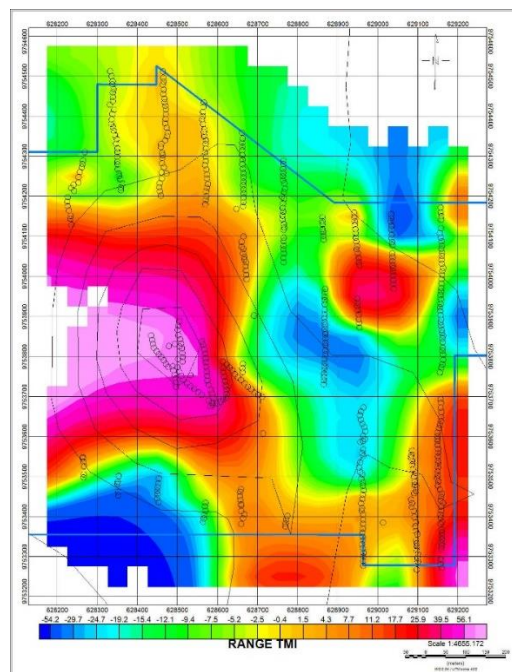


Figure 2 Local geomagnetic anomalies map

Local geomagnetic map produces three different coloured zones, zone one is denoted as sandstone in light blue to green region with moderate susceptibility value ranged from 0 to 20 nT. zone two is denoted by granite in yellow to red colour zone with susceptibility value ranged from 21 to 50 nT due to iron (Fe), quartz (SiO<sub>2</sub>), and hornblende minerals, purple coloured zone in the left area is caused by the mining activity that expose the granite resource which disturb the reading that make TMV data spiked. zone three is denoted as limestone in dark blue colour zone with susceptibility value ranged from -0.1 to -50 nT which is caused by minerals in limestone that have nonmagnetic properties such as cassiterite (Sn).

Based on the discovered outcrop in main research area, the zone which has granite resources is located at yellow to red zone with high susceptibility ranged from 21 – 50 nT due to iron (Fe), quartz (SiO<sub>2</sub>), and hornblende minerals.

### 3.2 Resource Distribution Direction

A Distribution direction of granite is determined by ‘filter upward continuation process. This process reduces magnetic anomaly effect which has no relation with desired materials. ‘Filter upward continuation’ process is a continuation stage after basic local geomagnetic map. In this research, filter is applied on upward continuation 50,100,150 to find out area of interest. The used distribution direction in this research is the result of upward map 150. The result of ‘filter upward continuation’ is written as follow.

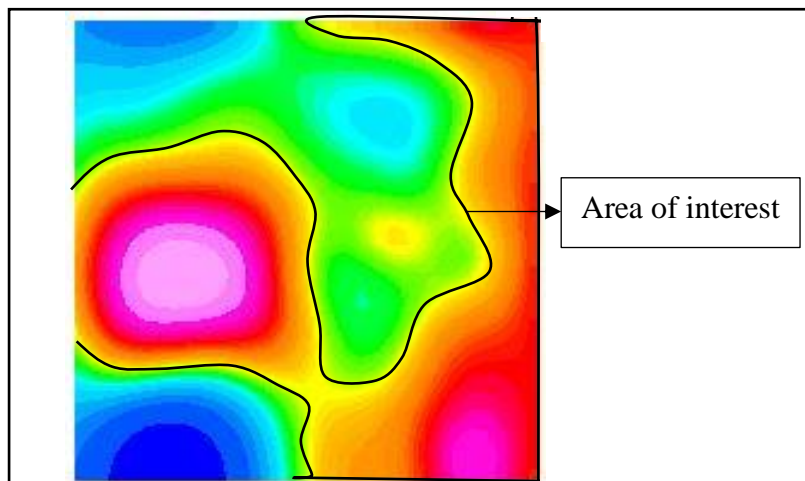


Figure 3 Filter *upward continuation, upward 150*

Based on figure three, distribution area of granite suspected occur at area that coloured with yellow to purple with susceptibility values ranged at 21 - 50 nT where the distribution is located at east to west area.

## 4. Conclusion

Research at Bukit Nunggal, Bangka Tengah resulted in geomagnetic anomalies contour which indicate the main zone that can be suspected has granite natural resource which denoted with yellow to red colored zone with high susceptibility values ranged at 21 to 50 nT and granite resource direction is headed toward east to west direction. Seen from location topography and local residential areas mining activities is advised to be done at west side area.

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