

# Determination of Best Fitting Geoid for Enugu State – Gravimetric Approach

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## SUMMARY

### Abstract

The importance of Geodesy to physical development cannot be over-emphasised, particularly in such developing parts of the world as Africa. In Geodetic and Engineering activities, such geodetic surfaces as the Geoid play a key role in height systems this is because Geoid has direct relationship with the direction of water flow; this is why the best fitting local Geoid of every country needs to be accurately determined. Enugu State is a mainland state in Nigeria. Its capital is Enugu (with Centre coordinates:  $6^{\circ}30'N$   $7^{\circ}30'E$ ). The state has an area of about 7,161 km<sup>2</sup>. It has a population of about 3,267,837 people and density of about 460/km<sup>2</sup> (source: 2006 Census).

This study was aimed at the Determination of a best fitting Geoid for Enugu State, Nigeria. The gravimetric method was applied in the study area. A total of one hundred and ninety five (195) stations within the study area were occupied for gravimetric observations. A Hi-Target Differential GNSS system was used on a static mode for the determination of the positions and ellipsoidal heights of the control points. A Lacoste and Romberg (G-512) gravimeter was used to measure the gravity values of all the locations, the Gravimeter was read at the base station on the average every two hours. The sling psychrometer was used to measure the Air temperature while the relative humidity, used in correcting the barometric readings was determined from the psychrometric chart. The common corrections needed in a gravity survey such as latitude, tidal, altitude, free air, Bouguer, terrain and drift corrections were all applied. The geoidal quantity  $N$ , at a specific control point,  $P$  was determined using the modified Stokes formulas, the Gravity anomaly data obtained from the gravimetric observations was used in the evaluation using the stokes formula. Thus the orthometric heights of the one hundred and ninety five (195) stations were determined as a result. The Geoid heights obtained were compared with the ten control points established by Federal

Surveys by spirit levelling and were found to be consistent. Other results of the study are absolute gravity contour, the Bouguer anomaly and the ellipsoidal heights. This study has achieved the aim of determining best fitting Geoid of the study area using a gravimetric approach. The determined Geoid is relevant in surveying, engineering and disaster management.

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