surveyed area.

⑤ Many channel structures running from shallow ground depths toward the basin structure on the south of Bou Mia in the area of the previous year's survey.

Of these, ①, ② and ③ channel structures are inferred at relatively shallow depths of less than 200 m from the ground surface and are common in that the formations covering the basement are composed, mostly, of Permo-Triassic P-T Red Sandstone Formation. But the ① and ② channel structures, which are under similar positional and geological conditions, have their directions limited by the fault-like step structure F-③ or the adjacent ridge-like structure which interrupts them.

Meanwhile, the ③ channel structures "pour" into a basin structure being at a depth of more than 200 m from the ground surface; thus this may suggest that the basin structure formerly was a lake or swamp. Assuming that these channel structures formed a river system on the basement, they may well have, after filling the lake or swamp, flowed to the north over the saddle either on the east side of drilling point MR-2 or midway between MR-2 and MR-4. Further, the formations covering the basin structure contain suggestions to the existence of a river system in each period. However, no related information is available from gravity prospecting.

As above, channel structures are presumed to exist in areas with relatively shallow basements. In areas with basement depths of more than 300 m, so many details were unknown that it was difficult to gain information of channel structures. But in the light of basement altitudes, channel structures are likely to be routed toward the north, as a whole.

4-5 Conclusion

The results of the gravity survey conducted in the Haute Moulouya

area are summarized as follows:

(a) Bouguer anomaly values in the surveyed area are distributed within the range of -88 mgal~-113 mgal; thus this is a district where isostasy is applicable with the Atlas mountains as the background.

(b) In the Bouguer anomaly map, there is bowed or arciform gravity trend reflecting the large-scale occurrence of crystalline schists to the north and east of the surveyed area.

(c) As the result of trend analysis, the relation between gravity distribution and geology has become clear from the residual gravity map in which the above-mentioned trend had been eliminated. Further, the whole structure of the basements has been obtained by two- and three-dimensional quantitative analysis.

(d) The following three formations seem to contribute to the gravity anomalies in this area:

Remarkable high-gravity anomalies	:	Crystalline schists (density ρ=2.8)
Mild high-gravity anomalies	:	Granites (density ρ = 2.6)
Low-gravity anomalies	:	Permo-Triassic and later sedimentary rocks (density ρ=2.4)

The basement structure has been clarified by a contour line map of depth from ground surface to basement rocks and an interpreted map of underground structure which show the surface of basement crystalline schists and Granites. And the following presumption of geological structures and channel structures has been carried out.

(e) It has been found that a saddle-like structure continuing almost horizontally in the E-W direction exists at shallow depths connecting the Zayda and Bou Mia Granite Bodies at the south end of the surveyed area. This saddle-like structure and the Zayda Granite Body form a divide in

the present basement. It is questionable, however, whether this was the case at the time of formation of the paleotopography. Rather, it is presumed from the recent geological survey in the north of Bou Mia and the research data on Zayda mineral deposits that the divide in the paleotopography was located farther south.

As for the north side of this saddle-like structure, basement altitude tends to decrease in the northern direction.

(f) The sedimentation covering the basements greatly differs between the eastern and western parts from the center of the surveyed area. Sediments in the eastern part are relatively thin, their thickness being up to about 200 m, but in the western part, the sediments are thick toward the north-west, attaining more than 400 m in maximum depth.

A basin structure representing depression in the basement is estimated to exist to the east of Itzar in the western part.

(g) Several NE-SW or NNE-SSW fault-like step structures are presumed to exist in the surveyed area. Ridge-like structures of the basement have been found to exist parallel, or adjacently, to these fault-like step structures.

Typical of the ridge-like structures are a ridge on the east side of Itzar and a ridge adjoining the west side of the fault-like step structure in the central part of the surveyed area. The former is a factor contributing to the situation of the foregoing basin structure while the latter constitutes the western edge of the radon etch anomaly zone concentrated on the east side of the ridge.

(h) Zonal grooves believed to represent channel structures running in the northern direction from the southern part of the surveyed area are presumed to exist on the basement Granites. The main localities and their characteristics are as follows:

i) The channel structures concentrated in the basin structure located east of Itzar may form a lake-like (or swamp-like) pool for once and then resume their northward course.

ii) On the east side of the NNE-SSW fault-like step structure in the central part of the surveyed area, several channel structures seem to meet and proceed to the north. It is interesting that strong radon etch anomalies generally correspond to these channel structures in this vicinity.

iii) It is presumed that the graben-like structure lain between two fault-like step structures in the eastern end of the surveyed area contains a channel structure.

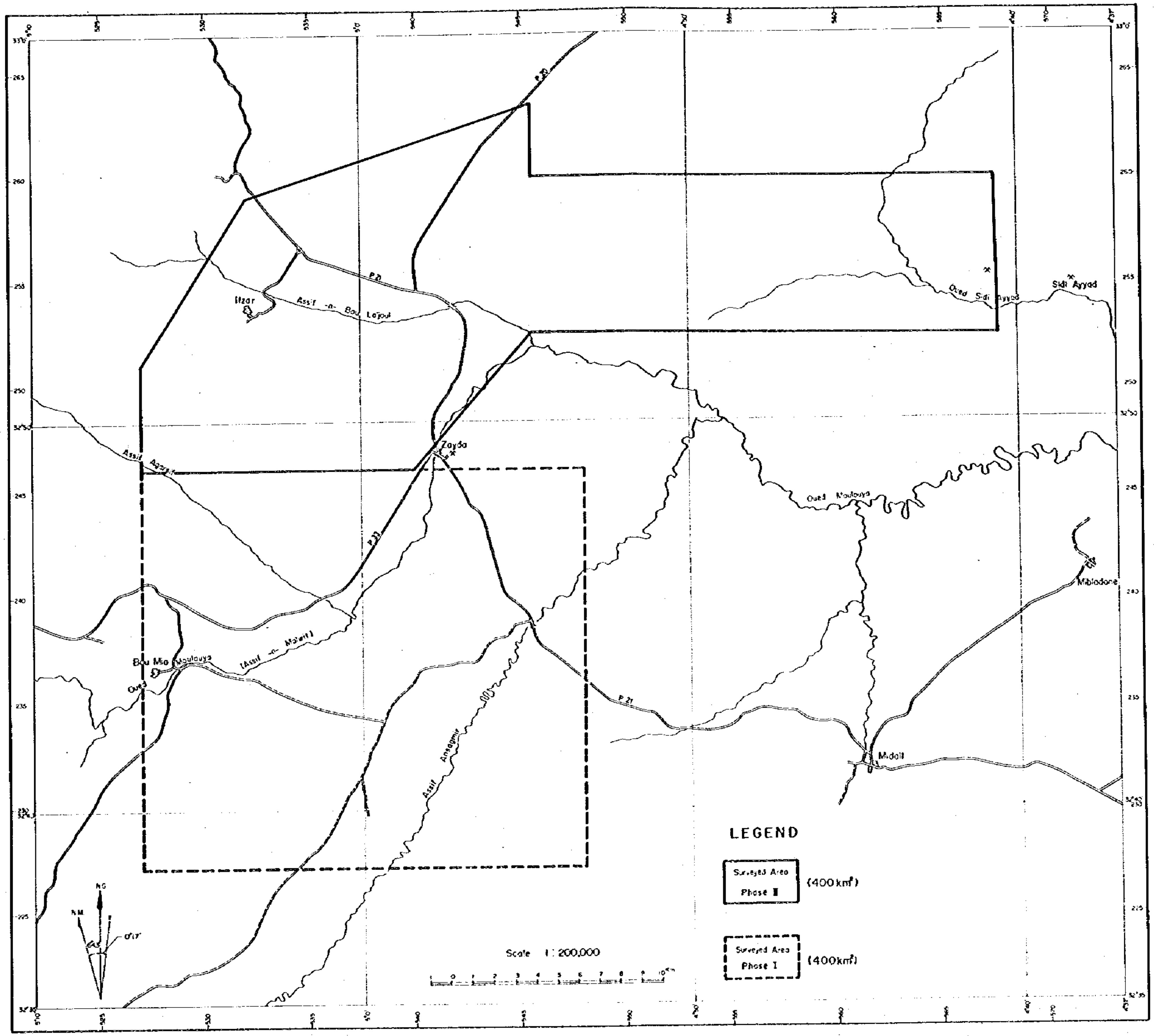


Fig.II - 1 Location of Gravity Survey

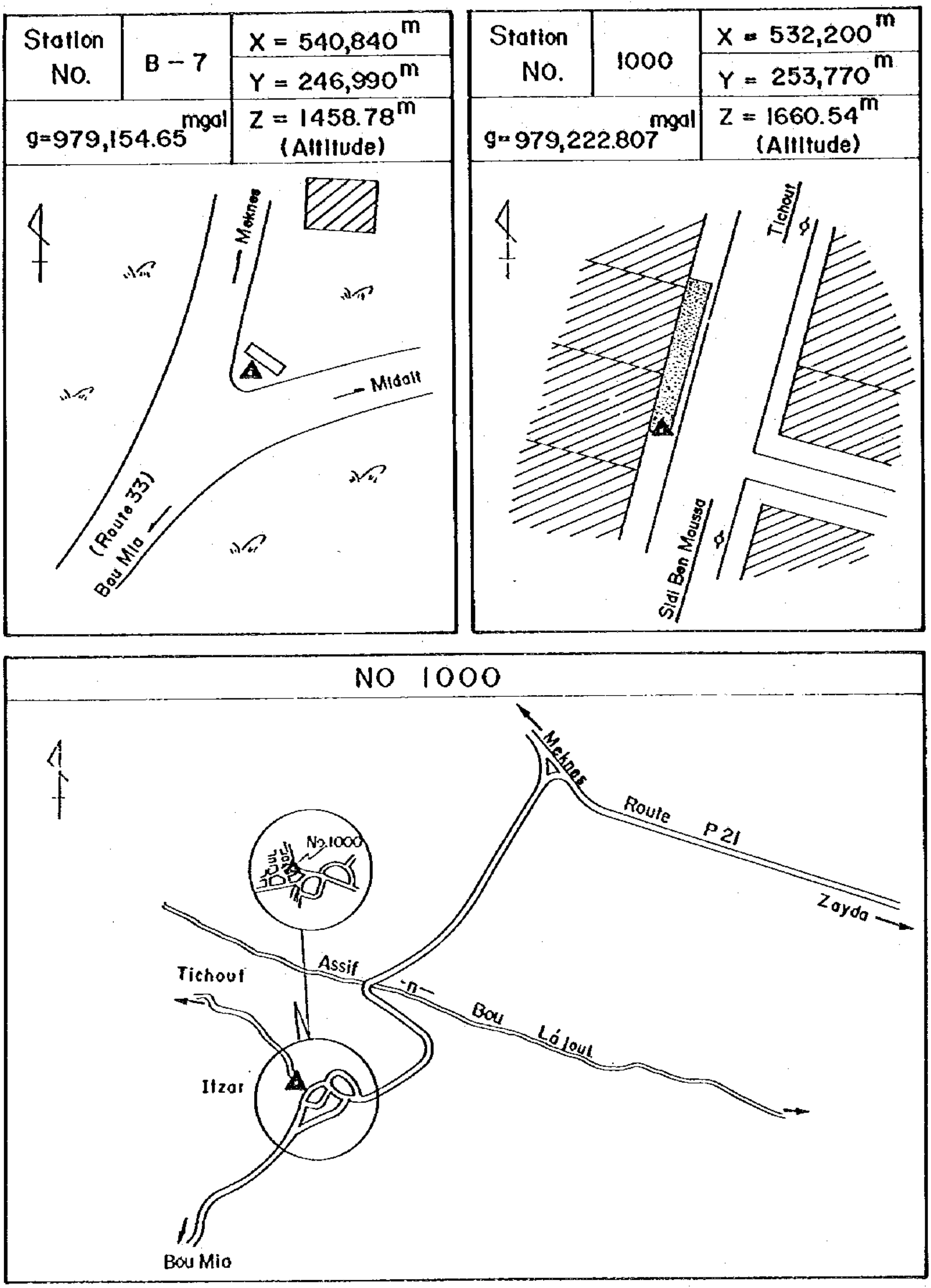


Fig. II – 2 Sketches of Gravity Base Stations

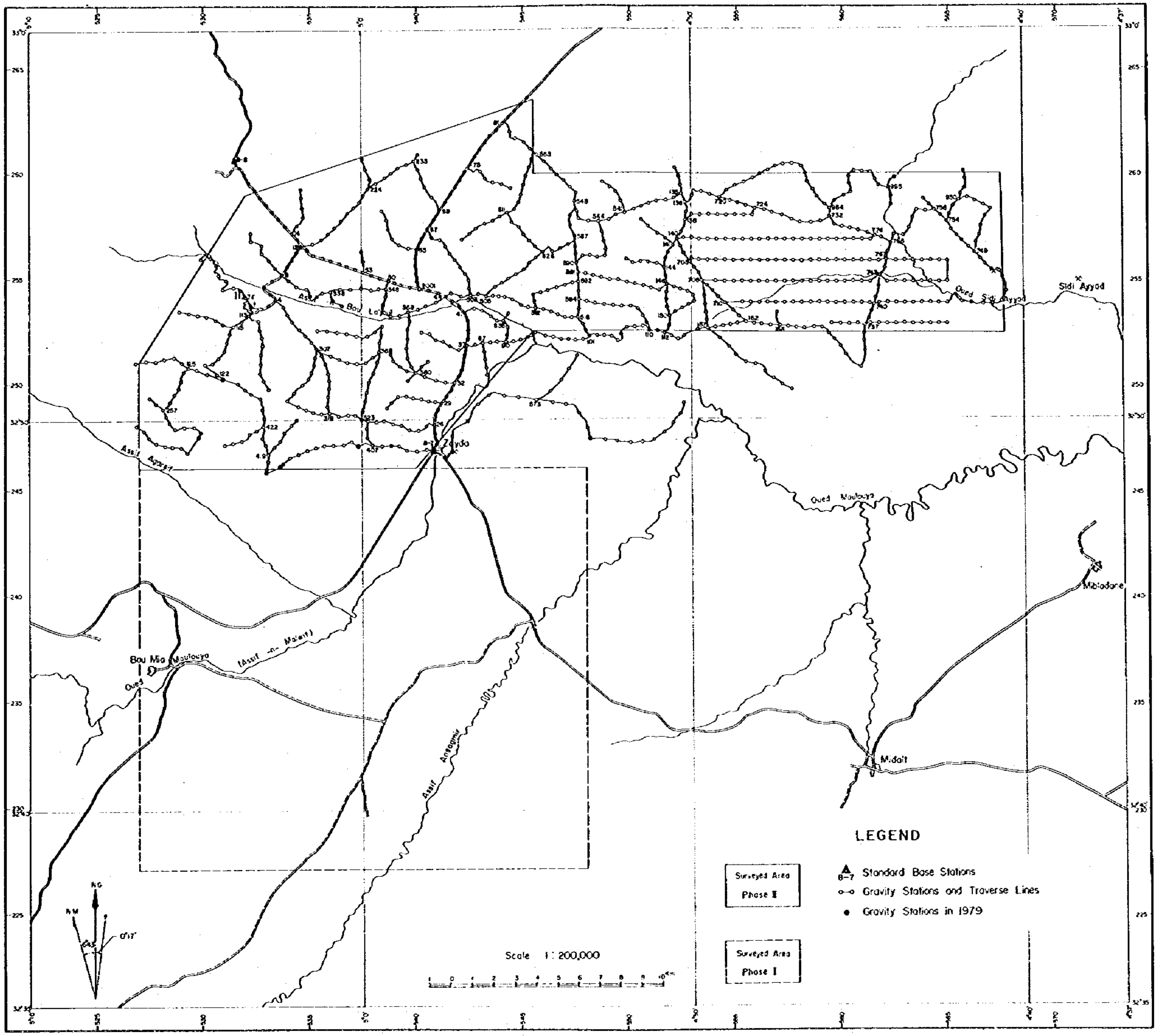


Fig II- 3 Network of Leveling Survey

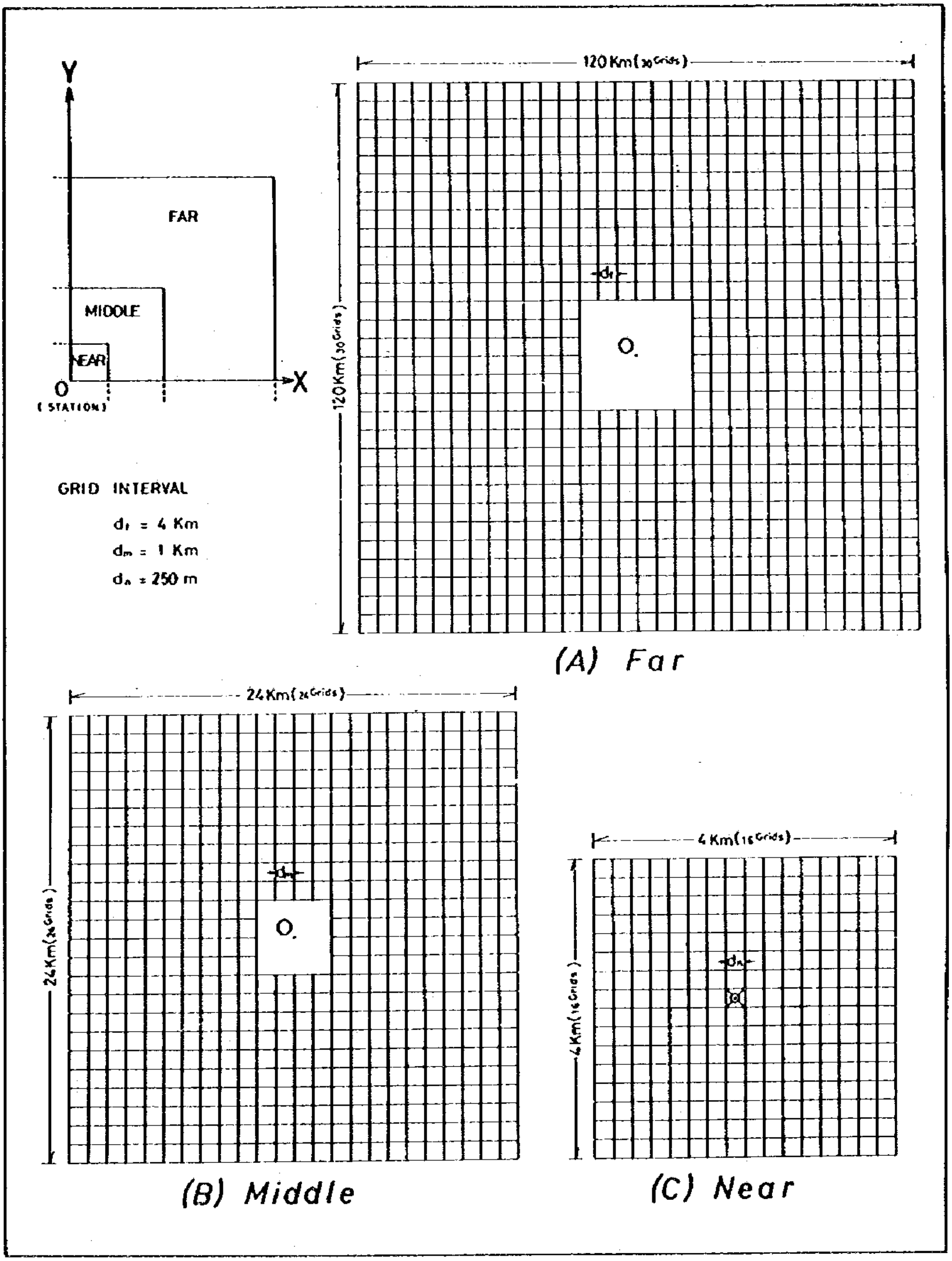


Fig. II - 4 Grids of Topographical Correction

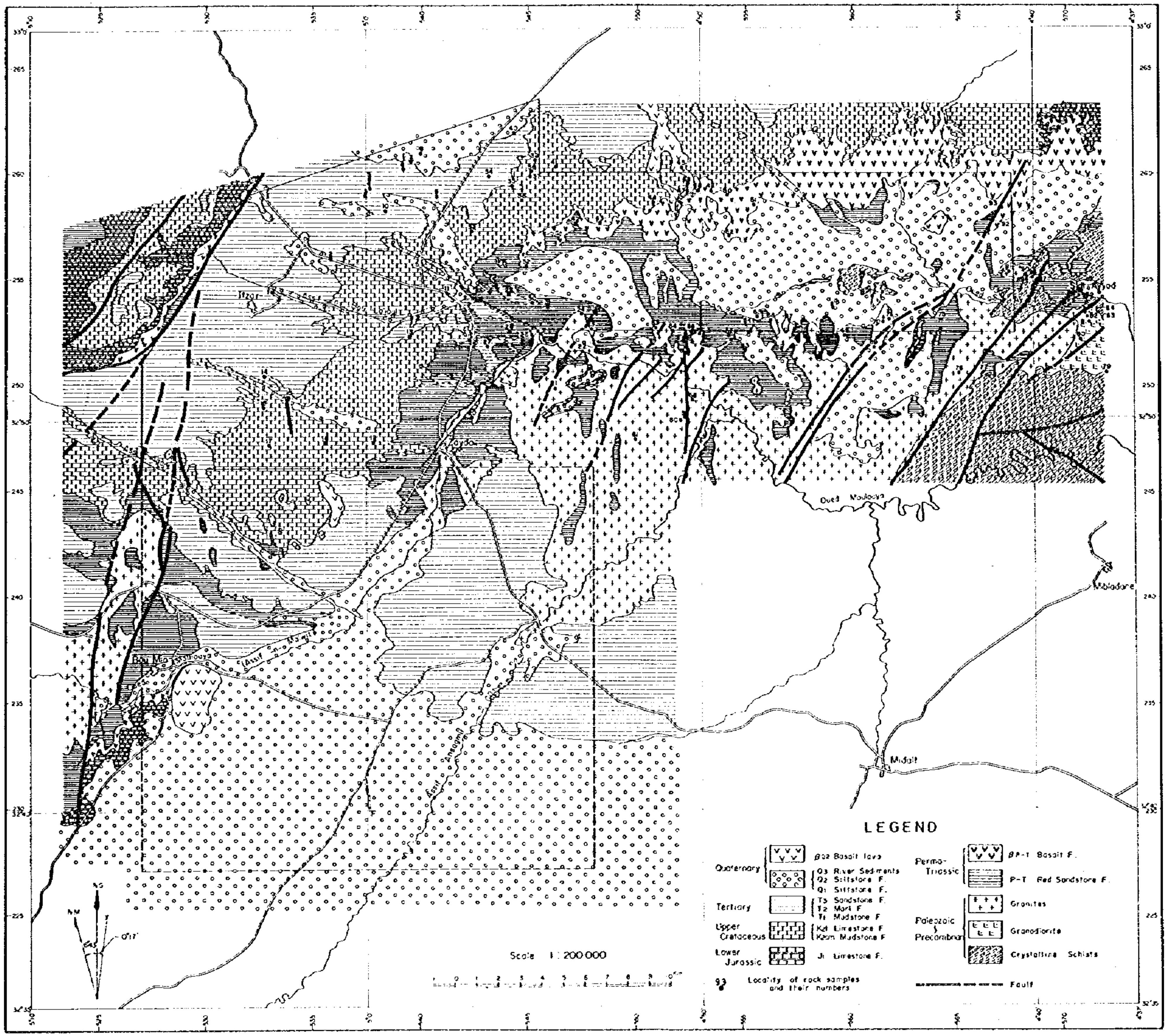


Fig.II-5 Geological Map and Locality of Rock Samples

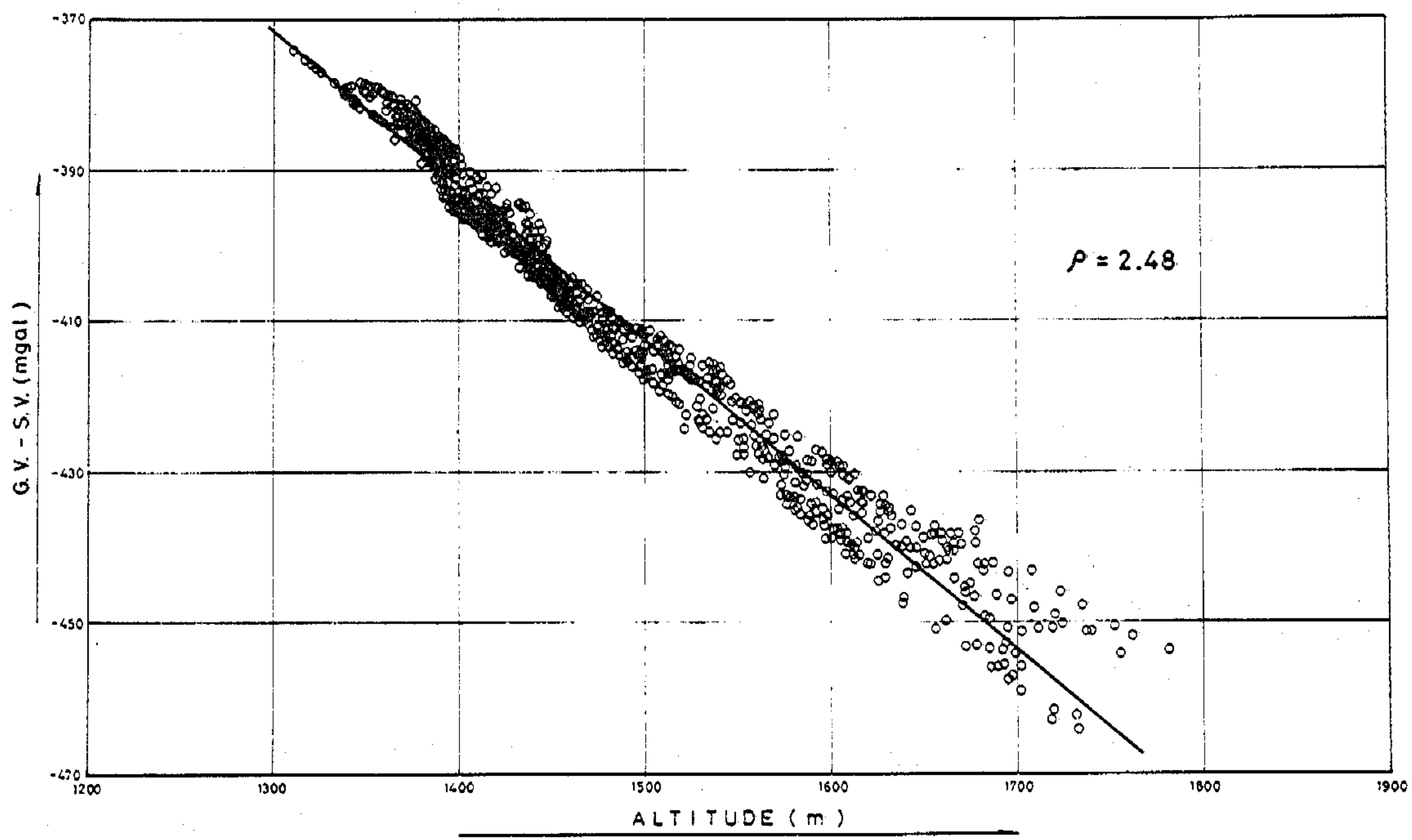


Fig. II-6 Gravimetric Value - Elevation Curve

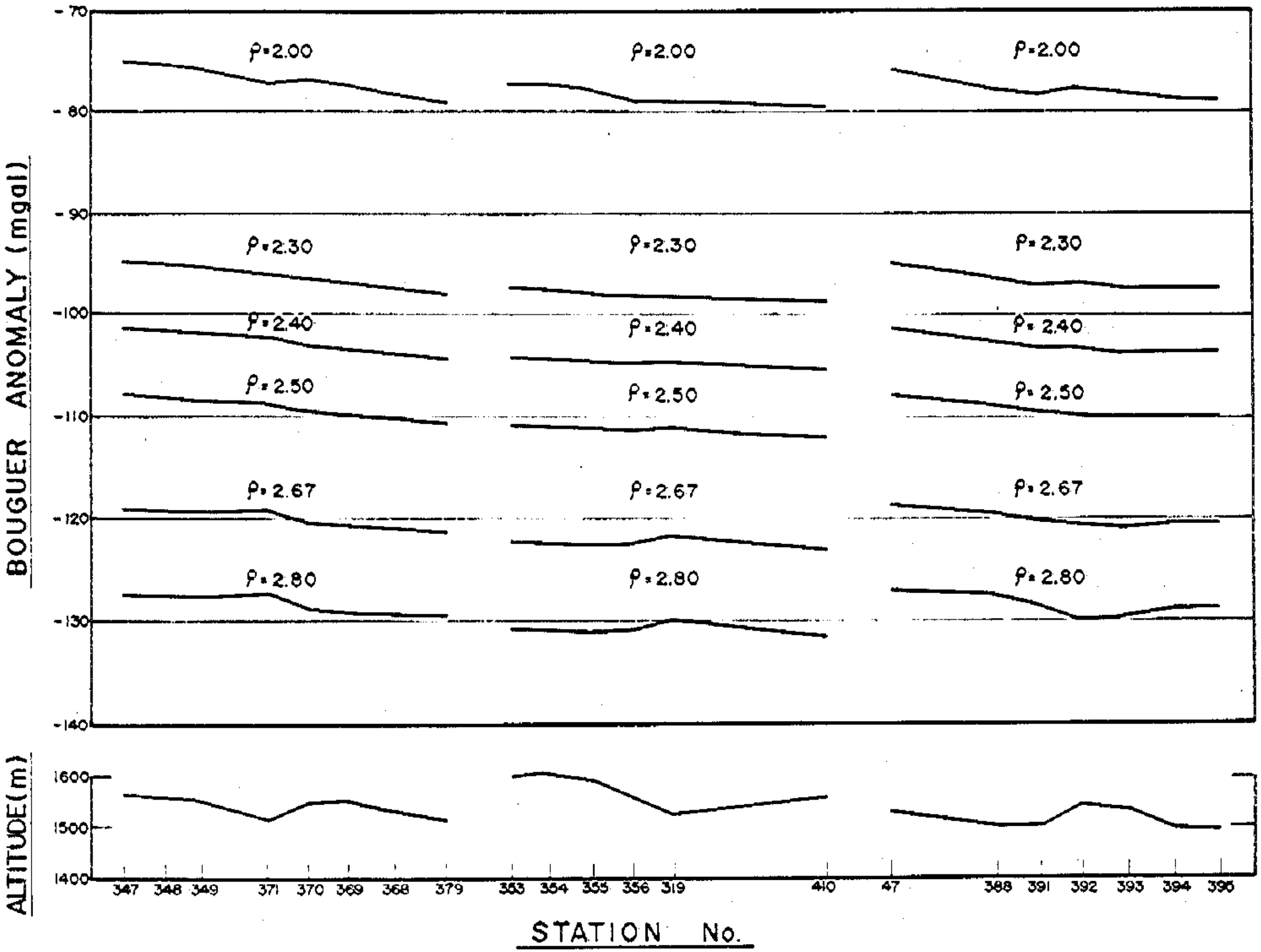


Fig. II - 7 Correlation between Bouguer Anomaly Values and Station Altitude

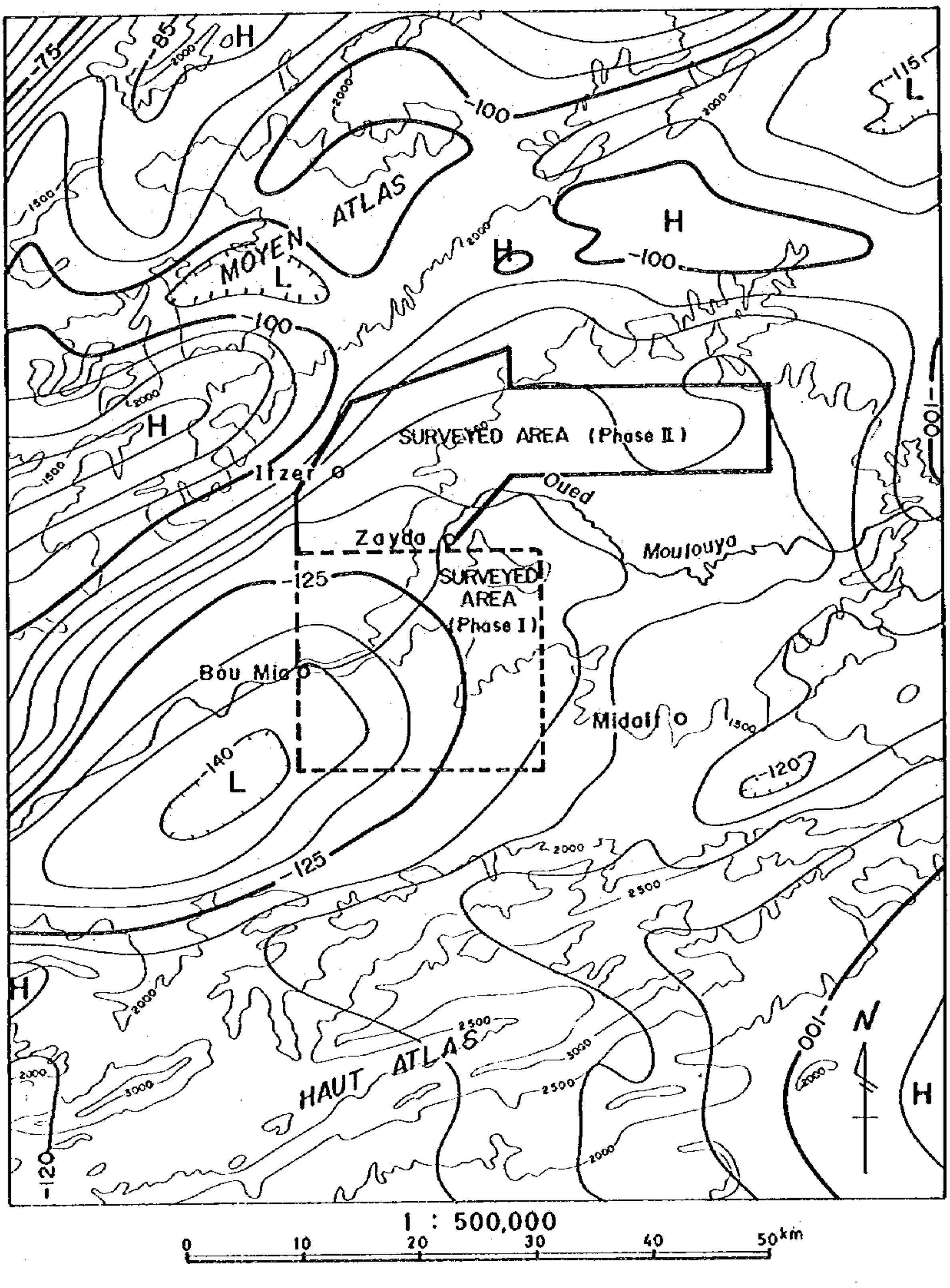


Fig. II -8 Bouguer Anomaly Map on Haute Moulouya Area (ρ=2.67)

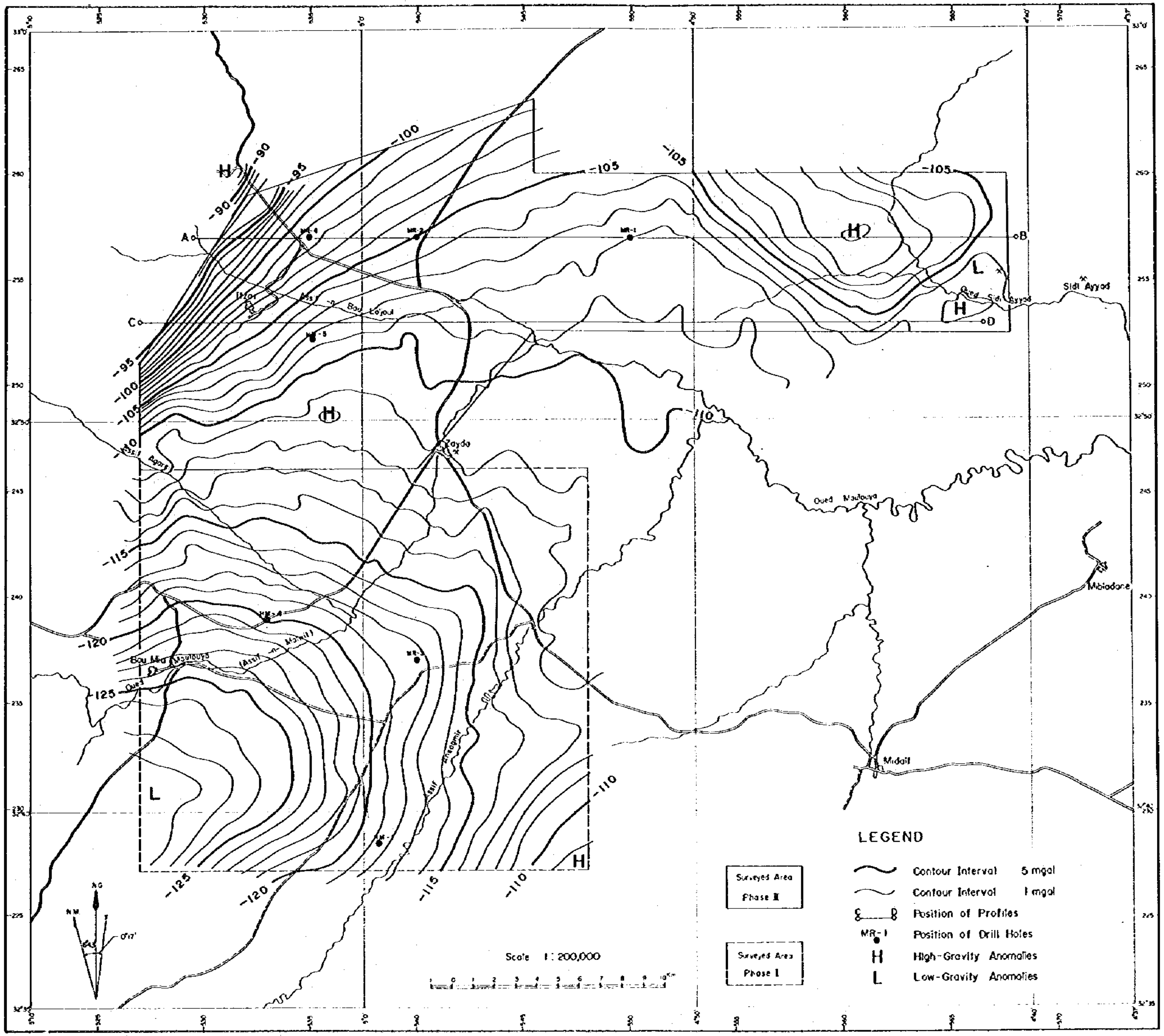


Fig.II-9 Compiled Bouguer Anomaly Map ($\rho = 2.5$)

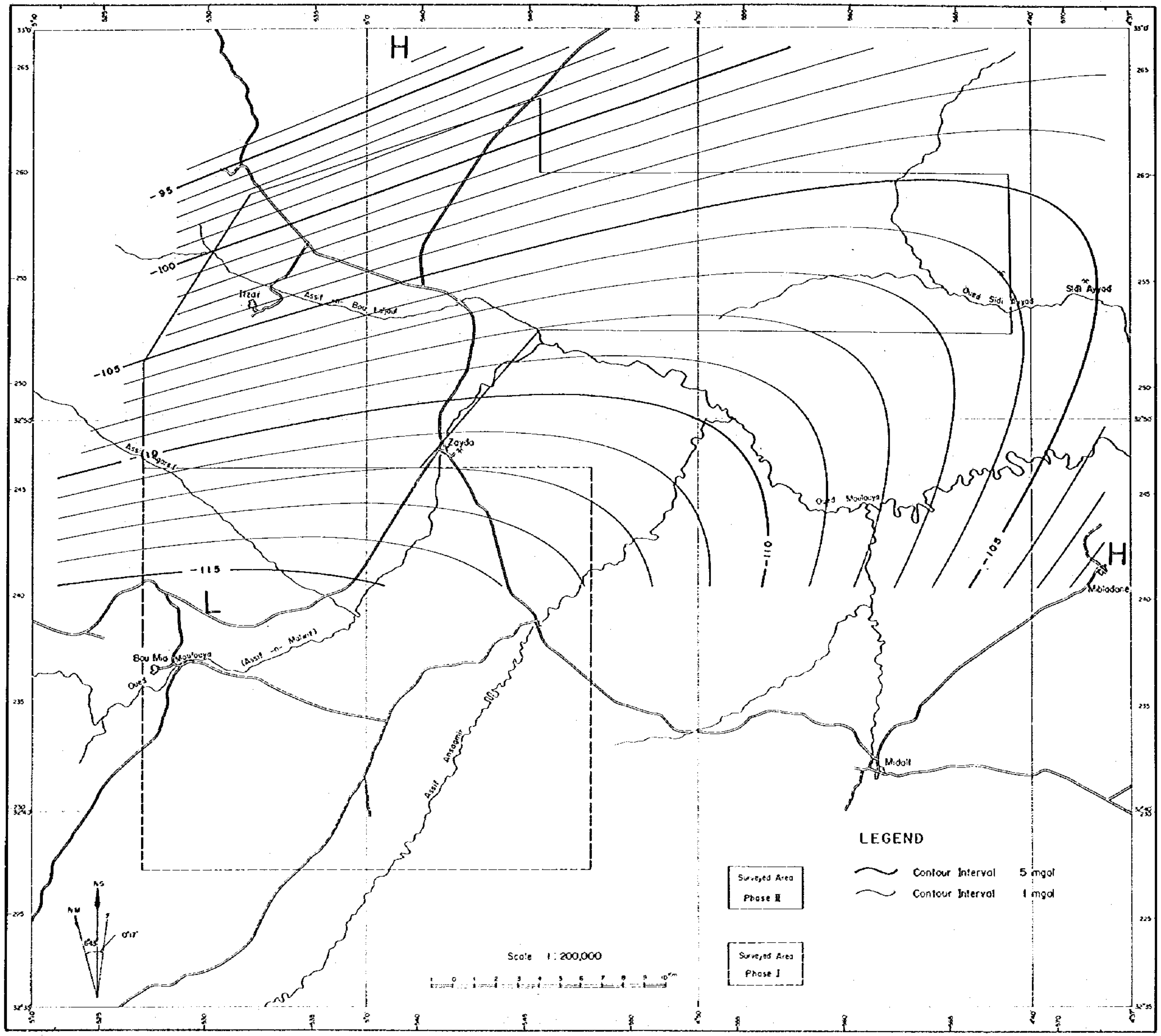


Fig.II-10 Regional Gravity Trend in Polynomial of Second Order

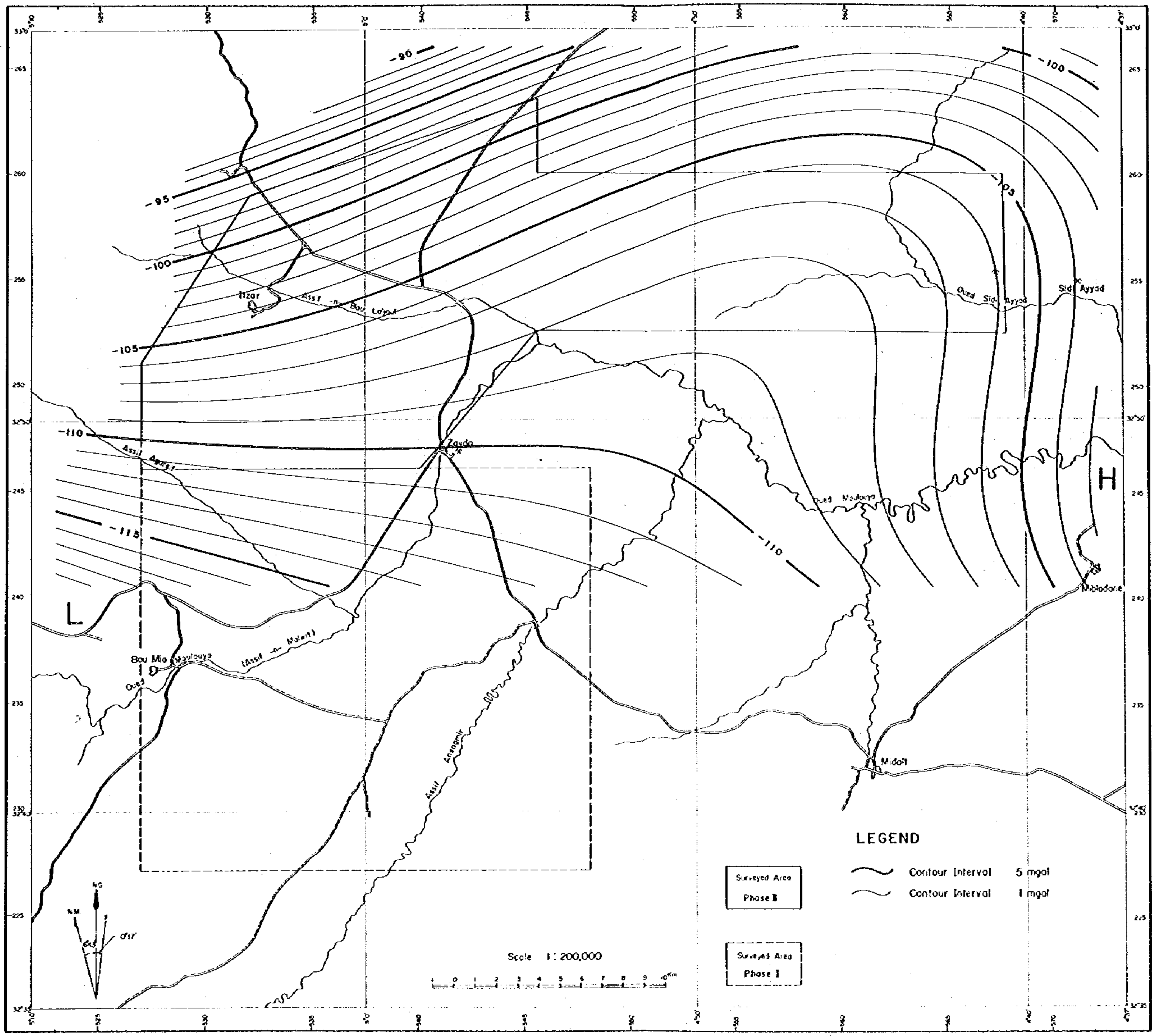


Fig.II-11 Regional Gravity Trend in Polynomial of Third Order

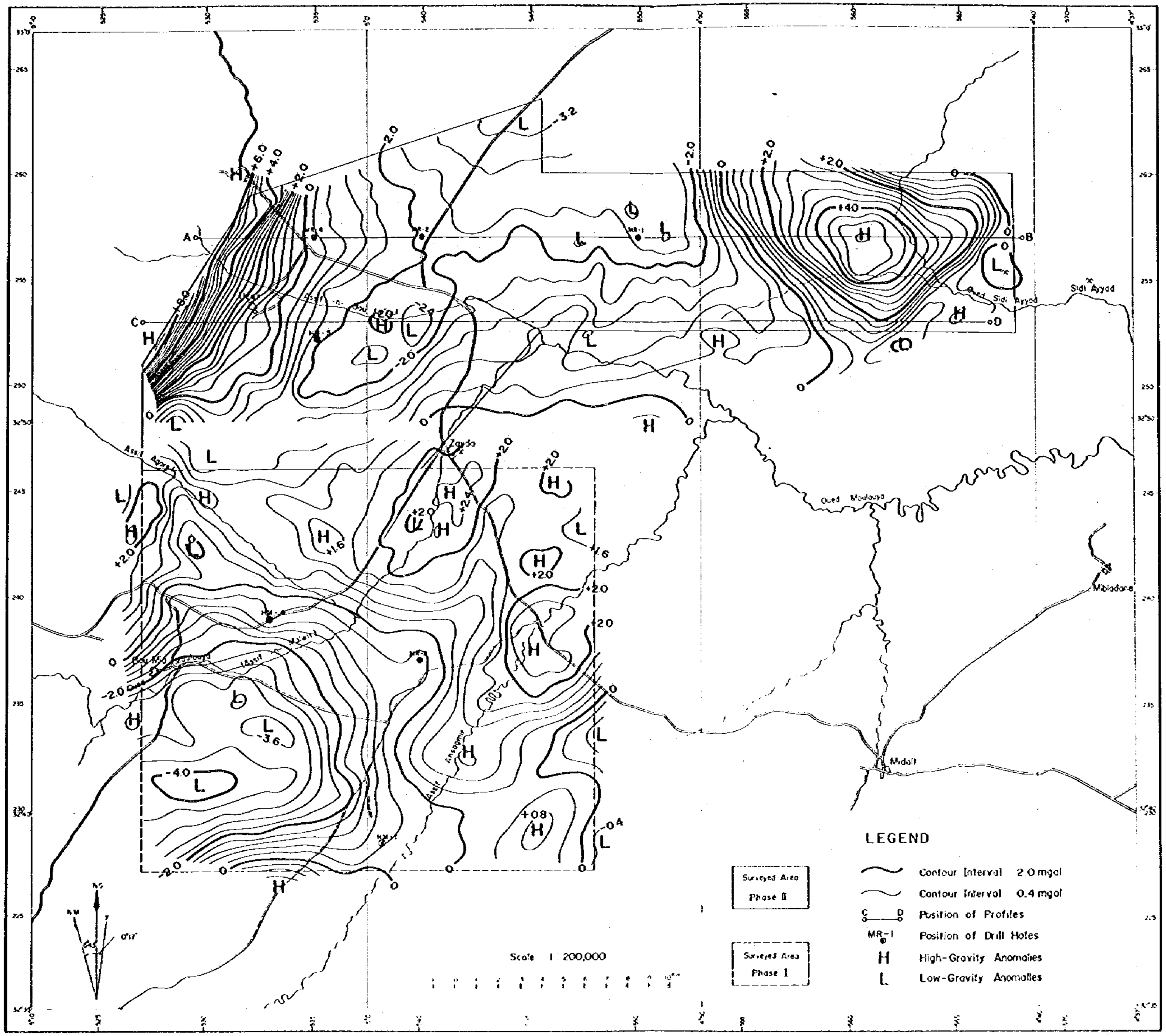


Fig.II-12 Residual Gravity Map in Polynomial of Second Order

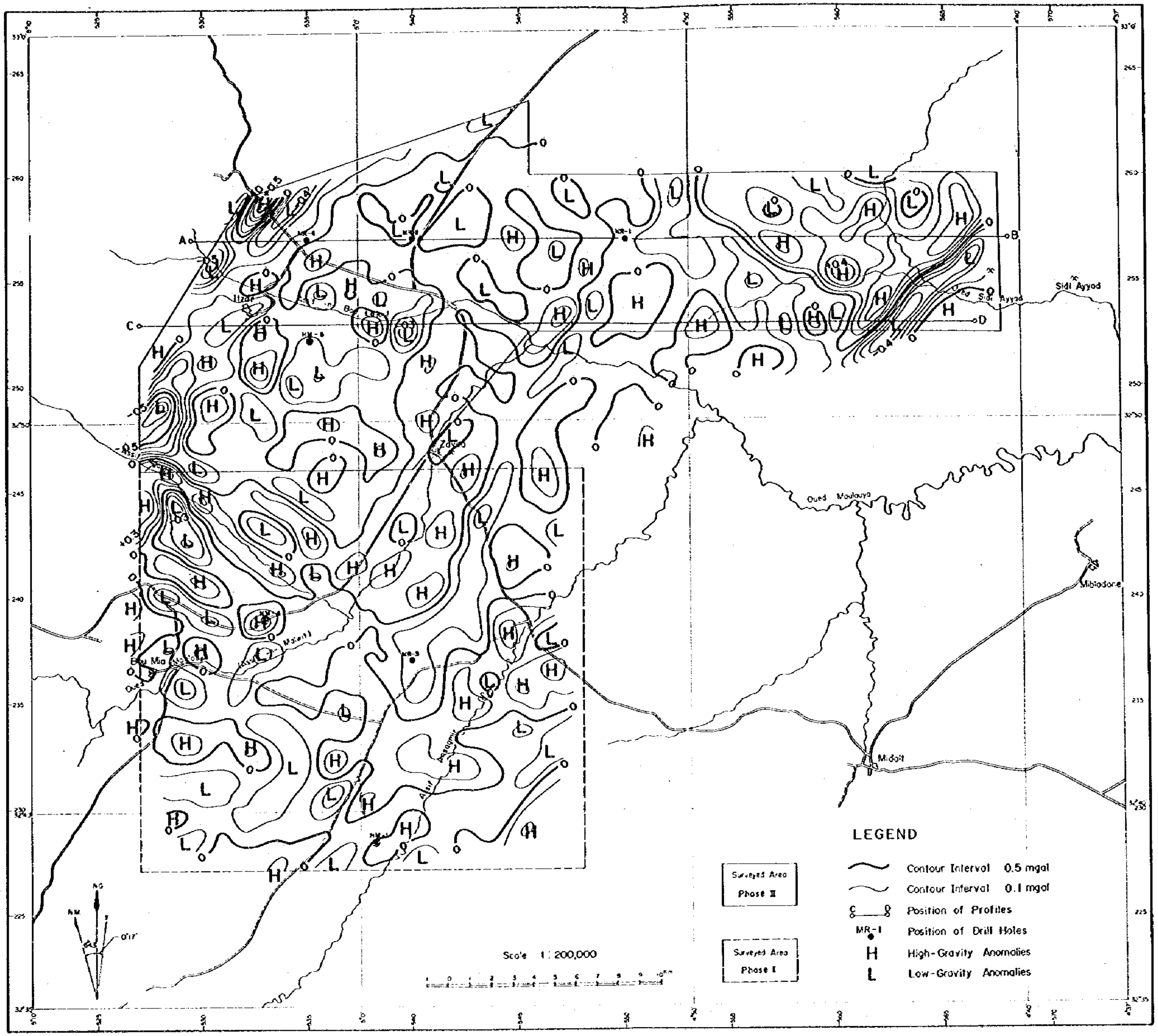


Fig.II-13 Intermediate Wave-Length Bouguer Anomaly Map

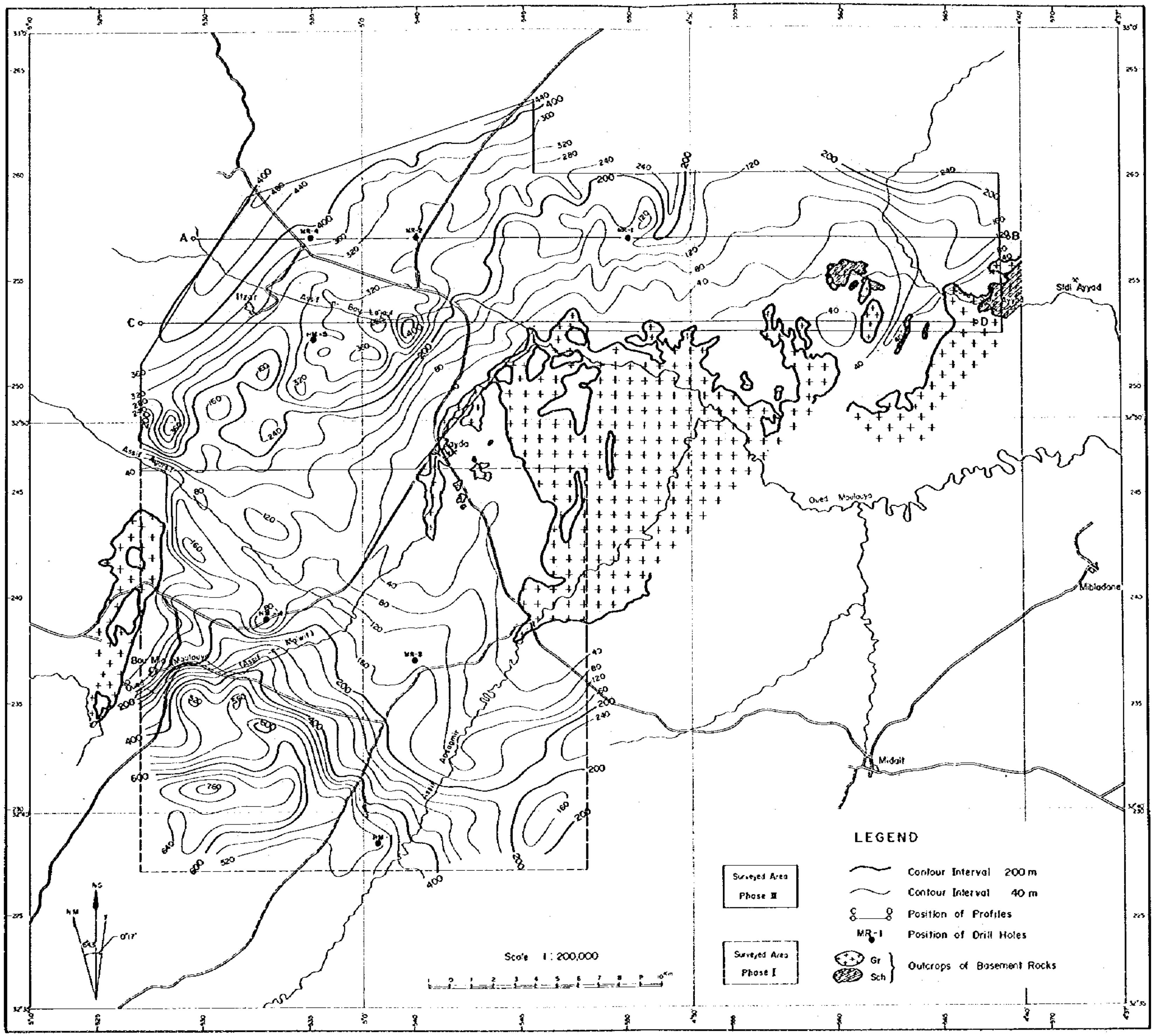


Fig.II-14 Contour Line Map of Depth from Ground Surface to Basement Rocks

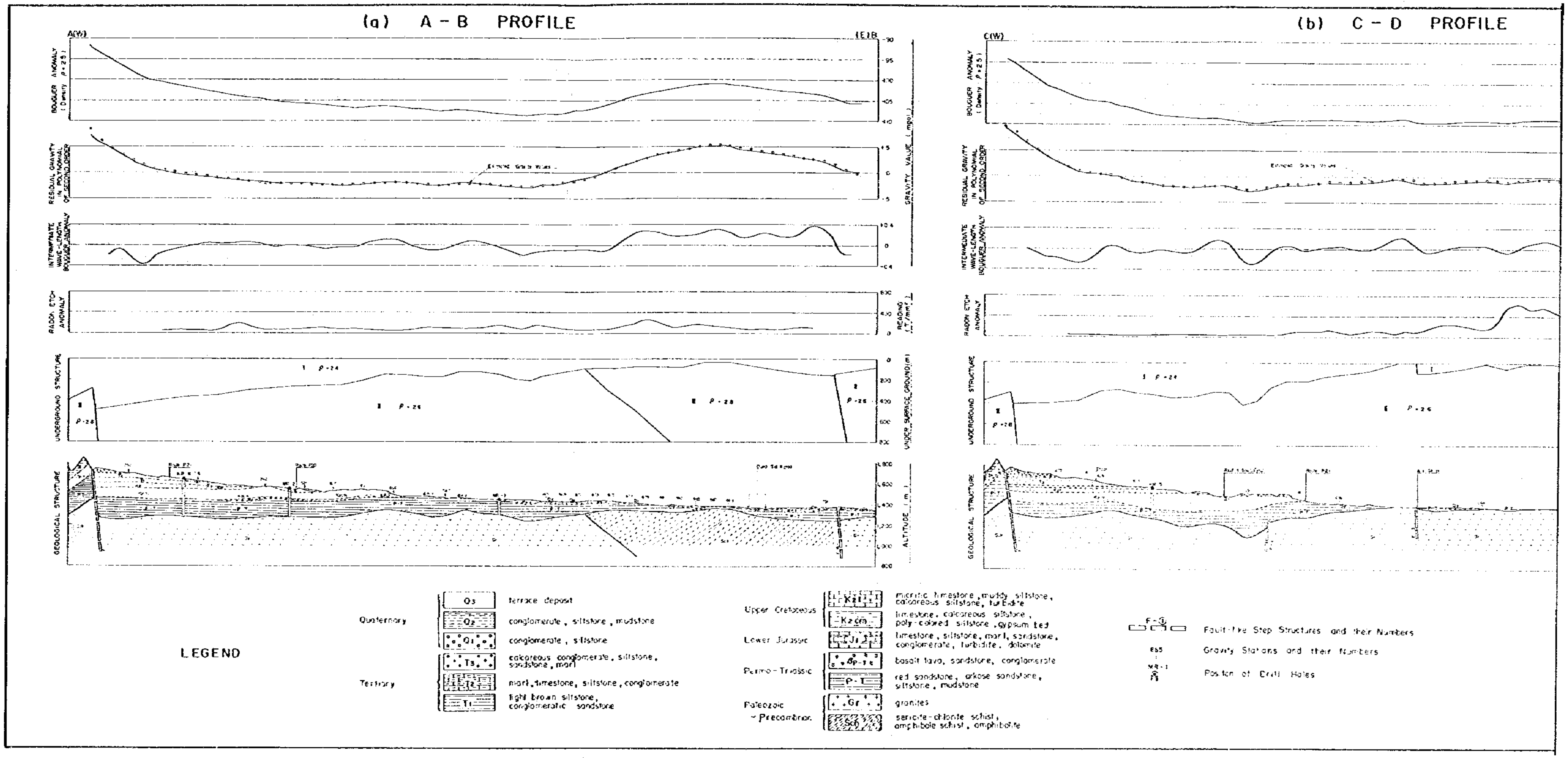
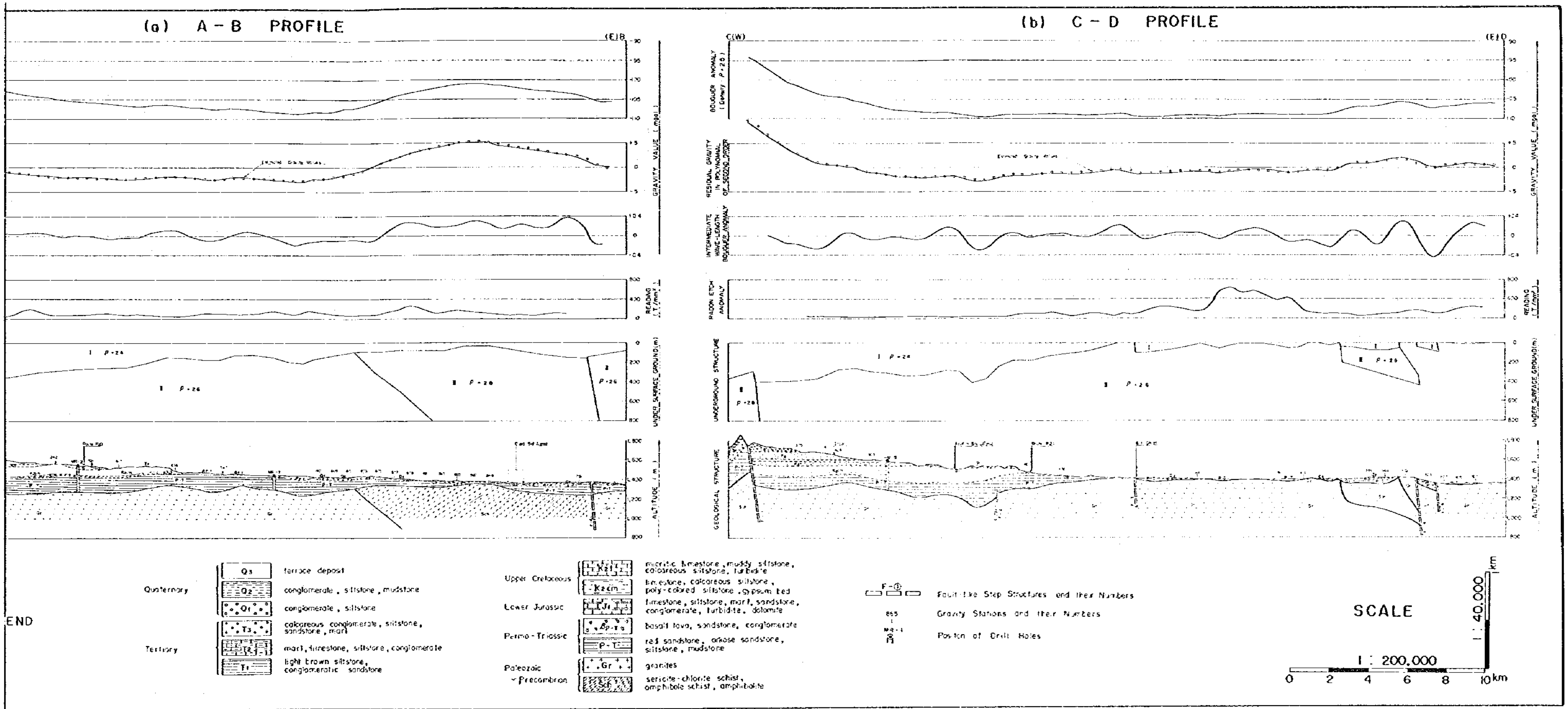


Fig. II – 15 Profiles of Underground Structure



5 Profiles of Underground Structure

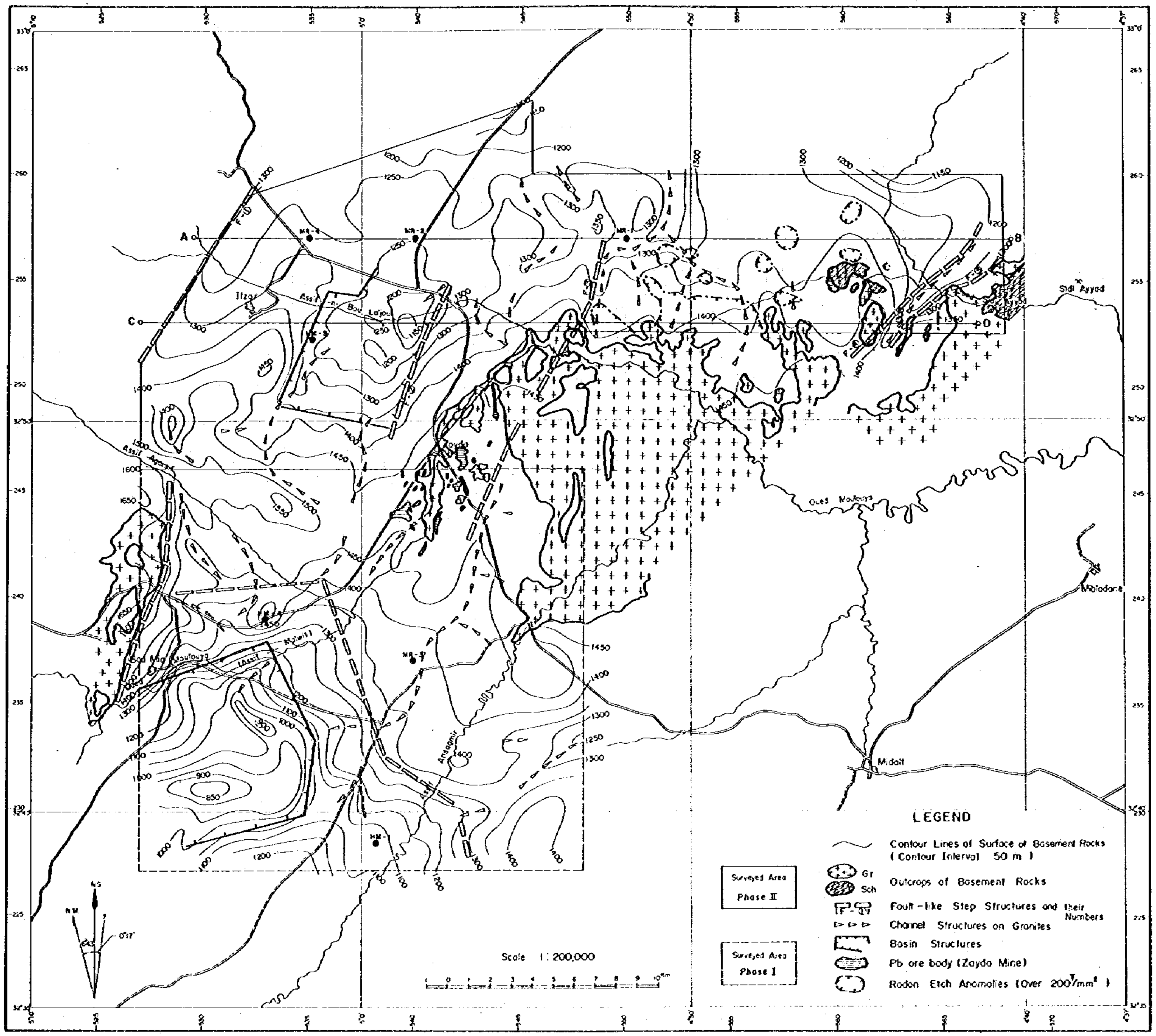


Fig.II-16 Interpreted Map of Underground Structure

Table II—1 Calculation of Gravity Values at Base Stations

No. of Gravity Meter & Date	No. of Stations	Time	Reading Values	×Factor (mgal)	Correction of Tidal Gravity (mgal)	Height of Gravity Meter (m)	Correction of Instrument Height (mgal)	Corrected Value (mgal)	Correction of Diural Drift (mgal)	Corrected Value (mgal)	Difference from B-7 (mgal)	Standard Value (mgal)
G-366 Jun. 6 1979	B - 7	13:48	2,703.172	2,858.316	- 0.001	0.27	0.083	2,858.398	0.000	2,858.398		979,154.650
	1,000	14:23	2,676.580	2,830.189	+ 0.007	0.28	0.086	2,830.282	+ 0.001	2,830.283	- 28.115	979,126.535
	B - 7	14:44	2,703.158	2,858.301	+ 0.013	0.27	0.083	2,858.397	+ 0.001	2,858.398		
	1,000	15:07	2,676.566	2,830.173	+ 0.018	0.28	0.086	2,830.277	+ 0.001	2,830.278	- 28.120	979,126.530
	B - 7	15:45	2,703.144	2,858.286	+ 0.029	0.27	0.083	2,858.398	0.000	2,958.398		

Table II—2 Densities of Rock Samples

Sample No.	Density (g/cm³)	Rock Name	Geological Unit
1	2.42	limestone	T_2
2	2.16	conglomeratic sandstone	T_1
3	1.90	conglomerate	Q_1
4	2.52	limestone	T_2
5	2.41	"	T_2
6	2.47	siltstone	T_2
7	2.26	silty conglomerate	T_2
8	2.49	siltstone	Q_1
9	2.51	conglomerate	T_1
10	2.54	limestone	T_2
11	2.46	calcareous siltstone	K_{2cm}
12	2.53	" "	K_{2cm}
13	2.40	silty sandstone	T_1
14	2.56	limestone	T_1
15	2.45	"	K_{2t}
16	2.52	"	K_{2t}
17	2.48	"	K_{2t}
18	2.39	siltstone	K_{2cm}
19	2.32	calcareous conglomerate	T_1
20	2.53	aplite	Ap-Gr
21	2.61	granite	Gr
22	2.54	arkose sandstone	P-T
23	2.45	sandstone	P-T
24	2.49	granite	Gr
25	2.54	aplitic granite	Ap-Gr
26	2.33	calcareous sandstone	T_1
27	2.51	micritic limestone	T_1
28	2.55	conglomerate	Q_1
29	2.48	"	T_1
30	2.43	limestone	T_1
31	2.47	conglomerate	Q_2
32	2.60	basalt lava	β_{P-T}
33	2.40	calcareous siltstone	K_{2cm}
34	2.51	" "	T_1
35	2.65	limestone	K_{2cm}
36	2.38	"	K_{2cm}
37	2.55	siltstone	K_{2cm}
38	2.54	"	K_{2cm}
39	2.34	limestone	K_{2cm}
40	2.37	light brown siltstone	T_1
41	2.61	limestone	K_{2cm}
42	2.34	basaltic sandstone	β_{P-T}
43	2.57	basaltic conglomerate	β_{P-T}
44	2.59	basalt lava	β_{P-T}
45	2.87	" "	β_{Q2}
46	3.09	" "	β_{Q2}
47	2.82	" "	β_{Q2}
48	2.20	calcareous conglomerate	Q_3
49	2.34	calcareous siltstone	K_{2cm}
50	2.43	sandstone	β_{P-T}
51	2.52	basalt lava	β_{P-T}
52	2.67	quartz vein	-
53	2.58	aplitic granite	Ap-Gr
54	2.59	red sandstone	P-T
55	2.40	sandstone	P-T
56	2.64	aplite	Ap-Gr
57	2.32	arkose sandstone	P-T
58	2.68	aplitic granite	Ap-Gr
59	2.62	" "	Ap-Gr
60	2.55	" "	Ap-Gr
61	2.54	aplite	Ap-Gr
62	2.56	red sandstone	P-T
63	2.42	" "	P-T
64	2.53	silty sandstone	P-T
65	2.22	conglomeratic sandstone	Q_2
66	2.58	red sandstone	P-T
67	2.54	aplitic granite	Ap-Gr
68	2.35	red sandstone	P-T
69	2.63	aplitic granite	Ap-Gr
70	2.55	porphyritic granite	Por-Gr
71	2.59	porphyritic granite	Por-Gr
72	2.62	aplite	Ap-Gr
73	2.78	granite	Gr
74	2.61	crystalline schist	Sch
75	2.49	arkose sandstone	P-T
76	2.55	granite	Gr
77	2.91	crystalline schist	Sch
78	2.87	" "	Sch
79	2.88	" "	Sch
80	2.76	granodiorite	Gr-Dio
81	2.65	"	Gr-Dio
82	2.64	"	Gr-Dio
83	2.73	"	Gr-Dio
84	2.32	red sandstone	P-T
85	2.37	" "	P-T
86	2.77	crystalline schist	Sch
87	2.60	red sandstone	P-T
88	2.53	" "	P-T
89	2.74	crystalline schist	Sch
90	2.79	" "	Sch
91	2.66	granite	Gr
92	2.49	basalt	β_{P-T}
93	2.54	"	β_{P-T}

L E G E N D

Quaternary { Q_3, β_{Q2}, Q_2, Q_1

Tertiary { T_2, T_1

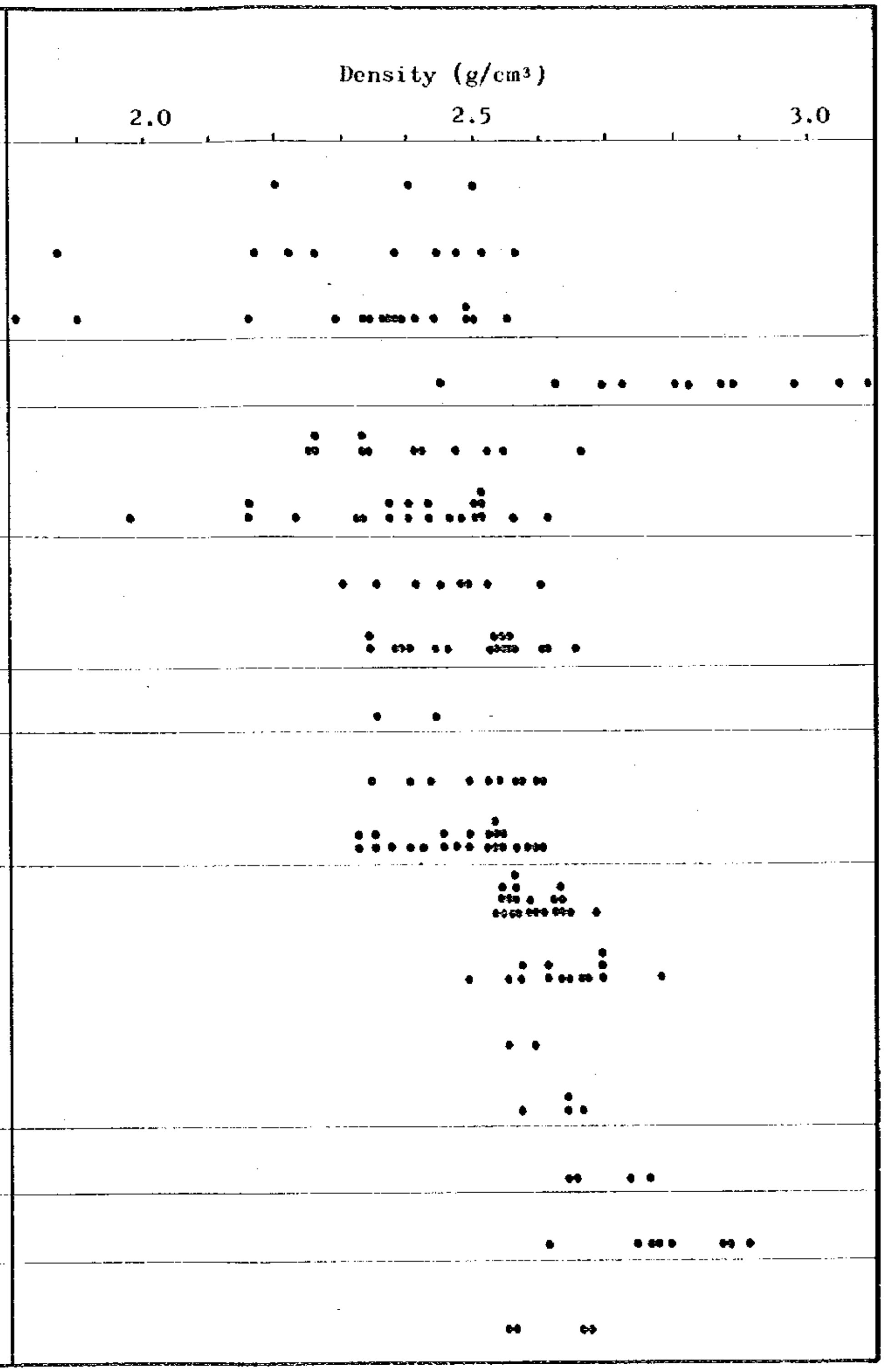
Upper Cretaceous { K_{2t}, K_{2cm}

Permo-Triassic { β_{P-T}, P-T

Paleozoic ~ Precambrian { Ap-Gr, Gr, Por-Gr, Cnt-Gr, Gr-Dio, Sch

Table II—3 Distribution of Rock Densities

Geological Age		Geological Unit and Mark		Lithology	Amount	Average of Density	
Cenozoic	Quaternary		Q_3	terrace deposit	3	2.37	2.33
			Q_2	conglomerate, siltstone, mudstone	9	2.32	
			Q_1	conglomerate, siltstone	16	2.33	
			β_{Q2}	basalt lava	11		2.82
	Tertiary		T_2	marl, limestone, siltstone, conglomerate	12	2.40	2.39
			T_1	light brown siltstone, conglomeratic sandstone	21	2.39	
Mesozoic	Upper Cretaceous	Turonian	K_2t	micritic limestone, muddy siltstone, calcareous siltstone, turbidite	8	2.45	2.48
		Cenomanian	K_{2cm}	limestone, calcareous siltstone, poly-colored siltstone, gypsum bed	18	2.50	
	Lower Jurassic	Lias	J_1	limestone, siltstone, marl, sandstone, conglomerate, turbidite, dolomite	2		2.40
	Permo-Triassic	Permo-Trias	β_{P-T}	basalt lava, sandstone, conglomerate	10	2.50	2.48
			P–T	red sandstone, arkose sandstone, siltstone, mudstone	23	2.47	
Proterozoic ~ Paleozoic	Paleozoic ~ Precambrian	Basement Complex	Ap-Gr	aplitic granite	21	2.59	2.60
			Gr	granite	14	2.63	
			Por-Gr	porphyritic granite	2	2.57	
			Cnt-Gr	contaminated granite	4	2.63	
			Gr-Dio	granodiorite	4		2.70
			Sch	crystalline schist	8		2.79
Others				quartz vein, barite vein	4		2.61



PART III DRILLING

PART III DRILLING

List of Figures

List of Tables

List of Plates

Chapter 1 Summary

1-1 Introduction

The geological structure and the circumstance of Pb, U deposition of this area were clarified in the first phase survey. As a result of the survey, the necessity of drilling to ascertain the geological structure has been proposed intensely. Three areas were selected as drilling sites: the Tanfit-Micha area located northeast of Zayda, the Itzar Basin area located north of Zayda, and the geophysical prospecting area in the central south. After reviewing the drilling results, one drilling site, in the Itzar Basin area, was added.

Drilling started on May 18, 1979 and ended on July 12, 1979 when the total bored depth reached 652.25 m. Drilling on the MR-4 hole was continued by BRPM from July 13, 1979 and was completed at the 375 m depth.

The Tanfit-Micha area has a gradually sloped structure downward to the north from Assaka Tabhirt and Paneu-1, and in this area, uranium mineral deposits of the Permian and Triassic periods, and uranium concentrations of the Quaternary period is to be expected. The Itzar Basin area forms a basin structure which was damned by the Yahia-Ouffalla fault. In the geophysical prospecting area in the central south, Paleochannel are assumed on the basement rock as a result of gravity prospecting and sandstone type and conglomerate type mineral deposits may possibly be included.

For the Tanfit-Micha and Itzar-Basin areas, it has been necessary to determine the correct geological structure for use as basic data for analyzing the results of the geophysical survey (gravity prospecting) which was conducted to investigate the basement structure in the second-phase's survey.

The drilling of above four holes reached the basement rock and performed an important role in the study to clarify the structure of sedimentary rocks, in which uranium and lead mineral deposits are expected, and the paleo-topographic structure of the basement rock.

1-2 Outline of Drilling Work

The drilling team arrived at Haute Moulouya (the destination for the survey) on May 14, 1979, and started camp construction. From May 15, the location of drilling site was confirmed.

For the MR-1 hole, repair of the road started on the 15th, and preparatory work started immediately after the arrival of drilling equipment on the 16th. Drilling started on the 18th.

The drilling machine was a Craelius D-1000 (drilling capacity: BQ 650 m). The wire-line method was employed for all drilling holes. On drill, bentonite mud water was used and, for the surface soil, a metal bit was partly used.

Initially, three holes were planned, and one hole (MR-4) was added.

Drilling of the MR-4 hole started on July 8 and ended on July 12 when the depth reached 100.10m. This means that the total depth of Drilling reached 652.35 m.

Beyond the 100.10 m depth of the MR-4 hole, Drilling was continued by BRPM until the hole was drilled into the granite and reached 375.70 m.

The total drilling depth was 652.35 m, total core recovery was 84.59%.

Chapter 2. Drilling Work

2-1 Location of Drill Holes

There are two routes from Itzar (where the team's camp was constructed) to MR-1. One runs northward on the Boulmane road and turns south-east. The other runs south-ward for zayda and turns to the north-east. For both routes, the distance from Itzar is 32 km and the drive takes 45 min.

MR-2 is 200 m from the Boulmane road. The distance from Itzar is 14 km, and the drive takes 15 min.

To reach MR-3, it is necessary to go 10 km southward from Zayda and on the Tounfit road, then a further 7 km. The distance from Itzar is 39 km, and the drive takes 50 min.

MR-4 is located at the intersection of the road from Itzar with the Midalt road. The distance from Itzar is 7 km, and the drive takes 10 min.

Coordinates of each hole are as follows.

MR-1	X = 550.0	Y = 257.0	Z = 1440.0
MR-2	X = 540.0	Y = 257.0	Z = 1545.0
MR-3	X = 540.0	Y = 237.0	Z = 1543.0
MR-4	X = 535.0	Y = 257.0	Z = 1630.0

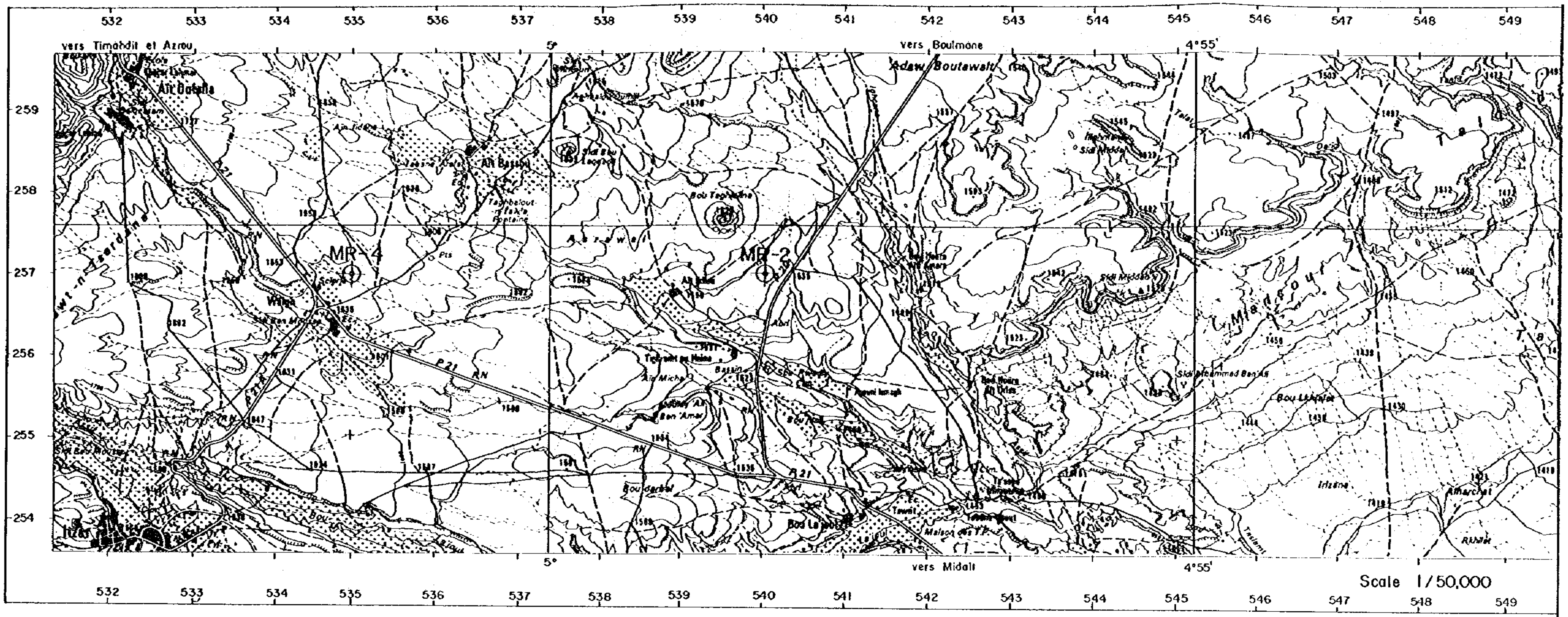
2-2 Preparatory Work

(1) Road Construction

Since topography of each drilling site was flat, and trucks were able to be driven close to the drilling sites, it was not necessary to construct any new roads. Weeds and rocks were cleared manually to repair roads over 300 m to 1000 m in length at each site.

(2) Transportation of Drilling Equipment

The drilling equipment was loaded on trucks on May 14 in Rabat,



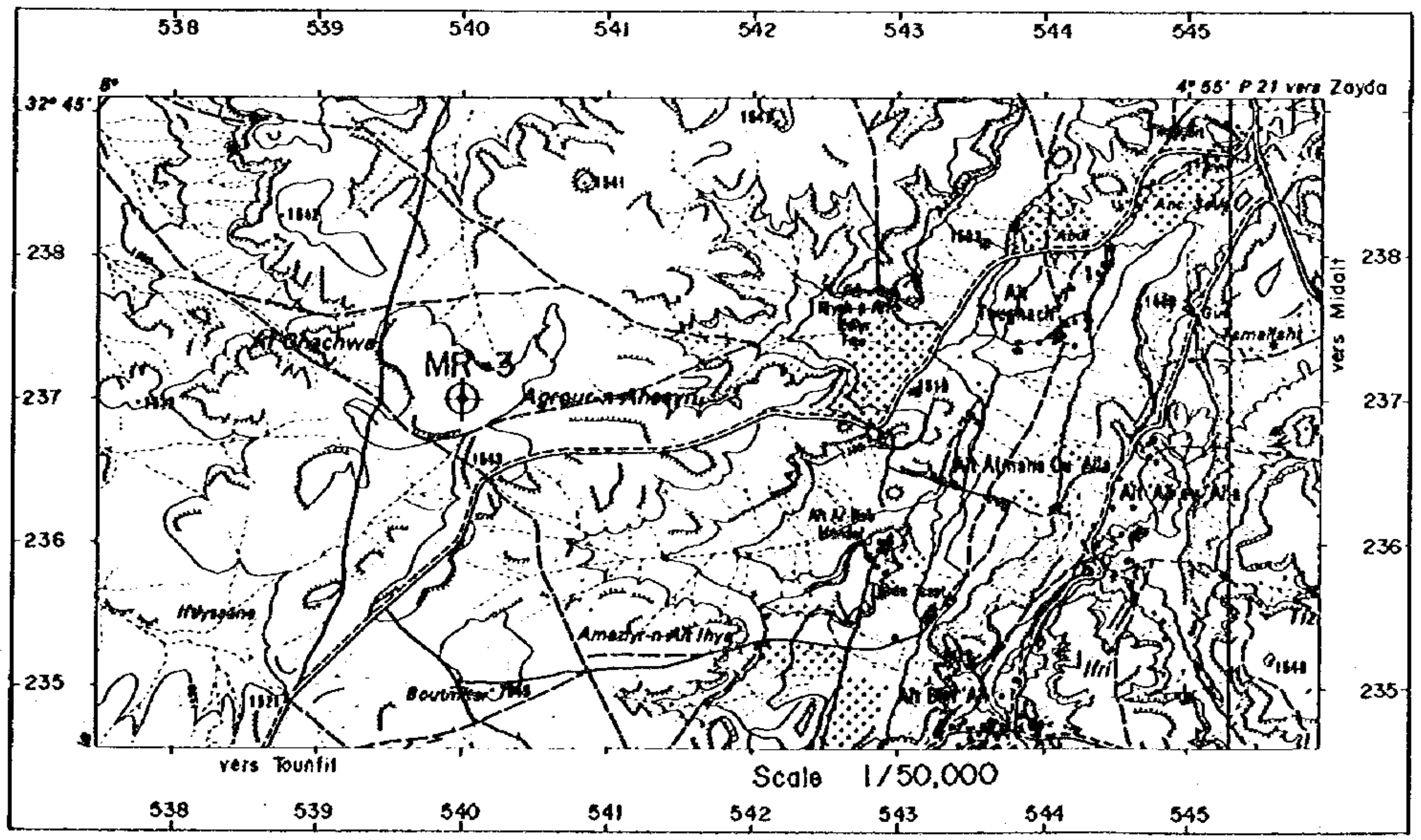
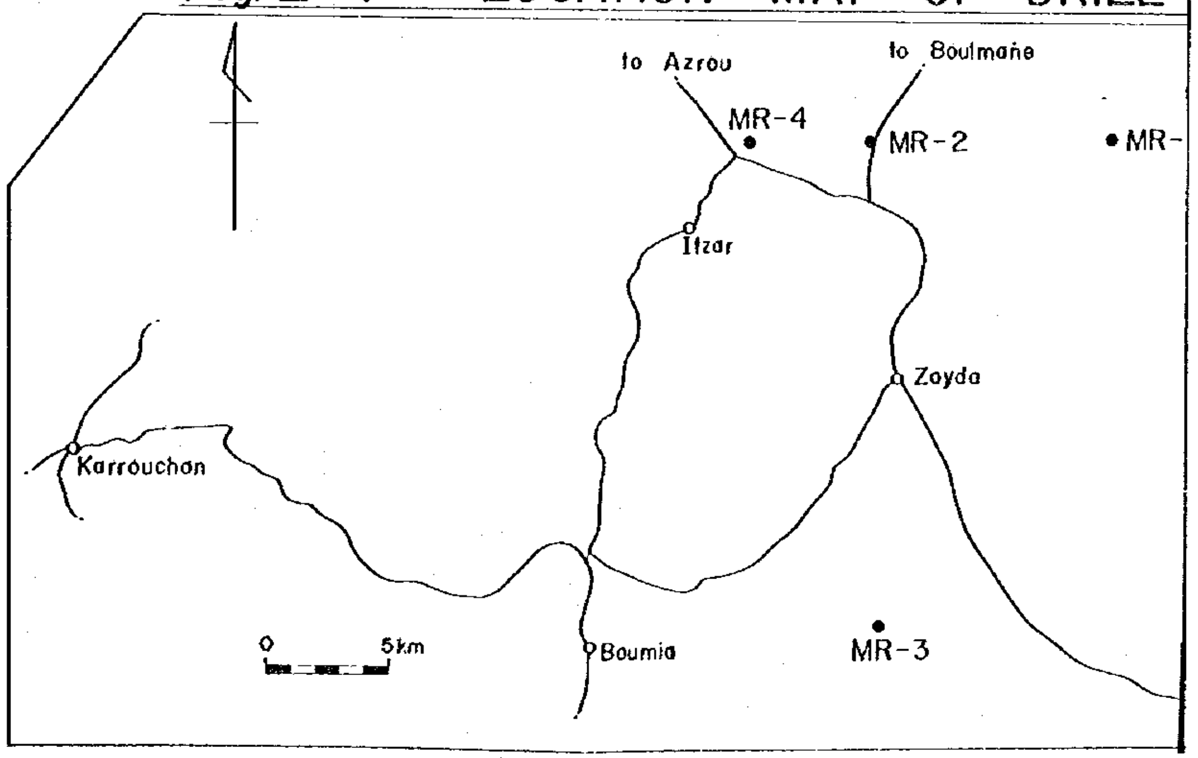
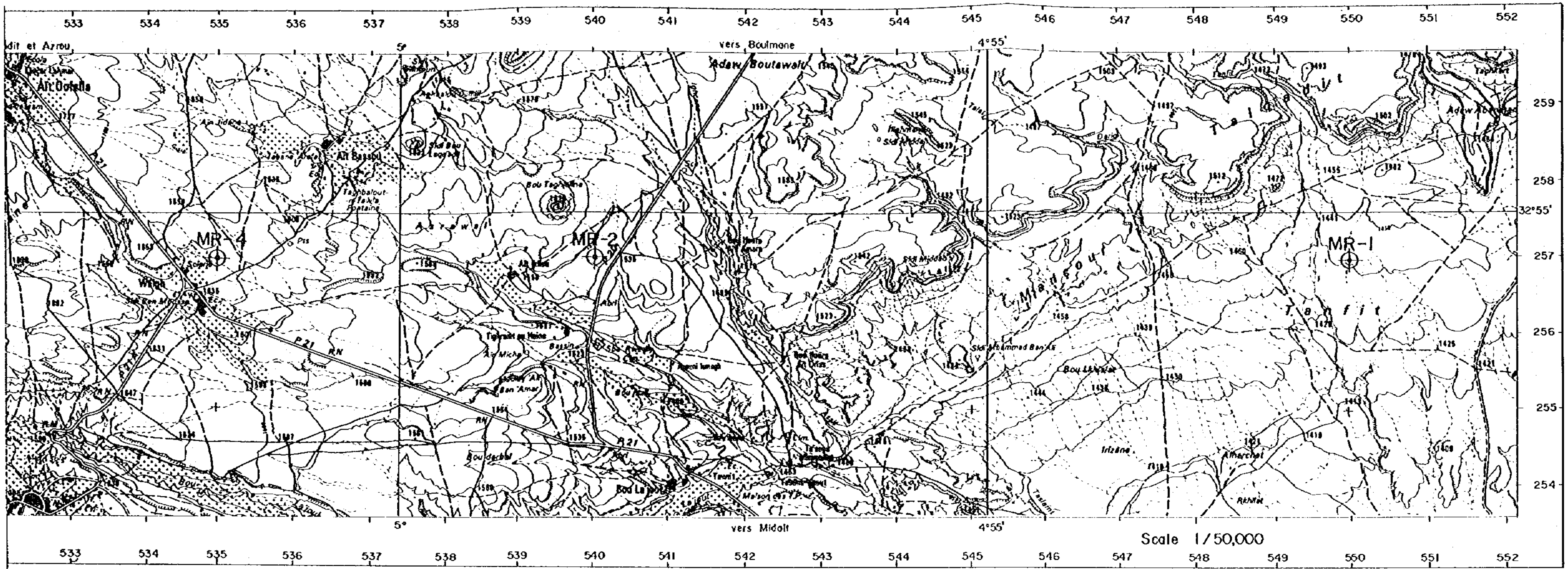


Fig. III-1 LOCATION MAP OF DRILL





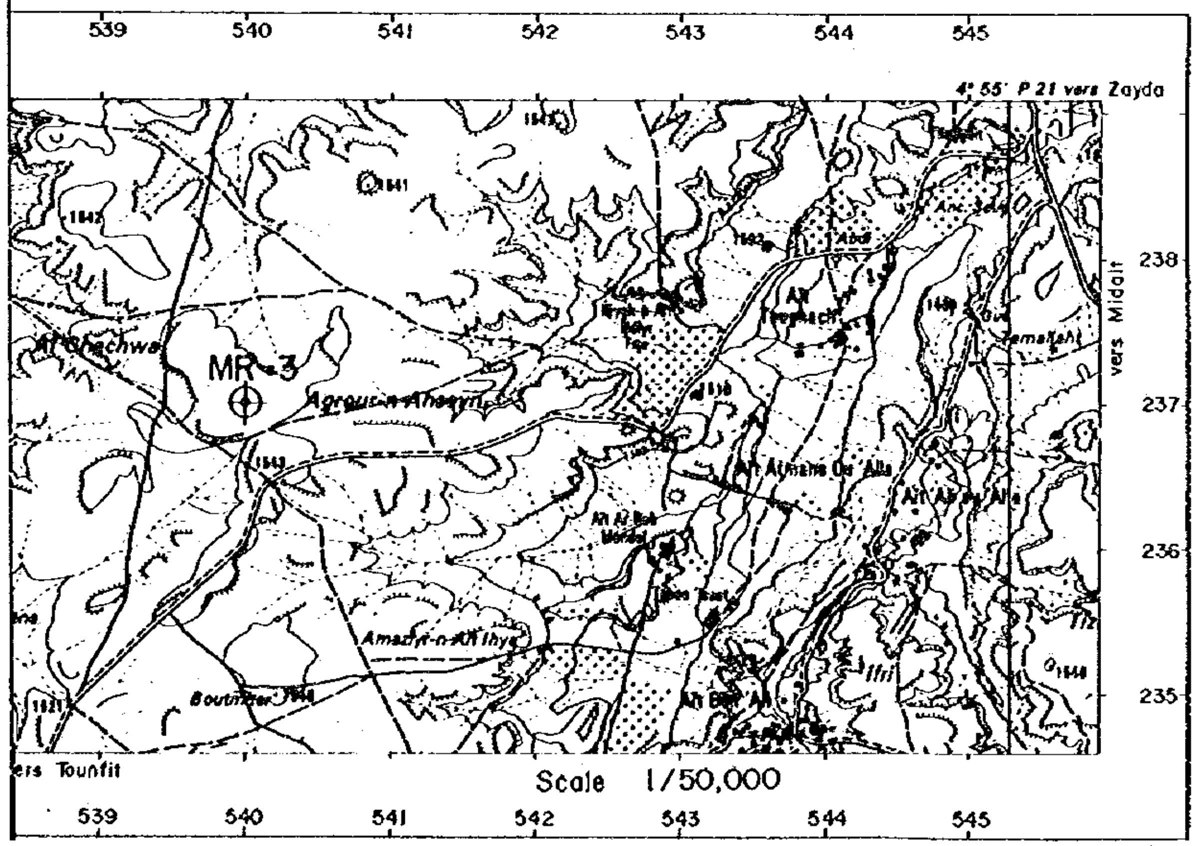
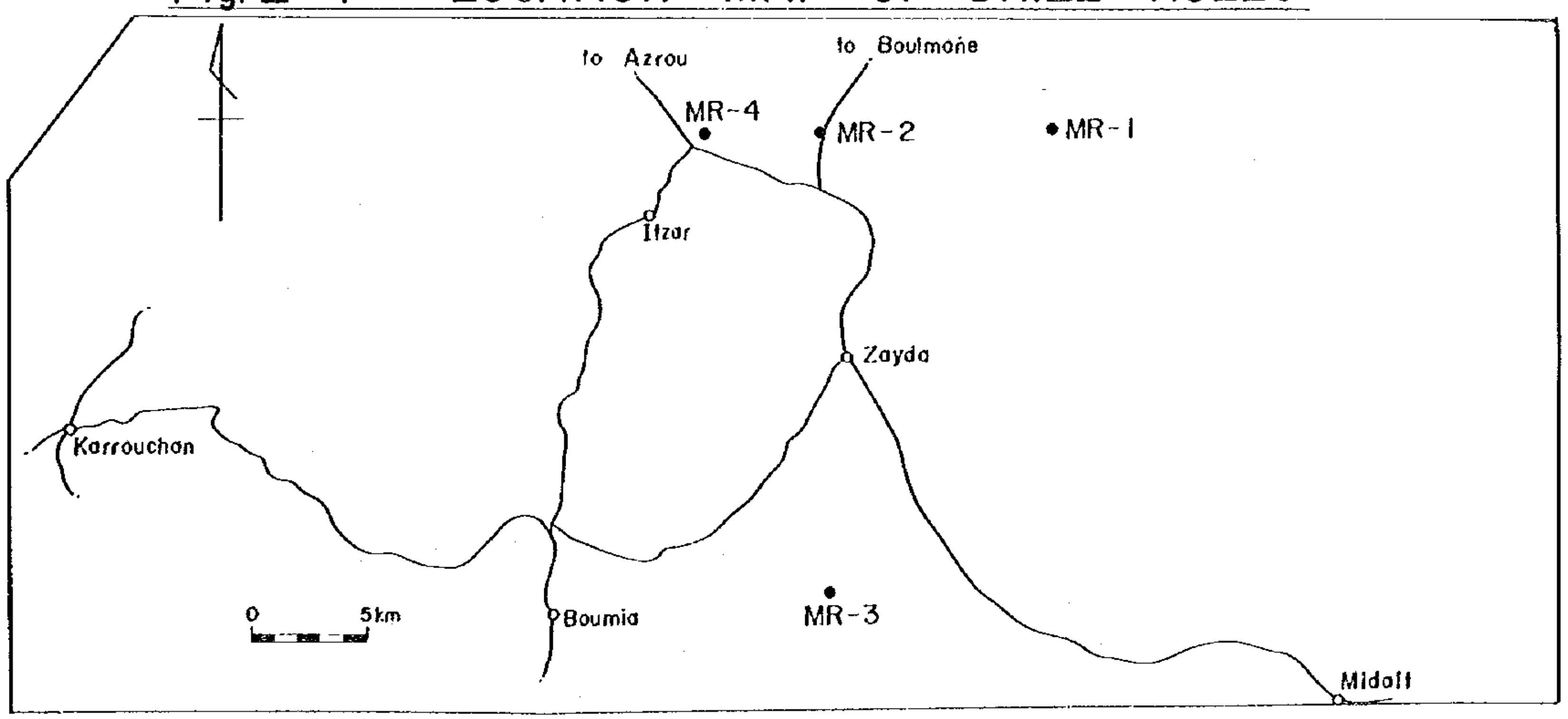


Fig. III-1 LOCATION MAP OF DRILL HOLES



and transported 350 km to Itzar. On the 16th, the equipment was transported to MR-1, and the preparatory work started at once.

(3) Installation

Since each drilling site was flat, the land construction for the installation of drilling equipment was easily completed manually.

(4) Water Supply

For MR-1, pipes were laid between the drilling site and the river for 600 m distance to pump water up.

Since there was no water souce close to MR-2, MR-3 and MR-4, water was supplied by a 4 m³ tank truck from rivers to the sites, which were 1.5, 3.0 and 1.5 km distance respectively.

2-3 Drilling Work

(1) MR-1 Hole

Drilled depth :	148.30 m
Core length :	126.20 m
Core recovery	85.1 %
Start of drilling :	May 18
Completion of drilling :	May 26

0 to 4.60 m :

Drilling was carried out for 4.60 m by employing a 116 mm single metal bit. Because the rock was stable at this depth, HW casing pipes were inserted into the hole.

4.60 to 70.25 m :

Drilling was smoothly carried out to 70.25 m by employing HQT-WL diamond bits and bentonite mud water. This section consists of strongly altered rock which increased the mud viscosity. Therefore, the mud water was renewed from time to time. Since the rock was stable at this depth, NW casing pipes were inserted into the hole to 70.00 m depth.

70.25 to 148. 30 m :

Drilling was smoothly carried out by employing NQT-WL diamond buts and bentonite mud water. The drilling reached granite and was completed at the depth of 148.30m.

(2) MR-2 Hole

Drilled depth :	265.95 m
Core length :	248.15 m
Core recovrry :	93.3 %
Start of drilling :	May 30
Completion of drilling :	June 18

0 to 2.00 m:

Drilling was carried out for 2.00 m by employing a 116 mm single metal bit. A HW casing pipe was inserted into the hole.

2.00 to 54.90 m :

Drilling was smoothly carried out to 54.90 m by employing HQT-WL diamond bits and bentonite mud water. Since the drilling reached stable rock, NW casing pipes were inserted into the hole to 54.00 m depth.

54.90 to 161.65 m :

Drilling was carried out to 161.65 m by employing NQT-WL diamond bits and bentonite mud water. One day was spent in repairing faults in the pump and drilling equipment. BW casing pipes were inserted in the hole to 161.00 m depth, then the bit was changed to a BQT-WL diamond for the next drilling.

161.65 to 265.95 m :

Drilling was carried out by employing BQT-WL diamond bits and bentonite mud water. The viscosity of the bentonite mud water was

increased for red-brown mudstone, therefore, the mud water was frequently renewed. From 251.00 m, its geology changed to arkose sandstone which had been partly crushed. The BQT-WL bit jammed at 254.40 m depth. To repair this trouble, the hole was reamed by BW casing bits and the BW casing pipes were extended to 254.00 m.

Drilling was continued using BQT-WL bits. From 264.90 m depth, the geology became to crushed granite. At 265.10 m, the BQT-WL bit jammed again. The bit could not be lifted out inspite of a trial with a hydraulic jack, so reaming using a BW casing bit was started, but the jamming of the BW casing bit was repeated at 261 m. Therefore, the reaming was continued using NW casing bits. NW casing pipes were extended from 54 m to 261 m and the BW casing bit was recovered. After inspection of BW casing bit the raming was continued with his bit to 264 m. At this depth, a gear of the drilling machine has broken. A spare gear was transported from Rabat and the machine was repaired. Drilling using the BW casing bit was completed at the 265 m depth. Repair of the BQT-WL trouble was also completed.

Drilling was completed at 265.95 m which the existence of granite was confirmed.

(3) MR-3 Hole

Drilled depth :	138.00 m
Core length :	114.10 m
Core recovery :	82.7 %
Start of drilling :	June 22
Completion of drilling :	June 30

0 to 3.70 m :

Drilling was carried out for 3.70 m with a 116 mm single metal bit and using bentonite mud water, then HW casing pipes were inserted into

the hole to the same depth.

3.70 to 33.40 m :

Drilling was carried out to 33.40 m by employing HQT-WL diamond bits and bentonite mud water. As the drilling reached stable rock, NW casing pipes were inserted into the hole to the same depth.

33.40 to 138.00 m :

Drilling was carried out by employing NQT-WL diamond bits and bentonite mud water. After reaching granite at 136.50 m, drilling was continued to 138.00 m.

(4) MR-4 Hole

Drilled depth :	100.10 m
Core length :	63.40 m
Core recovery	63.3 %
Start of drilling :	July 8
Completion of drilling :	July 12

Before receiving drilling instructions of the additional hole, MR-4, checking and maintenance of the drilling equipment was carried out for 3 days.

0 to 3.60 m :

Drilling was carried out employing a 116 mm single metal bit to 3.60 m. Since the rock was stable, HW casing pipes were inserted into the hole to the same depth.

3.60 to 54.90 m :

Drilling was smoothly carried out with HQT-WL diamond bits and bentonite mud water to 54.90 m. NW casing pipes were inserted into the hole to the same depth.

54.90 to 100.10 m :

Drilling was carried out with NQT-WL diamond bits and using bentonite

mud water. The contractual depth of 100.10 m was reached on July 12, thus completing drilling of the MR-4 hole. Beyond 100.10 m, drilling of the MR-4 hole. Beyond 100.10 m, drilling changed over to BRPM. Granite was confirmed at 375.70 m.

2-4 Removal Work

After drilling reached the revised contractual depth, removal of camping tools, etc. was started by the team members. The camp was removed on July 13 and all persons left Itzar for Rabat. Drilled cores were stored in the warehouse of BRPM in Rabat, thus all work has been completed.

2-5 Core Evaluation, Well Logging and Sampling

(1) Core Evaluation

Core evaluation was conducted at each drilling site by a Japanese geological engineer as drilling of each hole progressed. The engineer precisely studied the geology of cores and the existence of mineralization so that his tasks could be completed on the day of drilling completion.

(2) Well Logging

The well logging was carried out after the cashing pipe had been inserted into each drilled hole. For the well logging, and OYO-geologer was used for holes MR-1, MR-2 and MR-3, and a SINTREX GAD-6 Gamma-ray Spectrometer was used for the MR-4 hole by 3 engineers of BRPM.

(3) Sampling

On the basis of the results of the core evaluation and well logging, cores in which mineralization was observed and expected were selected. Then, each of these cores was split into half by a splitter. A half of each core was allocated as an analysis and laboratory research sample. The other half was a spare sample, which were stored in the were house of BRPM.

Chapter 3. Geology of Drill Holes

3-1 Geology Surrounding Drilling Sites

The geology in the Tanfit-Micha area where the MR-1 hole was drilled, in the Itzar Basin area where the MR-2 and MR-4 holes were drilled, and in the central south geophysical prospecting area where the MR-3 hole was drilled, is as follows.

(1) Tanfit-Micha Area

Red mudstone bed which is an upper member of the P-T Red Sandstone Formation and, above this β_{P-T} Basalt Formation of Permo-Triassic, J_1 Limestone Formation of Jurassic, K_2cm Mudstone Formation of Cretaceous, and T_1 Mudstone Formation of Tertiary are found in the area. In addition, Q_2 Silt Formation of Quaternary is extensively distributed in the lower part of this area.

J_1 Limestone Formation, K_2cm Mudstone Formation and T_1 Mudstone Formation are located in the northern part of the area. J_1 Limestone Formation varies markedly in thickness. K_2cm Mudstone Formation is about 40 m thick. It mainly consists of red, gray or blue mudstones and marls and always contains an intercalated limestone layer. The maximum thickness of the T_1 Mudstone Formation is 55 m at Agzou in the north of Micha.

The bedding plane of every formation is almost horizontal. The Ansagmir fault and the northern extension of the Ilich-Azougagh fracture zone are visible. No mineralization of lead and uranium has been found in this area. However, it was previously thought that a possible uranium concentration would exist deep in this area because the area is a stable sedimentary basin located close to the northern part of the uraniferous Zayda granite body.

(2) Itzar Basin Area

This area consists of P-T Red S ndstone Formation, a β_{P-T} Basalt Formation of Permo-Triassic, K_2cm Mudstone Formation, K_2t Limestone Formation of Cretaceous, T_1 Mudstone Formation, T_2 Maar Formation, T_3 Sandstone Formation of Tertiary, and Quaternary system.

P-T Red Sandstone Formation is distributed northward from the western part of Zayda in a NE-SW direction. The bedding is almost horizontal in the Zayda district. In the area about 9 km north of Zayda β_{P-T} Basalt Formation occur at places as lava of 1 to 3 m thickness. K_2cm Mudstone Formation is found northward from the western part of Zayda in a NE-SW direction. In Zayda area, the P-T Red Sandstone Formation is overlain by a K_2cm Mudstone Formation which is exposed almost horizontally. The K_2cm Mudstone stratum is overlain by the K_2t Limestone Formation which is exposed and gradually sloped in the NE-SW direction in the north-west of Zayda. The T_1 Mudstone Formation is distributed in the NE-SW direction in the Itzar district. This Formation is about 30 m thick, and consists of brown mudstone which overlays K_2t Limestone Formation. The T_2 Maar Formation and T_3 Sandstone Formation are almost horizontally distributed in the west of Itzar.

(3) Central South Geophysical Prospecting Area

This area consists of granites, P-T Red Sandstone Formation and β_{P-T} Basalt Formation of Permo-Triassic, J_1 Limestone Formation of Jurassic, T_1 Mudstone Formation and T_2 Marl Formation of Tertiary, and Quaternary system.

The granites consists of the eastern Bou Mia granite zone and the western Zayda granite zone. P-T Red Sandstone Formation is deposited in the basin located between both granite zones and consists of lower arkose sandstone and upper mudstone. β_{P-T} Basalt Formation is distributed in the western half of this area, but it is nor found in the eastern half.

β_{P-T} Basalt Formation is conformable overlain by J_1 Marl Formation which is distributed in a limited area south of Bou Mia. T_1 Mudstone Formation is colorful and soft, and intercalated with many conglomeratic sandstone layers. The T_2 Marl Formation mainly consists of gray or yellow-gray marl and contains intercalated siltstone and limestone. The Quaternary system is extensively distributed southward from the Moulouya River showing a terrace structure.

3-2 Geology of Drilling Sites

(1) MR-1 Hole

This site is located in the western end of the Tanfi-Micha area; coordinates: X = 550.0, Y = 257.0 and Z = 1440.0 (1,440 m above sea level). β_{P-T} Basalt Formation is found at the site. Other formations above this have been eroded. β_{P-T} Basalt Formation is about 10 m thick. Below this layer, it is asumed that there is a 170 m thick continuous P-T Red Sandstone Formation. Therefore, it was estimated that the granite basement would be reached at 180 m to 200 m.

(2) MR-2 Hole

The site is located in the north-eastern part of the Itzar Basin area; Coordinates : X = 540.0, Y = 257.0 and Z = 1545.0 (1,545 m above sea level). The site has a 5 m thick T_1 Mudstone Formation. Below this, there is a continuous 160 m thick K_2cm Mudstone Formation and 80 m thick P-T Red Sandstone Formation. Therefore, it was estimated that the granite basement would be reached at 240 m to 260 m. It is assumed that this area contains no Jurassic system deposits, the Permo-Triassic system is directly overlain by a Cretaceous system.

(3) MR-3 Hole

The site is located in almost the central part of the central south geophysical prospecting area (survey conducted in the first phase);

coordinates : X = 540.0, Y = 237.0 and Z = 1543.0 (1,543 m above sea level). Under the site, and palaeochannel runs south on the basement rock whick was assumed by gravity prospecting. The site has an approximately 110 m-thick T_2 Marl Formation. Below this, it is estimated that there is a continuous 50 m-thick T_1 Mudstone Formation, a 100 m-thick J_1 Limestone Formation and a 80 m-thick P-T Red Sandstone Formation. The basement is estimated to be at 340 m. About 9 km southward from this hole, the HM-1 hole was drilled by BRPM. The basement rock at this site was at 555.0 m

(4) MR-4 Hole

This site is located in the north-western end of the Itzar Basin area; coordinates : X = 535.0, Y = 237.0 and Z = 1630.0 (1,630 m above sea level). The location is 5 km west of the MR-2 hole. The site has and approximately 20 m-thick T_2 Marl Formation Below this, it is estimated that there is a 40 m-thick T_1 Mudstone Formation, a 100 m-thick K_2t Limestone Formation, a 160 m-thick K_2cm Siltstone Formation and a a 80 m thick P-T Red Sandstone Formation. The depth to the basement rock is estimated to be about 400 m. The site is higher than the MR-2 hole site, therefore, it is estimated that the covering sediment on the basement rock is thicker than that of the MR-2 hole.

3-3 Geology of Drilling Holes

Radioactive logging was conducted for each drilled hole to determine layers having radioactive anomalous values. The geology of collected cores was studied, and mineralizations and alterations were reviewed.

After logging, cores with especially high radioactive detected values and those with mineralization and alteration were analyzed for Pb, Ba and U. On some of them, microscopic observation were conducted.

(1) MR-1 Hole

The geology of this hole is as follows. (PL. III-1)

Drilled depth (m)		
0.00 ~ 0.50	Q	gravel layer
0.50 ~ 5.00	β_{P-T}	basalt
5.00 ~ 35.60	P-T	mudstone
35.60 ~ 36.60	P-T	shale
36.00 ~ 79.00	P-T	mudstone
79.00 ~ 82.00	P-T	siltstone
82.00 ~ 83.00	P-T	shale
83.00 ~ 95.00	P-T	siltstone
95.00 ~ 100.00	P-T	mudstone
100.00 ~ 103.00	P-T	siltstone
103.00 ~ 144.80	P-T	mudstone
144.80 ~ 145.70	Gr	carapace
145.70 ~ 148.30	Gr	granite

From the 5.00 to 144.8 m depth in this hole, there is mainly a P-T Red Sandstone Formation. This mainly consists of mudstone, but in places, contains about 1 m thick layers of interbedded siltstone. In this layer, there are discolored parts more than 10 cm wide. Close to the about 50 cm wide discolored parts at 75 m from the surface, a black mineral is found of which the radioactive measured value was as high as 90 c/sec (about 20 c/sec background for the vicinity). Between 85.00 and 120.00 m depth, there are many 5 cm thick gypsum layers. Between the 95.00 and 126.00 m depth, there are mudstone and siltstone layers having cross-laminations. This indicates that during sedimentation, this layer was exposed or an evaporite basin in which water flowed. The layer below than 122.0 m mainly consists of mudstone in which more than 20 c/sec radioactive values were frequently measured. Many discolored parts were found below 132 m deep.

Analysis values of this hole core are shown in Table III-14.

The analysis value of uranium for discolored parts was as low as 0.002 % or less. The value for black mineral portions at 75.80 m was 0.005 % U. The analyzed ore grades for Pb, Ba and U for samples collected every 1 m spacing from 140 to 145 m was 42 ppm pb or less, 8.40 % Ba or less, and 0.002 % U or less respectively. The maximum Ba value was for the Carapace grainite collected at 145 m.

The results of the microscopic test and X-RAY microanalysis clarified that the black mineral at 75.50 m was an aggregate of fine galena, chalcocite, sphalerite and pyrite and irregularly filled spaces between matrix particles. Also, it was clarified that the black mineral at 132.40 m was an aggregate of fine chalcopyrite, chalcocite, covellite and pyrite. In the sample collected from the Carapace on the basement rock, a small amount of acicular chalcopyrite and chalcocite were observed.

(2) MR-2 Hole

The geology of this hole is as follows. (PL.III-2)

Drilled Depth (m)		
0.00 ~ 32.10	T_1	siltstone
32.10 ~ 100.00	K_2cm	siltstone, gypsum and limestone
100.00 ~ 108.85	β_{P-T}	siltstone
108.85 ~ 243.00	P-T	mudstone
243.00 ~ 251.00	P-T	siltstone
251.00 ~ 264.90	P-T	arkose sandstone, siltstone and sandstone
264.90 ~ 265.95	Gr	granite

The strata between 0 to 32 m depth consists of Tertiary white-yellow siltstone and that between 32 m to 100 m Cretaceous K_2cm Mudstone.

These layers are formed the alternated bed of siltstone, gypsum and shale. The gypsum is particularly intercalated. The siltstone between 100 m and 108 m is, unlike the overlying siltstone, dark gray, massive and has less bedding plane. This layer is unconformably overlain by the K_1cm Mudstone Formation, but this layer conformably covers on the lower P-T Red Sandstone Formation. Therefore, it was determined as β_{P-T} Basalt Formation. The bed between 108.00 m and 243.00 m depth consists of mudstone of the P-T Red Sandstone. Between 160.00 m and 170.00 m, there are discolored parts. Between 167.00 m and 171.00 m, dissemination parts of black minerals were observed. The layer between 243.00 m and 264.90 m consists of siltstone and arkose sandstone, and contains many discolored parts. Close to portions 221.00 m depth, deeper than 258.00 m depth and 262 m depth, black minerals in the form of fine bands or spots were observed.

Radioactive values measured in this hole were generally 20 c/sec to 30 c/sec. However, the value of 50 c/sec was detected at a depth between 163.70 m and 165.30 m and 45 c/sec at the depth between 239.20 m and 240.00 m, which are 2 to 3 times the background value. Beyond 264.90 m deep, the granite basement has a radioactive value of 40 c/sec which is slightly higher than back ground value.

The results of the analysis of this hole core are given in Table III-15. For disseminated parts of black minerals, four samples, spaced 1 m apart, were analyzed. As a result of the analysis, the Pb grade was 0.43 % and the U grade was 0.014 % between 169.00 m and 170.00 m. Twenty six samples from between 221.00 m and 265.00 m were analyzed, but the U grade was less than 0.002 % for all samples. For six samples from the depth between 259.00 m and 265.00 m, analysis was conducted for Pb and Ba, but the maximum Pb grade was 220 ppm and the Ba grades were from 0.28 % to 5.0 %.

The microscopic tests clarified that the black mineral at 221.00 m was fine veins of 0.1 mm wide covellite. By microscopic tests and X-RAY microanalysis, it was clarified that the black mineral at 263 m was covellite, pyrite and hematite.

(3) MR-3 Hole

The geology of this hole is as follows. (PL.III-3)

Drilled Depth (m)		
0.00 ~ 73.90	T_2	siltstone and mudstone
73.90 ~ 77.65	T_1	conglomerate
77.65 ~ 92.95	T_1	siltstone and conglomerate
92.95 ~ 102.65	T_1	conglomerate
102.65 ~ 136.50	P-T	siltstone
136.50 ~ 150.25	Gr	granite

The layer between 0 and 10 m is partly soil resulting from strong weathering. Between 0 and 73.90 m mainly siltstone and mudstone are found with intercalated sandstone and conglomerate. The layer between 73.90 m and 77.65 m is a conglomerate consisting of limestone gravel more than 3 cm in diameter. Taking this as a border, the upper part is defined as a T_2 Marl Formation and the lower part as a T_1 Formation containing a conglomerate layer. The layer between 73.90 m and 102.65 m is a T_1 Mudstone Formation containing 4 intercalated conglomerate layers consists of limestone and siltstone, pebbles. Between 102.65 m and 136.50 m mainly siltstone was found which is correlated with the middle bed of the P-T Red Sandstone. In this layer, there are many 1 cm to 110 cm wide discolored parts. In logging, radioactive values were 20 to 30 c/sec in the P-T Red Sandstone Formation, but values were as low as 10 to 15 c/sec for other sedimentary rocks. Values of 30 to 40 c/sec were measured, in some cases, at the bottom of the red sandstone layer and granite.

The results of the analysis of this hole are given in Table III-16. Samples were collected at 1 m intervals between 131.00 m and 136.00 m depth and were analyzed for lead and uranium. The results were less than 0.007 % Pb and less than 0.002 % U.

(4) MR-4 hole

The geology of this hole is as follows. (PL.III-4)

Drilled Depth (m)

0.00	4.00		soil
4.00	7.15	Q_2	conglomerate
7.15	26.95	T_2	marl and siltstone
26.95	57.40	T_1	siltstone and sandstone
57.40	95.90	K_2t	siltstone, sandstone and limestone
95.90	112.50	K_2cm	sandstone and siltstone
112.50	198.45	K_2cm	siltstone and gypsum
198.45	350.25	P-T	siltstone and gypsum
350.25	372.00	P-T	sandstone and arkose sandstone
372.00	375.70	Gr	granite

The layer between 0 and 4.00 m consists of surface soil, and that between 4.00 and 7.15 m is a calcareous conglomerate of the Quaternary Q_2 Formation. The layer between 7.15 m and 26.95 m consists of siltstone containing intercalated marl and has the characteristics of a T_2 Marl Formation. The layer between 26.95 m and 57.40 m consists of brown siltstone. Through this layer, the siltstone is transformed, from top downward, into sandstone which contains black and brown siltstone fragments. This layer is correlated with T_1 Mudstone Formation. The layer between 57.40 m and 95.90 m mainly consists of white calcareous siltstone,

and contains intercalated limestone at between 68.80 m and 72.70 m. Fossils were found in this limestone layer which corresponds to the K_2t Limestone Formation. The layer between 95.90 m and 197.00 m depth mainly consists of green, gray, red-brown or dark-green siltstones and contains many intercalated gypsum layers. Therefore, it is assumed that this layer corresponds to the K_2cm Mudstone Formation. The layer between 198.45 m and 372.00 m consists of red siltstone and corresponds to the P-T Red Sandstone Formation. Discolored bands of 20 cm to 40 cm in width are scattered sporadically. Many gypsum veins were observed in the layer between 207.30 m and 328.00 m. Below 350.25 m, a sandstone layer is observed, and an about 16 m-thick lowermost layer is arkose sandstone. The basement granite is found at 372.00 m depth.

The logging of this hole was carried out with a GAD6 spectrometer, a different instrument that used for the above three holes. Values measured were generally 460 69 490 TC/sec. No high value was detected. Samples for analysis could not be collected.

Chapter 4 Discussion of Results

4-1 Discussion of Geological Sturcture

Four holes were drilled in the project this fiscal year, and the total depth reached was 927.95 m (including the additional drilling by BRPM). As a result of the drilling, the geological structure of the region has been clarified. Data not available by the ground surface geological survey was obtained, such as the depth of the basement rock, mineralization, alteration, etc.

Drilling of the MR-1 hole was carried out from the β_{P-T} Basalt Formation, 1,440.00 m above sea level. The drilling passed through this layer at 5 m, and reached the P-T Red Sandstone Formation. The basement rock was reached at 144.80 m depth. Therefore, the thickness of the P-T Red Sandstone Formation is 139.80 m, and the surface of the basement rock is 1,290.20 m above sea level. Drilling of the MR-2 hole started at 1,295.20 m height above sea-level. A 156.05 m thick P-T Red Sandstone Formation (from 108.85 m to 264.90 m depth) was found. The basement granite is distributed from 264.90 m depth (1,280.10 m above sea-level). The MR-3 hole was drilled at 1,543.00 m height above sea-level. A 33.90 m thick P-T Red Sandstone Formation (from 102.60 m to 136.50 m in depth) was found. The basement granite starts from 136.50 m depth (1,406.50 m above sea-level). For the MR-4 hole, the Drilling was started from 1630.00 m height above sea-level. A 173.55 m thick P-T Red Sandstone Formation (from 198.45 m to 372.00 m in depth) was found. The basement granite was found below 372.00 m deep (1258.00 m above sea-level). The geological structure discussion is based on these results.

PL.III-5 shows the geological profile for each hole. Section A-A' is an east-west section passing through MR-1, MR-2 and MR-4. According to the profile, as the upper level of the above P-T Red Sandstone Formation is approximately 1,435 m sea-level, it seems to be horizontal. This layer is thin in the eastern part and thick in the western part. From this fact, it can be said that the depth of the basement granite increases maintaining an approximately 1^{o} slope westward, and the P-T Red Sandstone Formation maintains almost same characteristics since it was deposited. Other upper layers above the P-T Red Sandstone Formation are extensively distributed in the western area where the altitude is high. Layers older than the Tertiary period are almost horizontally accumulated.

B-B' section in PL.III-5 shows a north-south geological profile passing through MR-2 and MR-3. According to this profile, the Zayda granite zone is high between MR-2 and MR-3 which divides between the Itzar Basin area (MR-2) and the central south geophysical prospecting area (MR-3). In the Itzar Basin area, the basement granite continues from the Zayda granite zone increasing the depth by sloping 6^{o} northward. The thickness of the P-T Red Sandstone Formation increases northward from the Zayda granite zone. From the thinly overlaid β_{P-T} Basalt Formation, the slope of the bedding plane of the P-T Red Sandstone Formation is assumable about 4^{o} to the north. Permo-Triassic systems were overlain by later formations than the Cretaceous period, so it is presumed that the sedimentation has continued in the same sedimentary basin since the Cretaceous period.

The central south geophysical prospectiong area has been formed sedimentary basin. The basement rock and P-T Red Sandstone Formation slope gradually southward. The basement granite is at 1,440.40 m above

sea-level at MR-3 and at 1,040.00 m above sea-level at IM-1 (drilled by BRPM) which is located about 8 km south of MR-3. The sedimentary basin has a tendency to deepen southward. The P-T Red Sandstone Formation is 40 m to 50 m above the basement rock and directly overlaid unconformably by Tertiary sediments. From this fact, it can be assumed that this sedimentary basin was formed after the Tertiary period and in a different period from the Itzar Basin area.

Accordingly, it may be inferred that the Tanfi-Micha area, Itzar Basin area and central south geophysical prospecting area belonged to the same sedimentary basin in the Permo-Triassic period, peneplanation occurred in the Jurassic period, then the basement rock was upheaved or subsided and finally small scale sedimentary basins were formed. In other words, the sedimentary basin in the Tanfi-Micha and Itzar Basin areas has been formed in the Cretaceous and Triassic periods, and that in the central south geophysical prospecting area has been built in the Triassic period. Since then, additional sedimentary basins formed in the Quarternary period in the Tanfi-Micha and central south geophysical prospecting areas.

The highest granites of basements complex is in the Zayda granite exposure zone where the altitude is 1,526.00 m. The lowest granite altitude, in these drillings is 1,258.00 m in MR-4. Therefore, it is presumable that the basement rock slopes 1.5^{o} north-westward.

The P-T Red Sandstone Formation in which lead and uranium deposits are faverable are as follows.

Hole	Depth (m)	Thickness (m)
MR-1	5.00 ~ 144.80	139.80
MR-2	108.85 ~ 264.90	156.85
MR-3	102.60 ~ 136.50	33.90
MR-4	198.00 ~ 372.00	173.55

For the MR-1 and MR-3 holes, there is no arkose sandstone layer and the mudstone and siltstone are directly deposited on the basement rock. From this fact, it could be concluded that materials deposited during the sedimentation had been supplied from crystlline schist. Especially for the central south geophysical prospecting area where the MR-1 and BRPM's HM-1 holes were drilled, it would be thought that these materials had been transported from the south or south-eastern.

4-2 Discussion of Mineralization

In the drilling carried out this fiscal year, high-grade lead and uranium mineralization that would be worth mining were not found. However, discolored altered bands were frequently found in the P-T Red Sandstone in which possible mineral deposits may be expected. In a part of these bands, dissemination and fine veins of black minerals were found. Furthermore, values of 3 to 5 times the background value were confirmed in radioactive logging.

High radioactivity values measured in logging are as follows.

Hole	Depth (m)	Radioactive value (c/sec)
MR-1	75.50 ~ 75.80	90
MR-2	164.20 ~ 165.30	50
	239.20 ~ 240.00	45
MR-3	133.00 ~ 133.80	45
MR-4	non	non

In the arkose sandstone of the lowermost of P-T Red Sandstone Formation and granite, slightly high background values were generally seen. However, the value is low in other sedimentary rocks. Therefore, it can be considered that the P-T Red Sandstone should be assumed to be a layer having a high possibility of mineral deposit.

High radioactivity values measured in logging did not always correspond to the discolored altered bands or dissemination of black minerals. This is probably due to the depth measurement error in logging or the rate of core collection. Therefore, measurement should be carried out taking great care of the above points in furture surveys.

High U analysis values for discolored bands or black minerals in the high radioactivity value portions are as follows.

Hole	Depth (m)	U analysis value (%)
MR-1	75.50 ~ 75.80	0.005
MR-2	169.00 ~ 170.00	0.014

In other parts, the maximum U analysis value was 0.002 % for all areas.

The maximum Pb analysis value was 0.43 % in the MR-2 hole between 169.00 m and 170.00 m. Other values were lower.

As described above, the existence of discolored bands and weak mineralization of lead and uranium has been confirmed in P-T Red Sandstone Formation in the surveyed region, especially, because of the existence of mineralization in conjunction with discolored bands, it can be considered that uranium and lead were deposited under the reductive circumstance in this formation. It is desired that, in a future survey, the strong reduced zone will be confirmed and the prospection taken the palaeotopographic study into considaration will be performed.

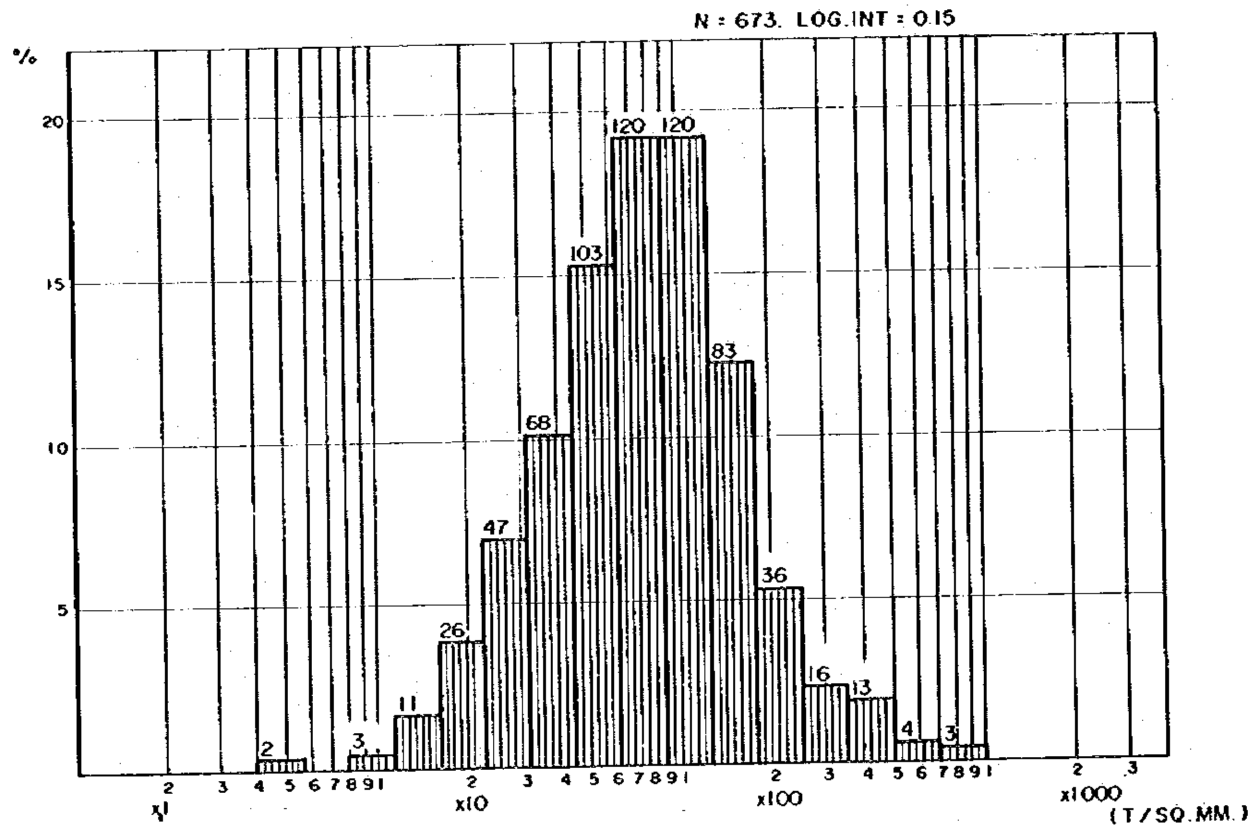
APPENDICES

I Geological Survey

Fig. I-4 Statistical Diagrams for Radon Etch Survey Results

1. All Radon Etch Readings
2. Group - 1 : Radon Etch Readings on Quaternary Formations
3. Group - 2 : Radon Etch Readings on Tertiary Formations
4. Group - 3 : Radon Etch Readings on Cretaceous Formations
5. Group - 4 : Radon Etch Readings on βP-T Basalt Formation
6. Group - 5 : Radon Etch Readings on P-T Red Sandstone Formation
7. Group 6 : Radon Etch Readings on Basement.

HISTOGRAM



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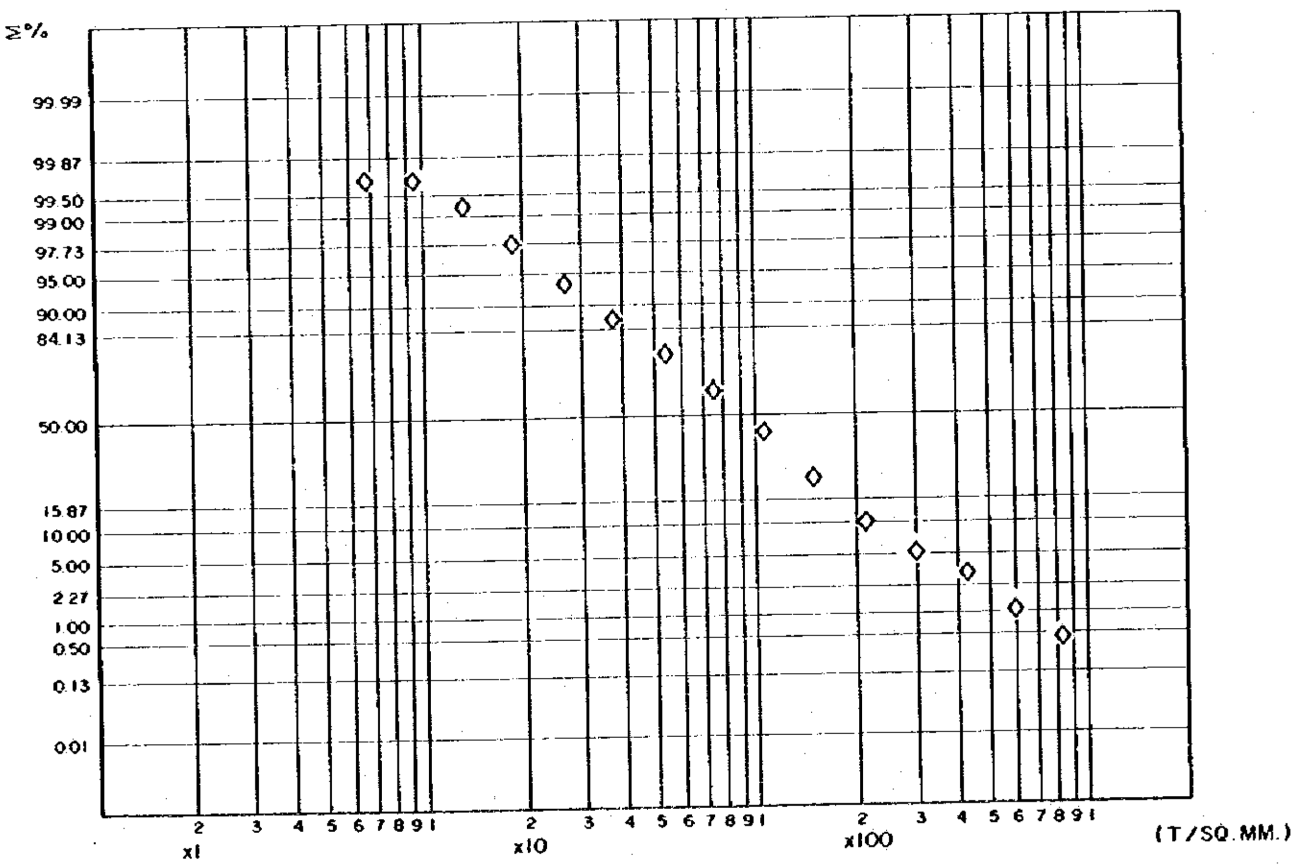
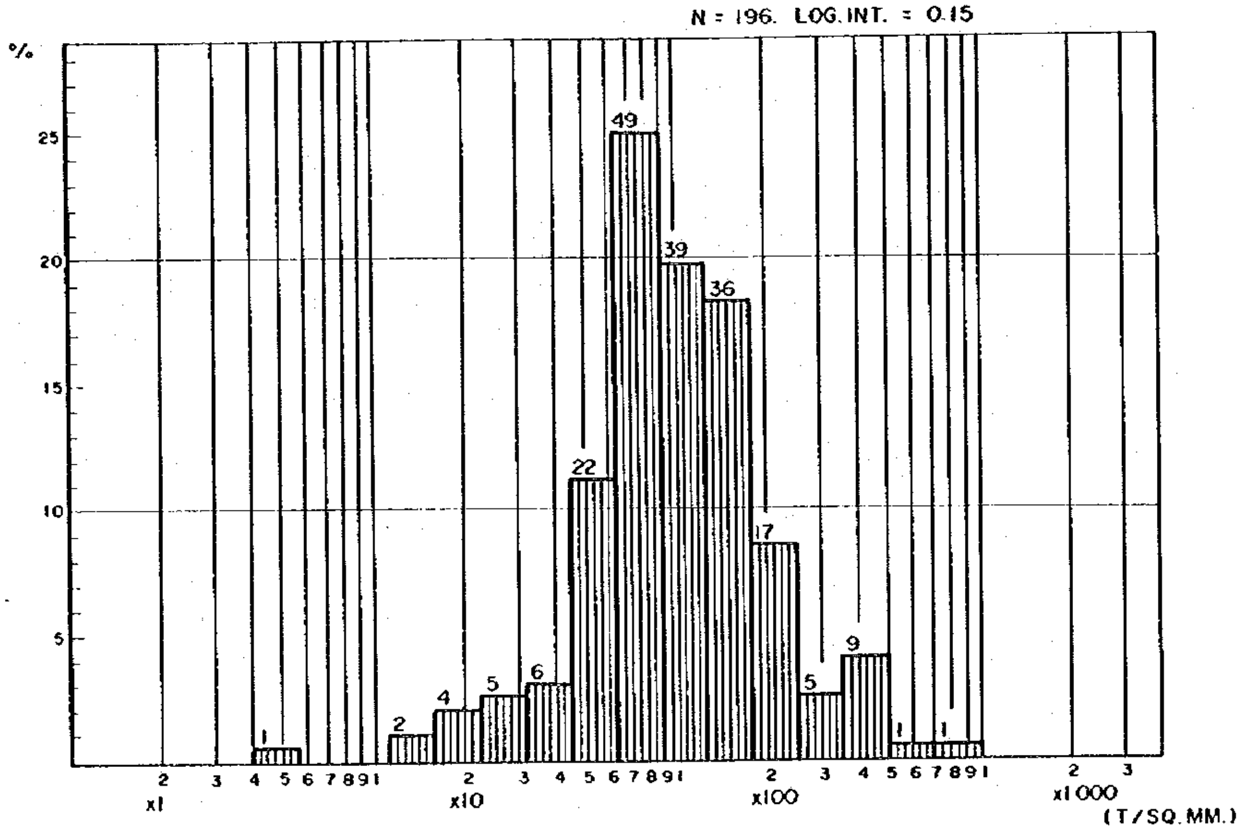


I. Diagrams for All Members

HISTOGRAM



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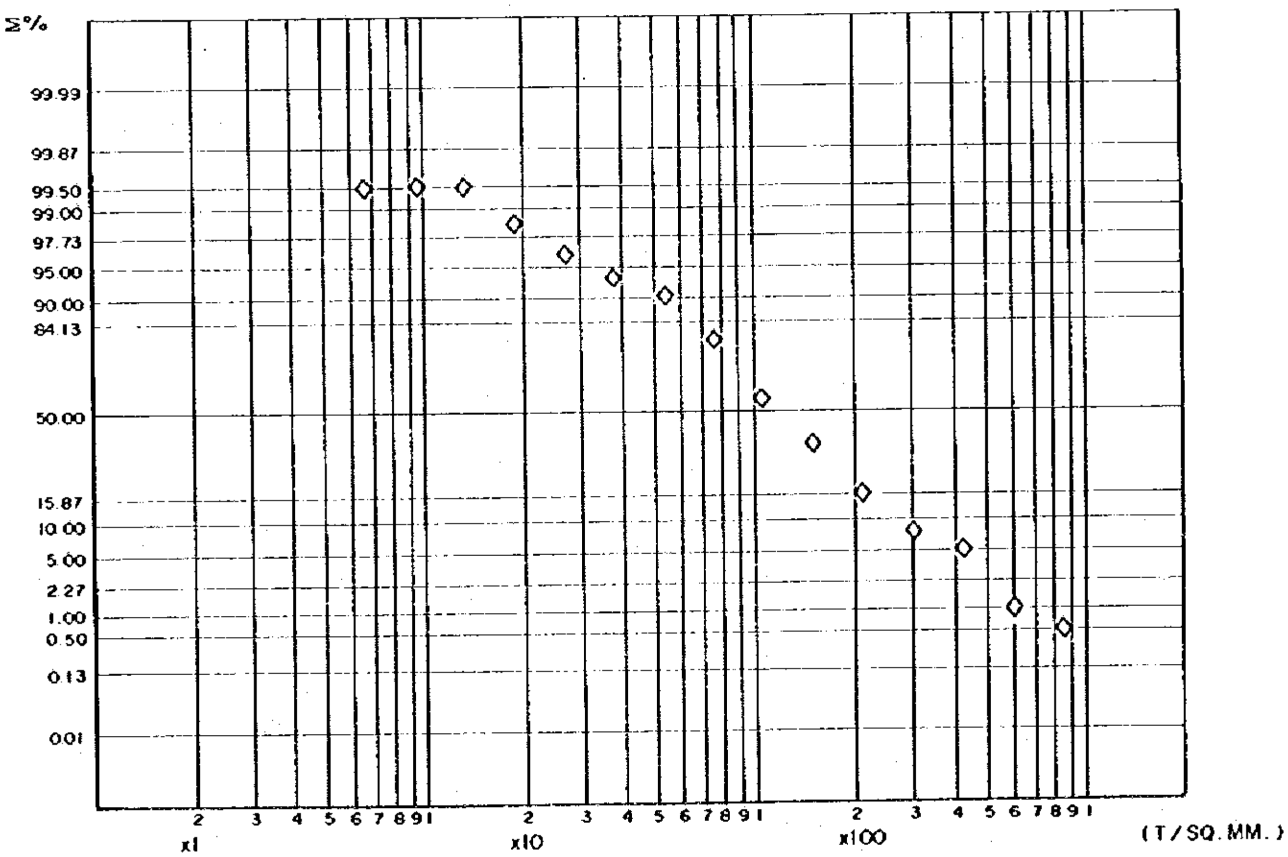
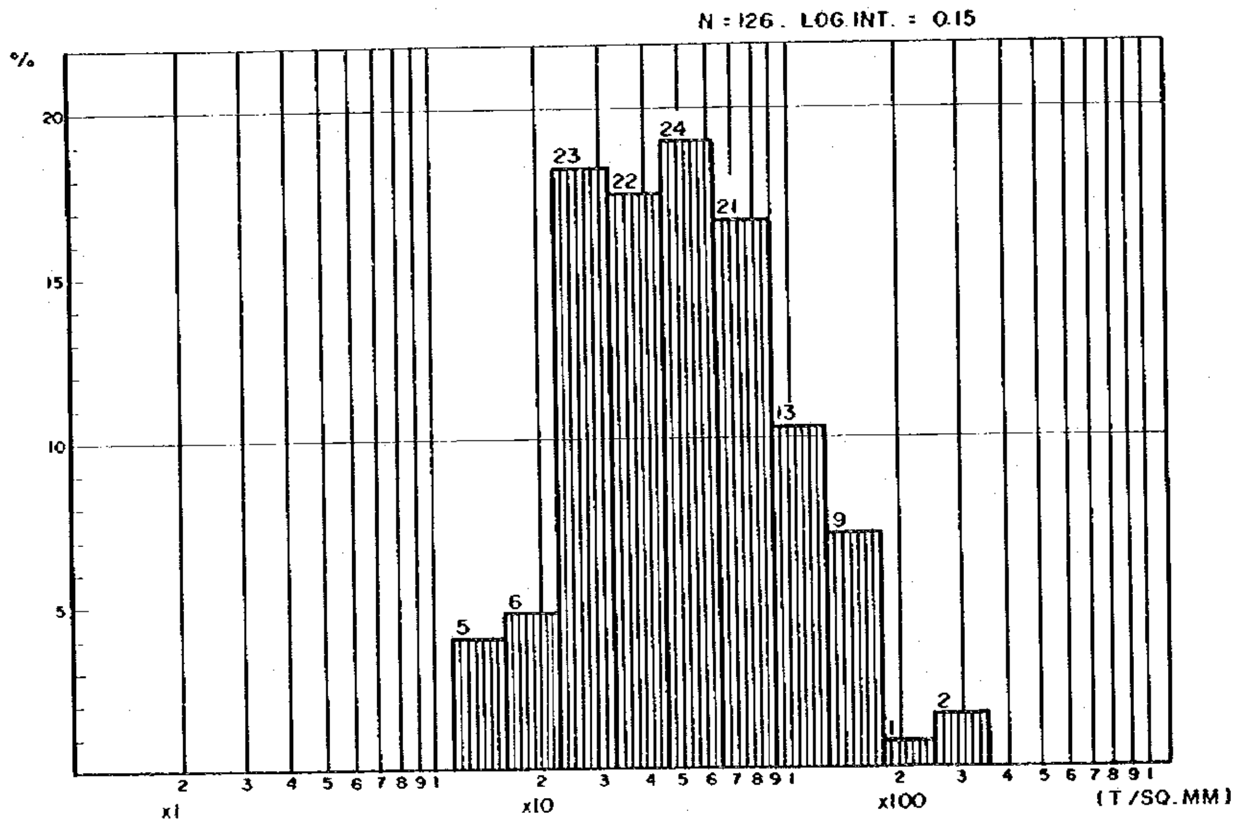


2. Diagrams for Group - I

HISTOGRAM



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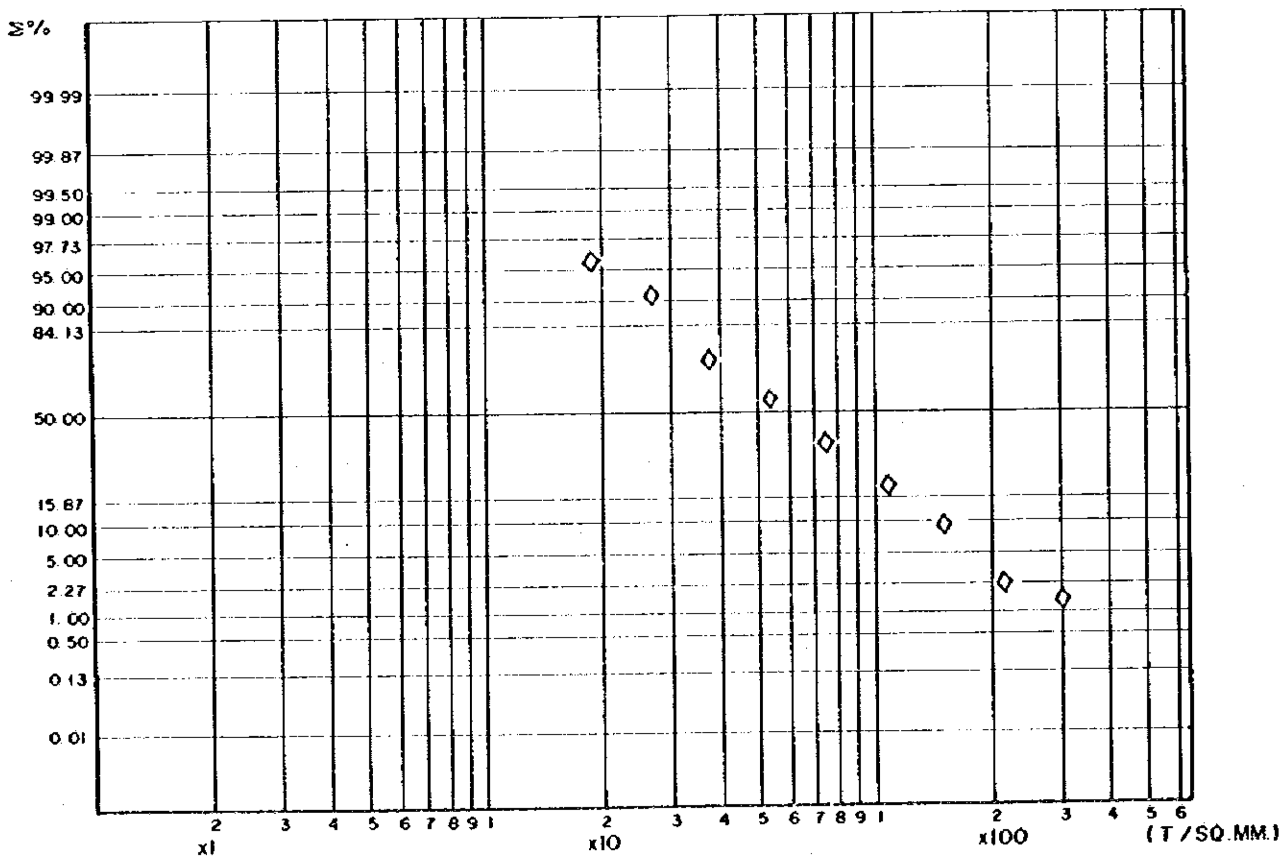
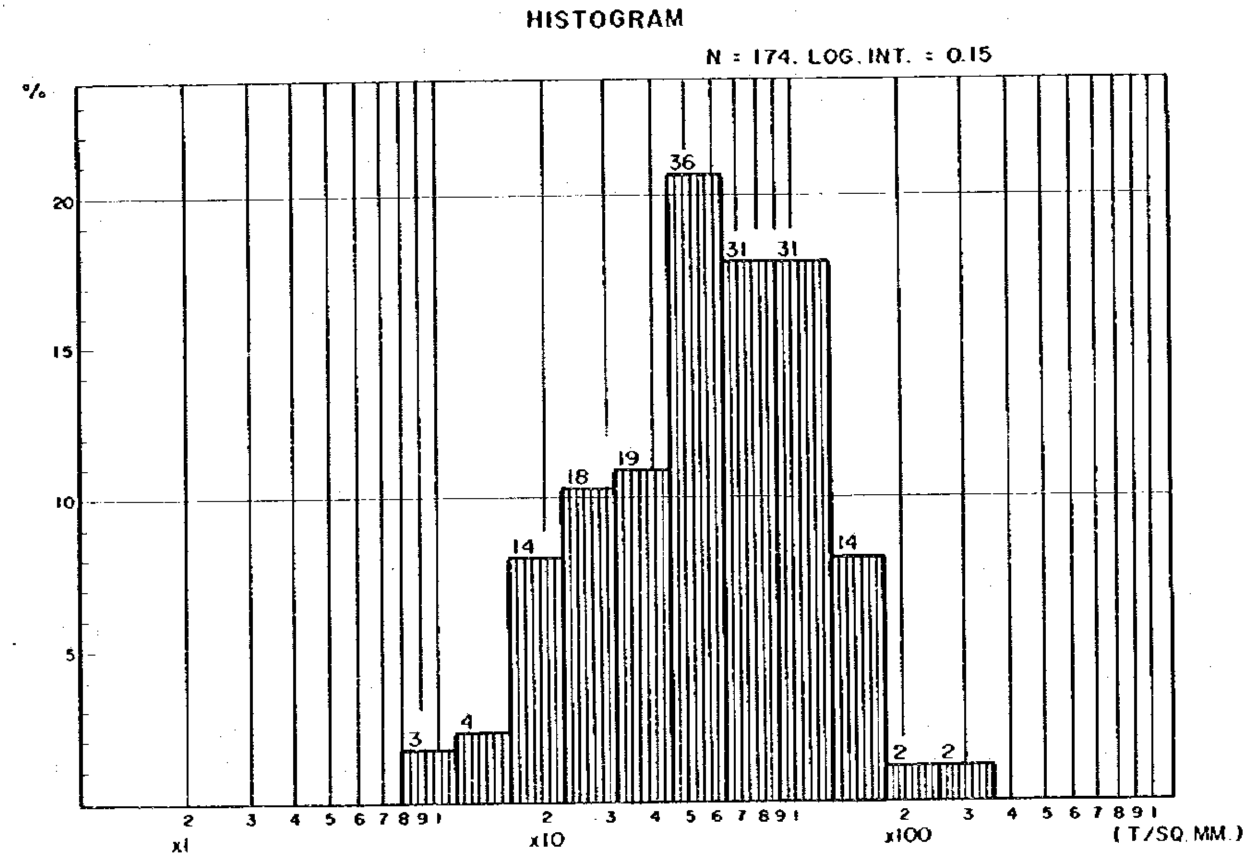
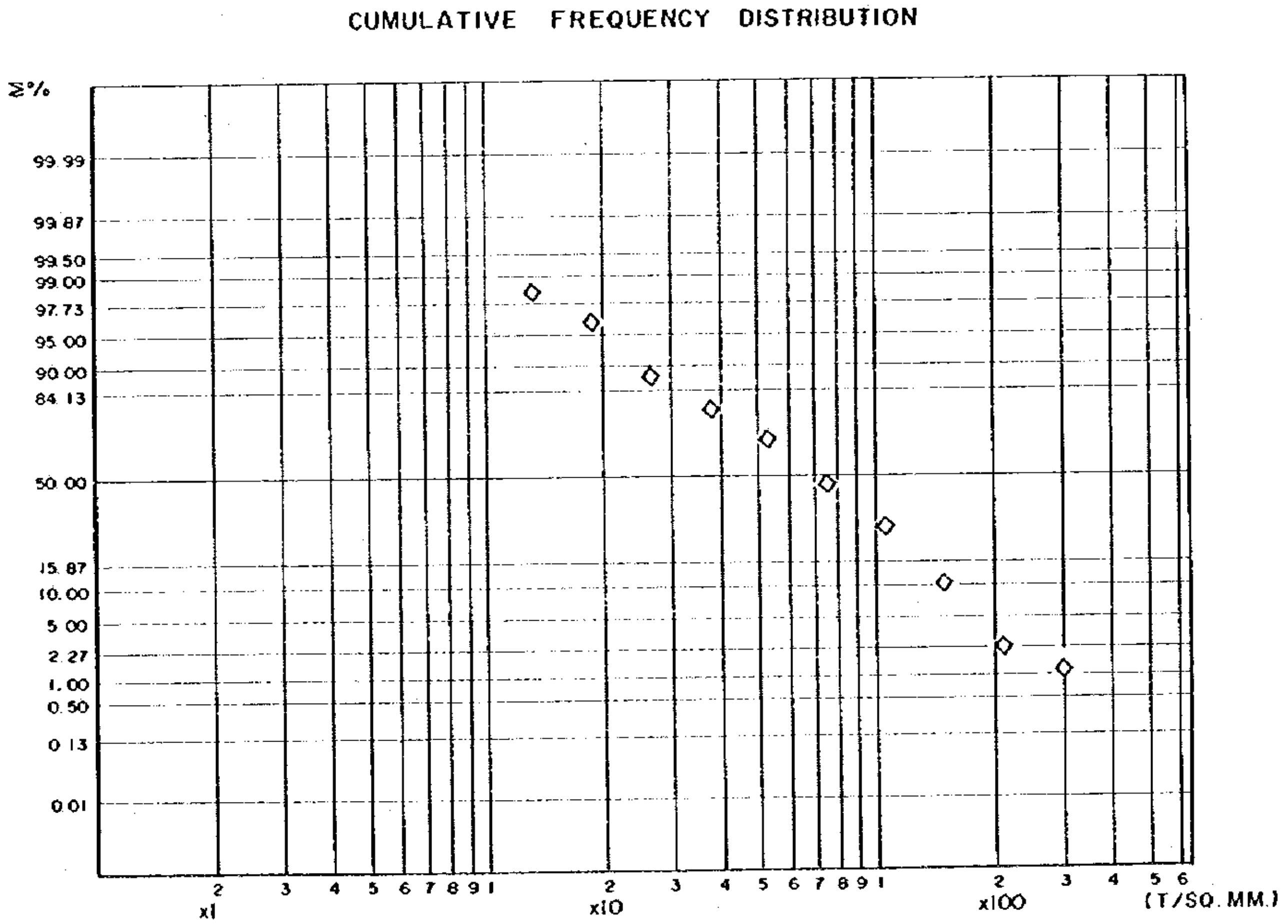


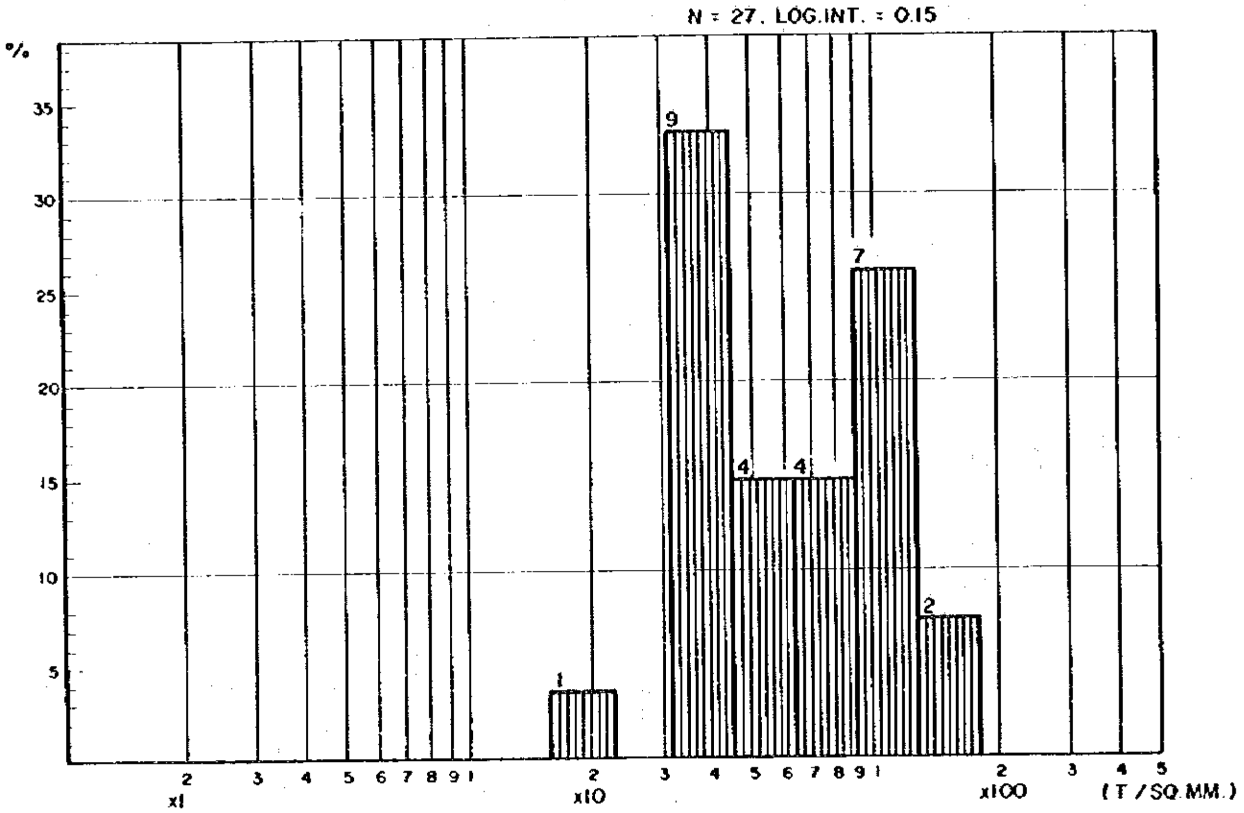
3. Diagrams for Group - 2





4. Diagrams for Group - 3

HISTOGRAM



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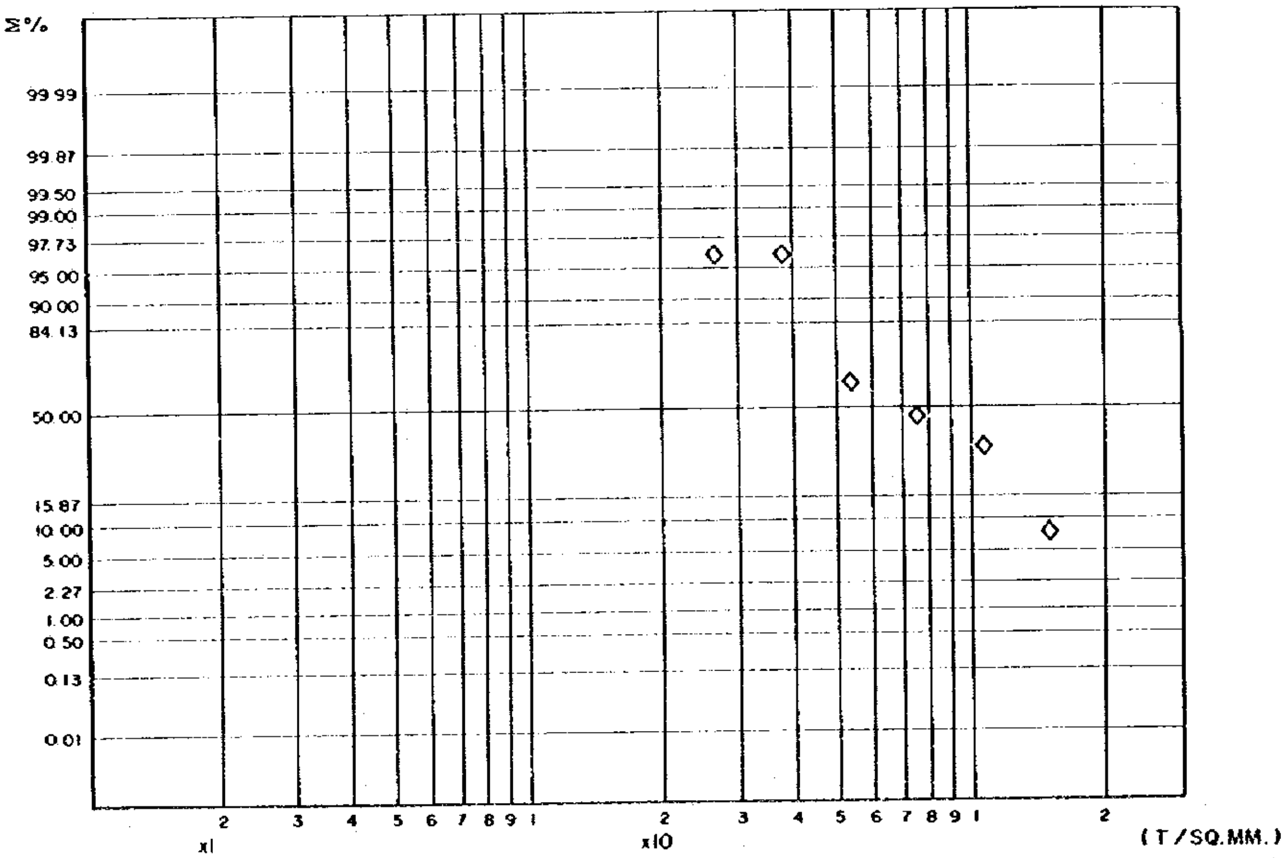
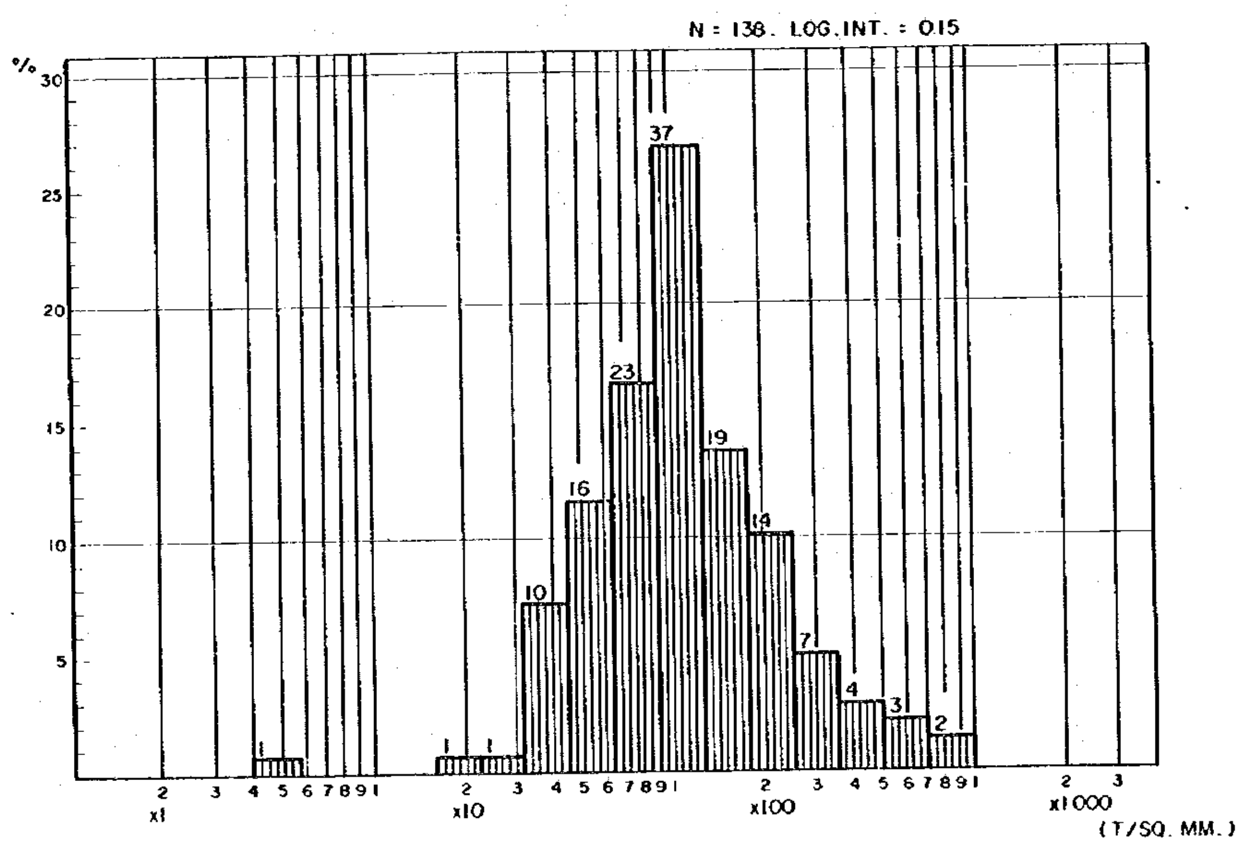


5. Diagrams for Group - 4

HISTOGRAM



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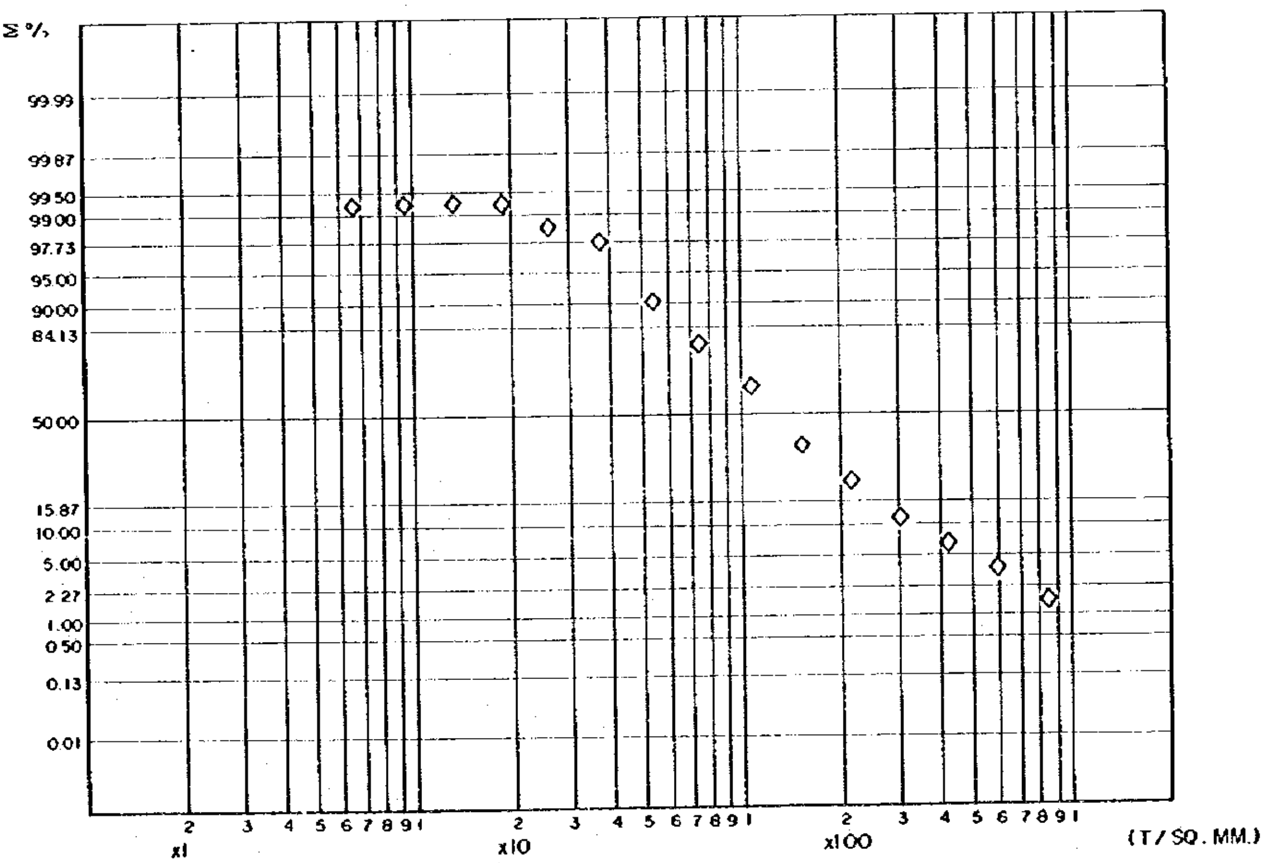
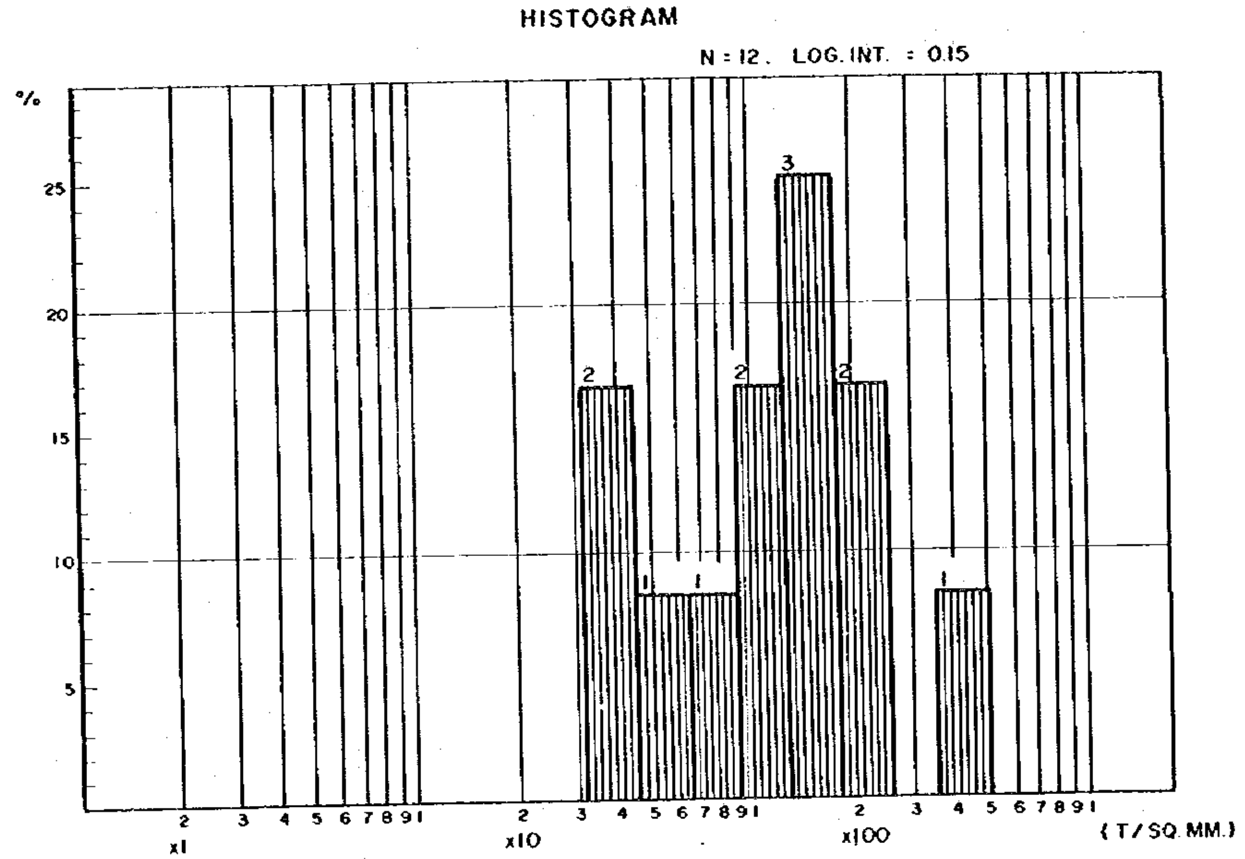
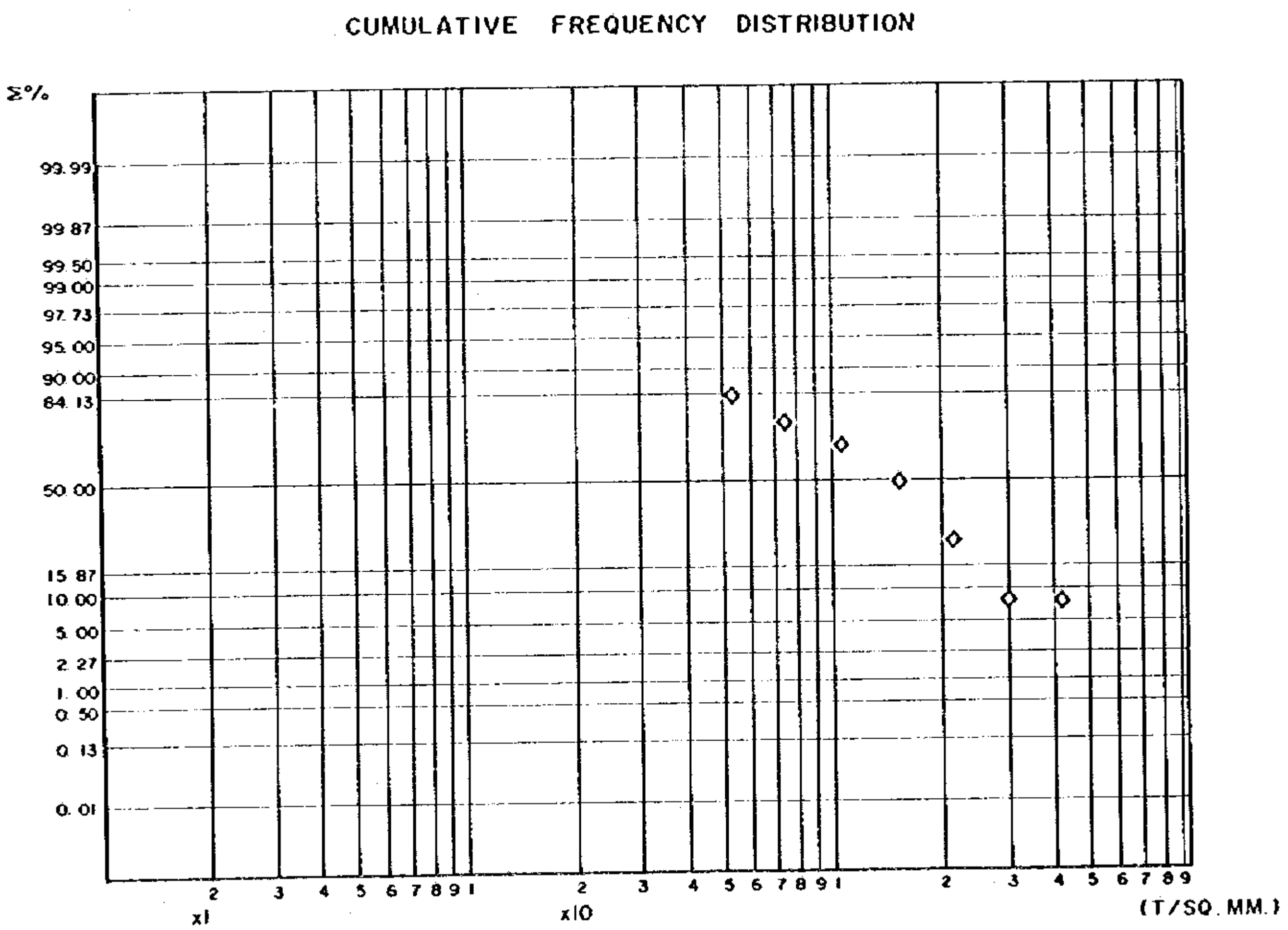


6. Diagrams for Group - 5





7. Diagrams for Group - 6

Fig. I–5 Photomicrographs of Thin Sections

Abbreviation

Aug : Augite

Bio : Biotite

Cal : Calcite or carbonate

Chl : Chlorite

Gr : Granite

Mag : Magnetite

Mel : Mellite

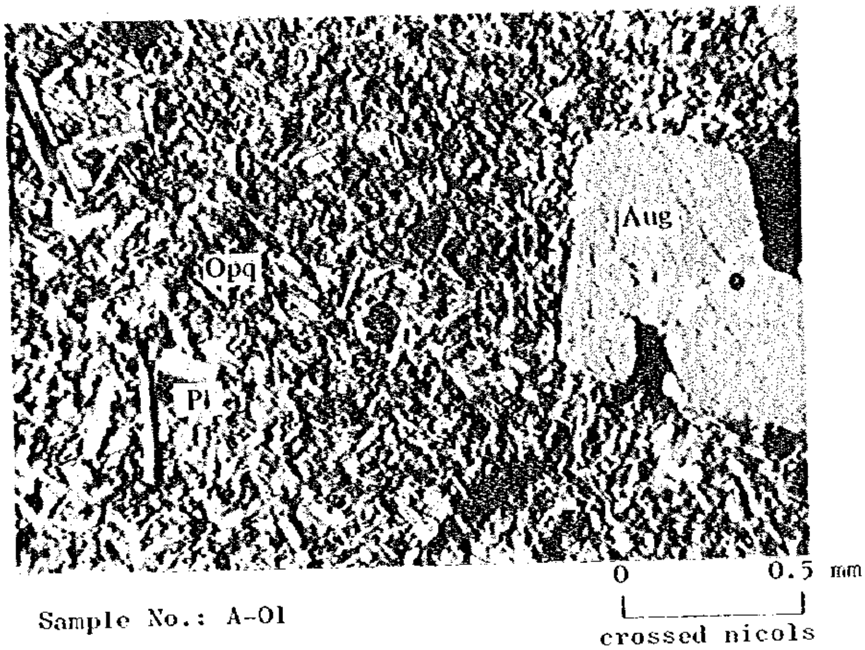
Opq : Opaque mineral

Or : Orthoclase

Pl : Plagioclase

Qz : Quartz

1.

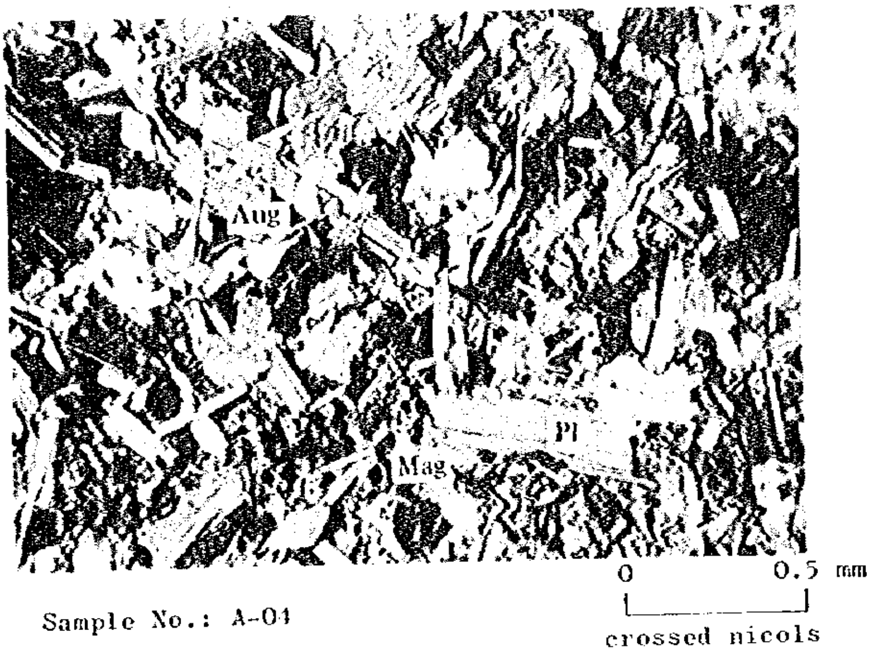


Sample No.: A-01

Rock name : Basalt

(β_{P-T} Basalt Formation)

2.

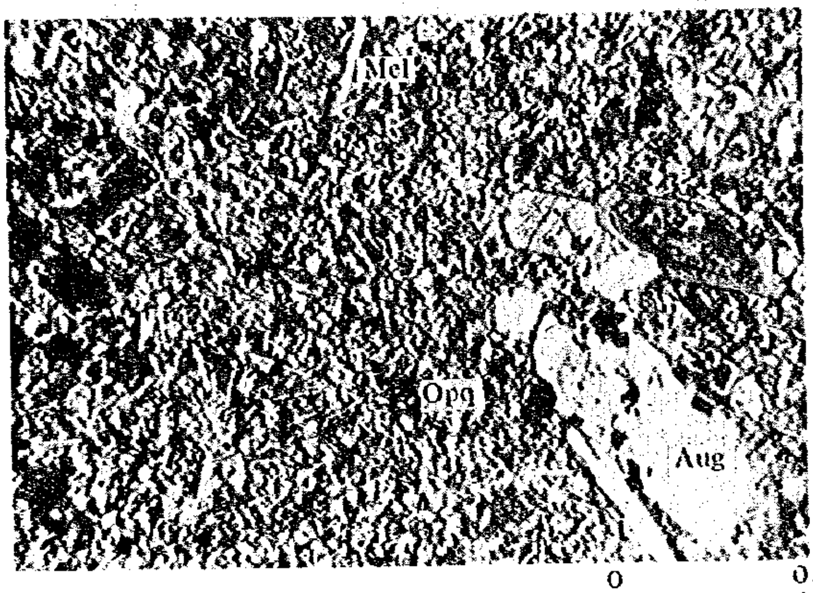


Sample No.: A-04

Rock name : Dolerite

(β_{P-T} Basalt Formation)

3.

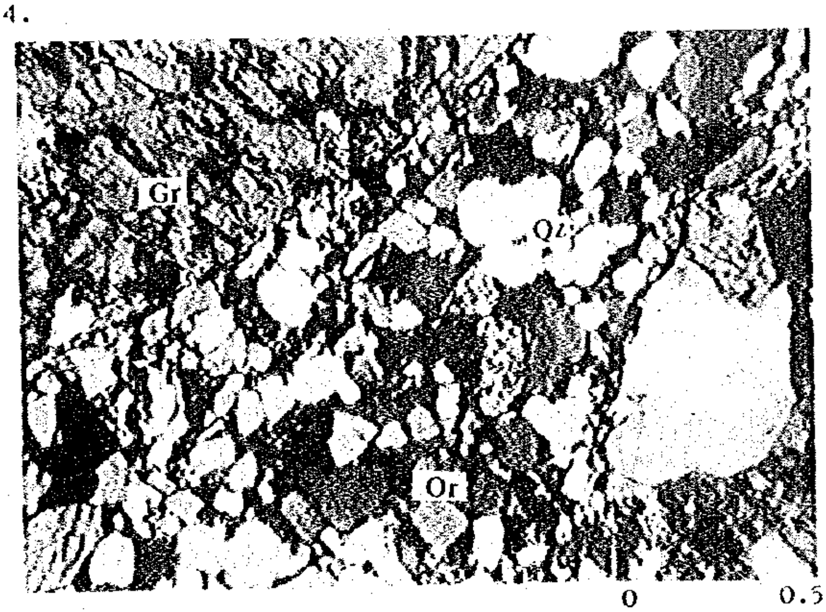


Sample No.: A-14

Rock name : Lamprophire

(β_{P-T} Basalt Formation)

4.

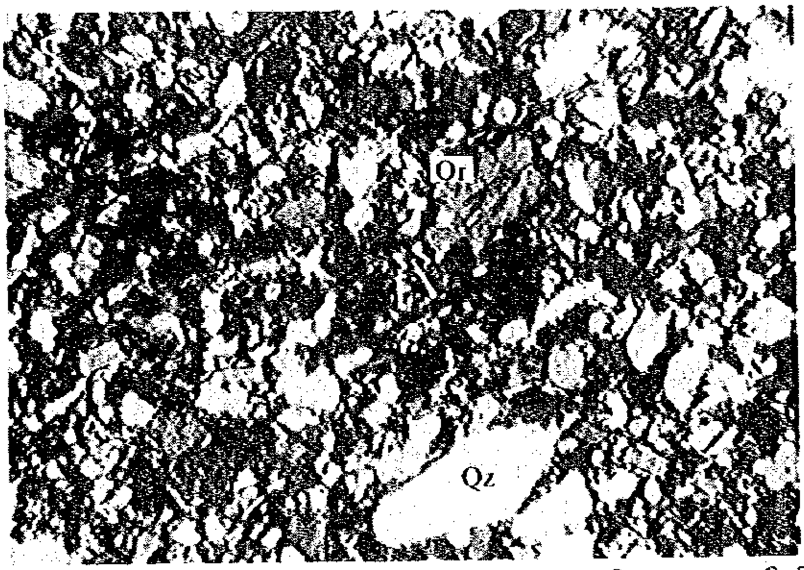


Sample No.: A-20

Rock name : Arkose Sandstone

(P-T Red Sandstone Formation)

5.



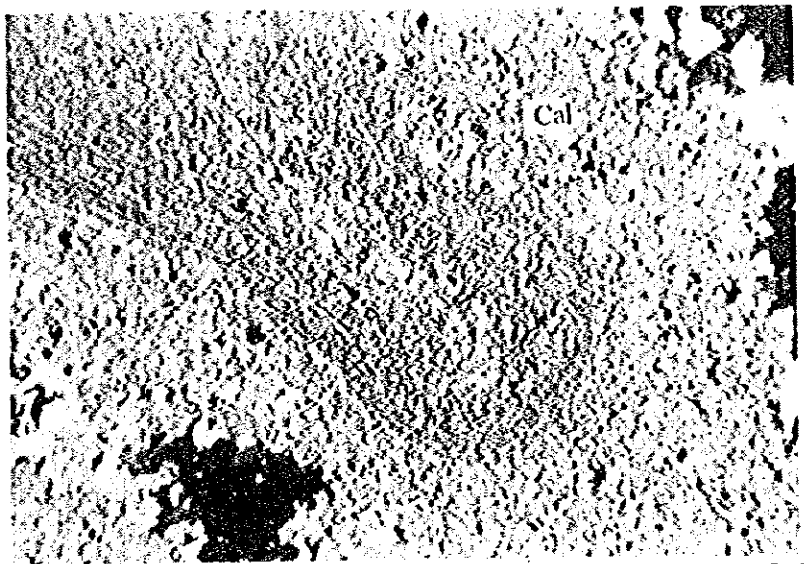
0 0.5 mm
crossed nicols

Sample No.: A-21

Rock name : Siltstone

(P-T Red Sandstone Formation)

6.



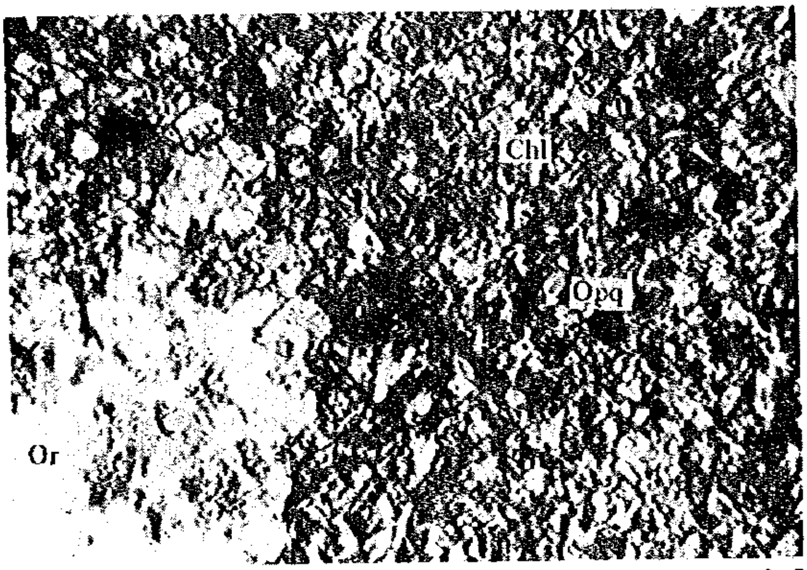
0 0.5 mm
crossed nicols

Sample No.: A-28

Rock name : Oolitic limestone

(J_1 Limestone Formation)

7.



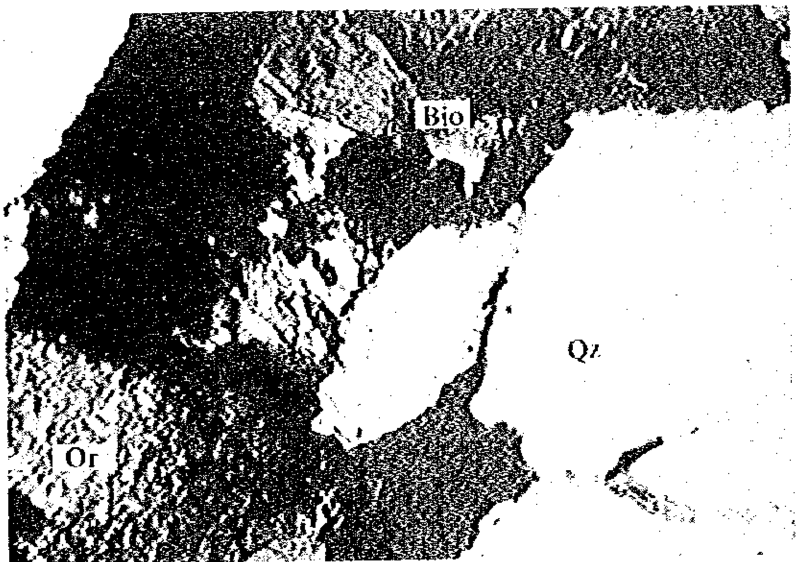
0 0.5 mm
crossed nicols

Sample No.: A-30

Rock name : Arkosic siltstone

(β_{P-T} Basalt Formation)

8.



0 0.5 mm
crossed nicols

Sample No.: ZNE-31

Rock name : Granite

(Basement)

Fig. I—6 Photomicrographs of Polished Sections

Abbreviation

Ba : Barite

Ce : Cerussite

Co : Co-Mn mineral

Cu : Native copper

Fe : Fervanite

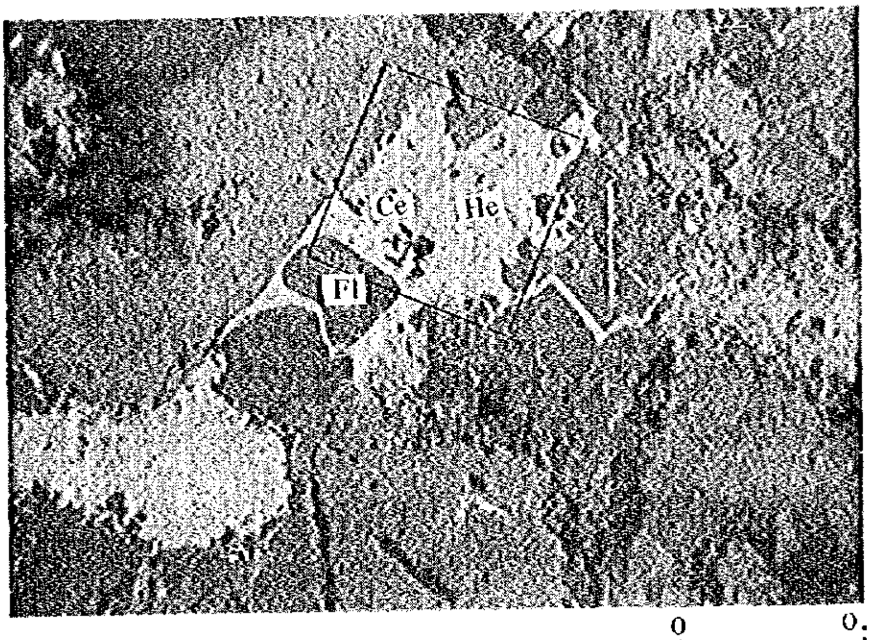
Fl : Fluorite

Ga : Galena

He : Hematite

U : Uraninite or Pitchblende

1. 1.



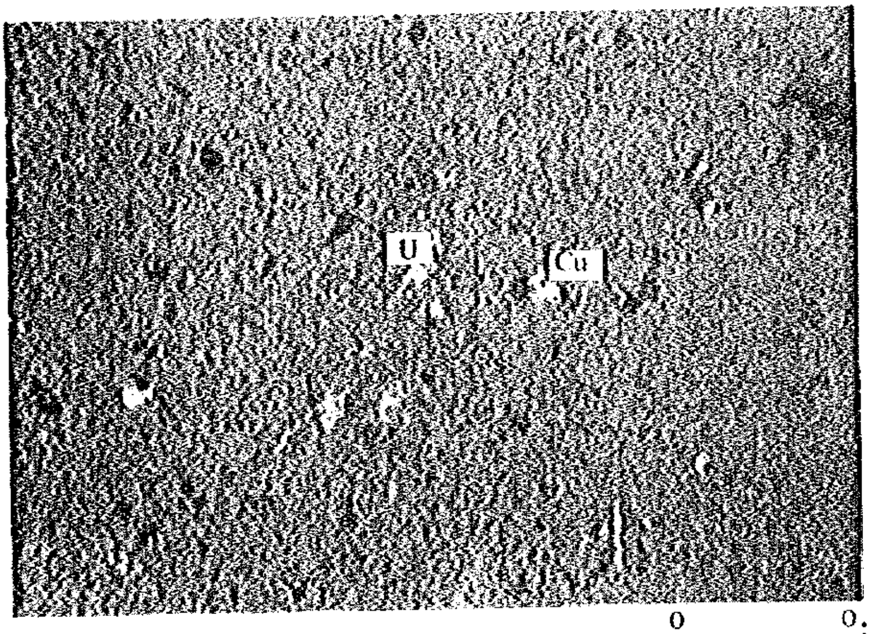
0 0.2 mm

Sample No.: K-23

Rock name : Arkose sandstone

(P-T Red Sandstone Formation)

2.



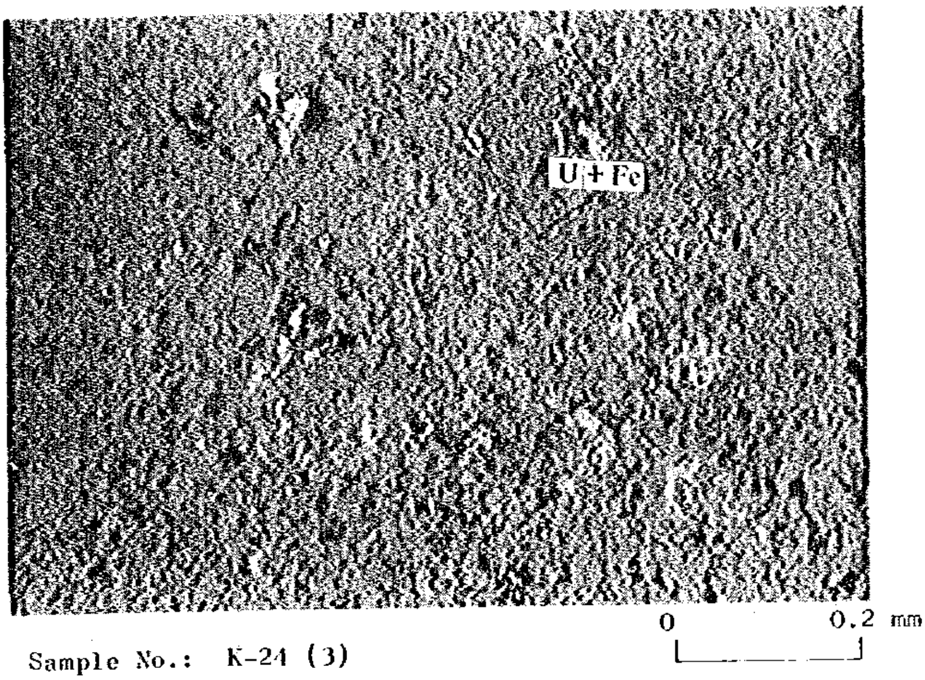
0 0.2 mm

Sample No.: K-24 (1)

Rock name : Aplitic granite

(Basement)

3.

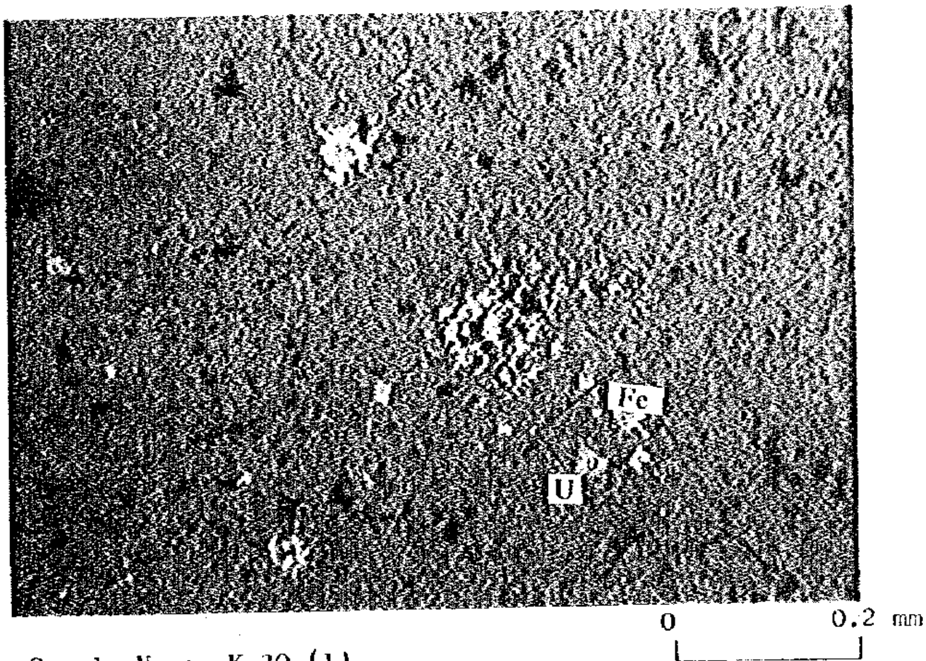


Sample No.: K-24 (3)

Rock name : Aplitic granite

(Basement)

4.

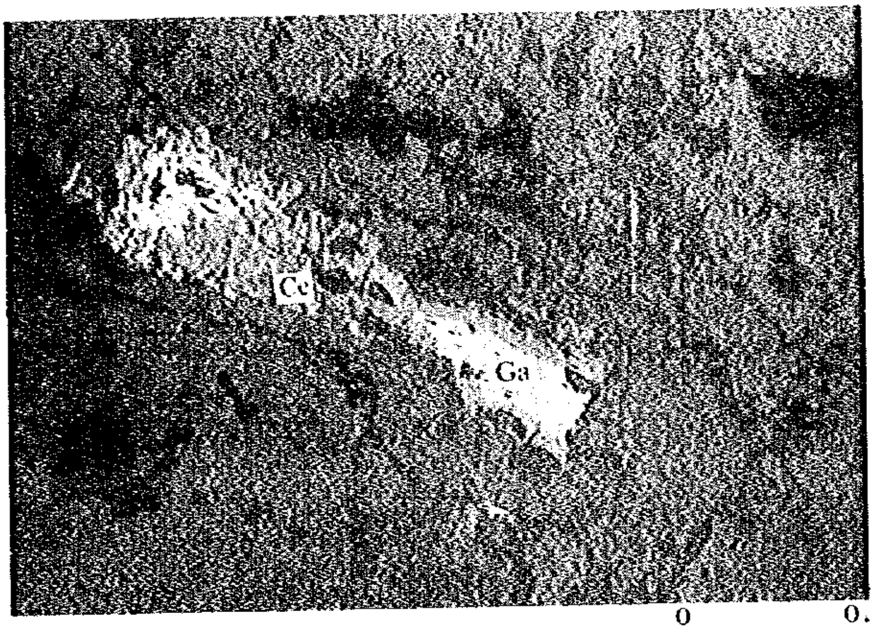


Sample No.: K-30 (1)

Rock name : Ferruginous quartz

(Basement)

5.

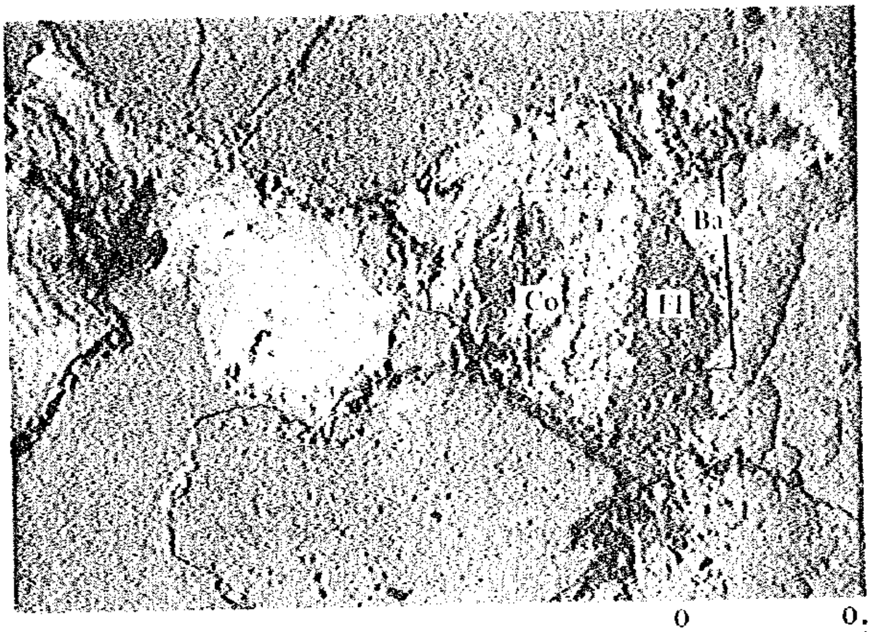


Sample No.: K-31

Rock name : Arkose sandstone

(P-T Red Sandstone Formation)

6.



Sample No.: ZNE-31

Rock name : Granite

(Basement)

Fig. I—7 Photomicrographs of X-ray Microanalysis

Abbreviation

Ba : Barite

Be : Bequerelite

Ca : Carnotite

Ce : Cerussite

Co : Co-Mn mineral

Fe : Fervanite

Fl : Fluorite

Ga : Galena

He : Hematite

U : Uraninite or Pitchblende