SUMMARY AND CONCLUSION

The study area covers about 3300 km in the Northern part of the Western Desert of Egypt, extending between latitudes 28° 00` to 30° 00` N and longitudes 27° 00` to 30° 00` E. This area is considered as a part of the unstable shelf (Mobile) of Egypt.

The recent studies on the Northern Western Desert shows that, the rocks and loose sediments cropping out the investigated area belong to the Paleocene, early-middle-late Eocene, Oligocene, early-middle-late Miocene and Quaternary. The lithology of these formations are mainly limestones, sandstones, conglomerates and shales.

The subsurface geology of the area under study is clarified from the study of several bore holes. The sedimentary section has different thickness at different parts. The stratigraphic column is generally thick and includes most of the sedimentary succession from Recent to Pre-Cambrian basement complex.

The detailed study of the critical analysis of the Bouguer anomaly map in the form of shape, extension, amplitude, type and polarity of its anomalies show that the area is characterized mainly by complex subsurface features in the form of major uplifting and downfaulting blocks on the basement surface and the overlying sedimentary cover, associated with high and low gravity values respectively.

The uplifted and downfaulted blocks are separated by linear anomalies of high gradient, great areal extent and different trends. The following are the main conclusion that could be derived from the analysis of these linear anomalies :

a- The predominent directions in the study area are :

i - N 55° E (Qattara or Syrian Arc trend).

ii - N 85° E & N 85° W (Tethyan or Mediterranean or E-W trend)

iii - N 25° E (Aquaba trend).

iv - N 15° W (N-S or East African trend).

v - N 45° W (Suez trend).

b- These recorded tectonic trends represent the most predominent directions in Egypt as recorded by Youssef, 1968. Qattara and E-W trends are most probably the oldest tectonics in the area, which also control the basement block moasic of the Western Desert of Egypt (Halsey et.al., 1975). It is thought that the E-W trend was developed mainly due to compressional fold thrust directions related to late Tertiary, (N-S compression), youssef, 1968 and Halsey et.al., 1975. The Qattara trend has much more manifistation on the sedimentary cover and it is the principal controling direction of major folding running across Egypt from Libya to the Dead sea Rift (Said, 1962 and Halsey et.al., 1975). The Qattara, E-W and the Suez trends represents the most important tectonic directions that affected the structural development of the study area.

c- Two sets of shear zones were detected in the study area. The first include four right lateral shear zones striking in NW direction, whereas the other set include thirteen lift lateral zones striking in NE direction. The NW trending set may represent the Suez right lateral shearing clained to be existing by Halsey et.al., 1975, Health, 1975, and Riad, 1977. Also, El-Shazly et.al., 1975, reported that faults of NW-SE direction may be strike slip faults of right-lateral type. Whereas the NE trending set, most probably includes the Aqaba shear direction which constitutes, together with the Suez trend, the conjugate shear components resulting from the N-S compression.

d- The number, mean depths to the upper and lower surfaces of the different faults show that the predominant range of the basement depth was found to be ranging from 0.5 to 5.0 kms. in the study area.

e- The density contrast between the basement rocks and the overlying sedimentary rocks was found to be 0.23 gm/cm.

f- Some statistical tests such as, product moment correlation coefficient (Karl Pearson), the Standared Deviation (S.D.) and Rank order Correlation Coefficient (Spearman), were used in the present study to deduce a probable relationships between the fault parameters. The results of this study shows a good linear relation between the length of the faults and their different parameters (upper and lower depths and the downthrow of the faults).

These relations were found to have the following form for El-Bahariya area :

	Karl Pearson	spearman's rank order
$L = 3.66 + 0.69\ H$	0.81	0.9992
$L = 5.56 + 0.94\ Z_1$	0.91	0.9993
$L = 3.62 + 0.41\ Z_2$	0.72	0.9993

g- General relations between the different characteristics of the fault systems in the north Egypt were achieved .

These relations are :

$L = 10.8\ H + 4.87$ S.D. $= \pm 7.8$

$L = 16.37\ Z + 5.43$ S.D. $= \pm 5.57$

$L = 2.73\ Z + 4.47$ S.D. $= \pm 4.39$

The regional component was calculated, in the study area using a different techniques. It was found to change from SE to NW this change is considered to be due to the effect of the Mohorovic discontinuities, which separates the lower part of the earth's crust from the upper Mantle.

The thickness of the earth's crust has been determined by five formulae. From the correlative studies of the mean values of the crustal thickness from the above five formulas with and by means of the least squar method, the most probable formaula for calculating the crustal thickness in the study area was derived, which is :

$$H = 32.88 - 0.067\ \Delta g$$

It was found that, the thickness of the earth's crust changes regulary in the study area, reaching amaximum value of 35.0 kms.at the southwestern corner of the area, and a minimum value less than 33.0 kms. in the northeastern and northwestern part of the area. This decrease in the crustal thickness toward the north direction is probably due to the transition from sedimentary continental crust in North Africa into intermediate crust in the Mediterranean sea.

The residual component of the Bouguer anomaly field was also, calculated using a different techniques. Consequently the residual anomaly map was constructed and the tectonic trends were determined.

From the tectonic trend analysis of the residual anomalies, the following can be concluded :

1- The predominent directions of these linear residual anomalies are :

i- N 55° E (Qattara trend).

ii- N 35° E (Aqaba trend).

iii- N 35° W (Suez trend).

iv- N 85° E (E-W trend).

v- N 5° E (N-S trend).

2- The number of faults (linear anomalies) accompaning the residual anomalies are relatively less as compared to the number of faults deduced from the Bouguer anomaly map.

3- There is some deviation in the forces acting on the study area with the time .

4- Two sets of shear zones were recognized. The first includes five right lateral shear zones striking in NW direction. The other set include eight left lateral striking in NE direction.

The thickness of the sedimentary cover (Basement depth) in the study area was calculated along profiles using a simple well known equation as well as the spectral analysis technique and Bott and Smith method. The basement relief map of the study area was constructed which shows that :

1- The thickness of the sedimentary section have different values at different parts, ranging between 0.5 km. in the southeastern postion to about 5.0 kms. in the southwestern portion of the area.

2- The basement surface of the study area is characterized by the presence of major uplifted zones localized at different parts such as : Bahariya - El-Khatatba, Rabat, Mubarak, East Mubarak, Southwest of Betty and south of Agnes, and minor uplifted zones scattared at different parts.

3- It is also, includes major downfaulted blocks (basins) localized at southwestern portion of the area, Abu Gharadige downfaulted block, south of W.D. 7-1 well, southwest to W.D. 8-1, downfaulted block to west of Bahariya - El-Khatatba, western portion of Ramak well, S.W. Mubarak well, Diyure- Zebeida major structural low, and south of W.D.32-1 well.

4- The major uplifting and downfaulted blocks are separated by linear anomalies (lineaments) with different trend, different areal extensions and different horizontal gradient.

5- The calculated thickness values of the sedimentary section (basement depth) in the study area are in a good agreement with the actual values of drilling. Only, at the Agnes-1 well locality, the calculated basement depth was found to be less than the actual depth.This may be attributed to an intrusion within thebasement across this portion of the major El-Bahariya,El-Khatatba uplift on which a basic inhomogenity in the igneous material exists.Consequently, the calculated basement depths at this part was corrected .

6- Some statistical tests were applied for deriving the relationship between $\Delta g_{Bog.}$ and $\Delta g_{res.}$ and the depth to the basement.

A comparison between the result of the tectonic trend analysis deduced from the Bouguer and residual anomalies and the trends obtained from landsat images and field investigation shows a good agreement with each other, except some differences in the regionality of the different trends, that refer to different phases of tectonic activity. The detected fault systems and shear zones are interpreted to be mainly to the N-S meridional stress resulting from the interaction between the European and African plates which started in the Pre-Cambrian time and rejuvenated during the Hercynian (Pre-Carbonifrous), Laramide (Late-Cretaceous) and Alpine (Late-Tertiary) orogenies. NE stress

field associated with the Red Sea Rifting is also responsible for some fault system and shear zones present in the area.