CHAPTER III

REGIONAL GEOLOGICAL SETTING AND GEOLOGY OF THE AREA

3.1 Regional Geological Setting

The rocks of the "Shillong Group" are well developed in Meghalaya and in some parts of Assam. They lie unconformably over the Basement Gneissic Complex.

According to Pascoe (1950), Shillong Plateau is the remnant of the Precambrian of Indian Peninsular Shield. The plateau stands on Precambrian gneisses, which are well exposed in most parts of the plateau. The Indo-Gangetic trough has separated the plateau from the Indian Peninsula. Considerable lithological variation, complexity in metamorphism and tectonic history are the most evident character of the rocks belongs to the plateau.
The Shillong Group of rocks are not only well exposed around Shillong but also in Gopents from Myllium of upper Shillong to Jowai along east-west direction. The group consists of metasedimentary with conglomerate, phyllite and quartzite. They occur in such a way that pelitic are at the base and quartzitic at the top. This group is underlain by Basement Gneissic Complex and the conglomerate of group separates it from the complex.

The major structural trends of these rocks are mostly NE-SW. The Shillong Group of rocks are intruded by both igneous rocks (Precambrian) of acid and basic compositions. The first intrusive was basic in composition, which later metamorphosed very weakly to epidioritic and is locally known as "Khasi greenstone" (Medlicot 1869). The Khasi greenstone occurs as sills in quartzite of the Shillong Group. This was followed in a later date by coarse grained porphyritic granite (Myllien granite) within the Shillong Group showing 765±10 Ma (Crawford, 1969) and 607±13 Ma (Chinote *et al.*, 1988). Similar types of porphyritic granite occur in different parts of the plateau, such as the Umroi pluton, south Khasi pluton, Nongpoh pluton and others.

Most of the Palaeozoic and lower Mesozoic rocks are missing in the plateau region. The southern fringes of the plateau show the occurrence of the Sylhet Traps of Jurassic (?) age, which is overlapped by the sedimentary rocks of the Cretaceous age and are followed without any appreciable break by the sedimentary formation of the Tertiary age. Rao and Perumal (1978) indicated the presence of numerous lineaments and fractures. On the basis of the study of the LANDSAT imagery of varying magnitude it is found that the lineament trends in NE-SW, N-S and E-W directions. Murthy and others *et al.* (1976) have suggested that block uplift and subsidence have profoundly affected the Meghalaya plateau.

The general stratigraphy of the Meghalaya plateau is given in Table 3.1.

TABLE3.I: Stratigraphic succession of the Meghalaya Plateau (Kumar *et al.*, 1990)

Geological age	Group Name	Formation	Lithology
Oligocene Miocene	Garo	Chengapara	Sandstone, Siltstone, Clay and marl.
		Baghmara	Feldspthic sandstone, Conglomerate and clay
		Kopili/Rewak	Sale, Sandstone and Marl.
Eocene	Jaintia	Shella	Alteration of sandstone and limestone.
Palaeocene		Langpar	Cretaceous shale, sandstone and impure limestone.
Upper Cretaceous	Khasi	Mahadek	Upper coarse, arkosic purple sandstone (190m). Lower grey, coarse to fine sandstone (25-60 m).
		Jadukata	Sandstone, conglomerate alteration.
	~~	Unconformity	~~~~~~~~~~~~~~~~~~~~~~~~~~
Jurassic	Sylhet Trap		Basalt, alkali-basalt and acid tuff. Alkaline rocks and carbonatites.
	~~	Unconformity	~~~~~~~~~~~~~~~~~~~~~~~~~~
Late Proterozoic	Mylliem Granite (Intrusive)		Porphyritic granite, pegmatite, aplite, quartz veins, epidiorites and dolerite.
Middle Proterozoic	Shillong		Phyllite-quartzite sequence with basal conglomerate.
	~~	Unconformity	~~~~~~~~~~~~~~~~~~~~~~~~~~
Archaean	Gneissic Complex		Biotite gneiss, granite gneiss, migmatite, mica schist, sillimanite quartz schist, amphibolite and pyroxene granulite.

3.2 General Geology of the area

The area under investigation is hilly with narrow valleys. Quartzite, phyllite, conglomerate, khasi greenstone and granite rocks are well developed in the area (Map No. 1). The hills are made up of wide variety of litho-units. The resistant quartzite occupies the hills and the phyllite dominates the valleys. The khasi greenstone and metabasic are exposed as intruded body at Ksehpangdeng, Shormo, Mawryngkneng and Nongplit. The granitic veins across the Shillong Group are also present at Ksehpangdeng near the water pump and at Shormo near the river valley.

The Shillong Group of rocks are characterized by fold, fault, joint, planar and linear structures. Local variation of the dominant NE-SW trend of the planar structure at the Mawryngkneng (the beds are dipping towards NW) and at the Ksehpangdeng and Thangshalai (all beds are dipping towards SE) is indicative of the development of a major fold in the area (Map No. 2).

3.2.1 Distribution and field relationship of different Rocks in the area

The rock units of the present area can be broadly subdivided into two groups – the metasediments of Shillong Group and intrusive.

3.2.1.1 Shillong Group

Quartzite: Quartzite is the dominant member of the Shillong group in the area. They are well exposed along both sides of the National Highway No.44. The quartzites are well bedded and joined (Photo-3.1a).

The rocks are medium to coarse grained. The color varies from reddish brown to light ash color. They are very hard and compact. In some places they are found to be highly brittle. Numerous quartz vein of variable dimensions have criss crossed the quartzite. There are two types of quartzite observed (i) micaceous quartzite and (ii) massive quartzite. The micaceous variety is highly weathered and brittle. They are generally inter-laminated with phyllitic bands. The massive quartzite is hard and compact and is less affected by weathering action. They are well bedded and often with sedimentary structures like cross beddings (S_o). General trend shown by the quartzite is NE-SW with dip ranging from 10^0-80^0 towards NW and SE. Joints of vertical, diagonal and horizontal types are also present.

Photo-3.1a: An exposure of quartzite near Mawryngkneng Dispensary.

Phyllite: Phyllites are well exposed along both sides of National Highway No.44 and interlaminated with micaceous quartzite. They are gray and reddish in color and are very soft and brittle characterized by slaty cleavage defined by strong preferred direction of mica and chlorite flakes. The trend of foliation is NE-SW and dips at about 45^0-75^0 towards NW and often towards SE directions. The small scale folding, joints, crenulation cleavage and kink band are also not uncommon in phyllite. Veins of quartz are also seen along and across the cleavage. The phyllites of the Shillong Group are very susceptible to weathering (Photo-3.1b).

Photo-3.1b: Weathering of phyllite (Ksehpongdeng road)

Conglomerate: Conglomerate occurs on the roadsides of Lulang and Mawryngkneng near graveyard. The thickness at Lulang conglomerate is about 100 meters. The long axis of pebbles varies from 9cm to 1.5cm. It strikes in the NE-SW direction with dip 40^0-78^0 towards NW. The average thickness of the Mawryngkneng conglomerate is about 4 meters and strikes in the NE-SW direction and dipping 55^0-85^0 towards NW. The pebbles of the bed are mostly quartzites and quartz. The range of the length of long axis of pebbles varies from 4cm to 0.5cm. In both beds the pebbles are highly cemented, so it becomes hard and difficult to break by hammer. The long axes of pebbles are parallel and sub-parallel to the strikes of the beds.

3.2.1.2 Intrusives

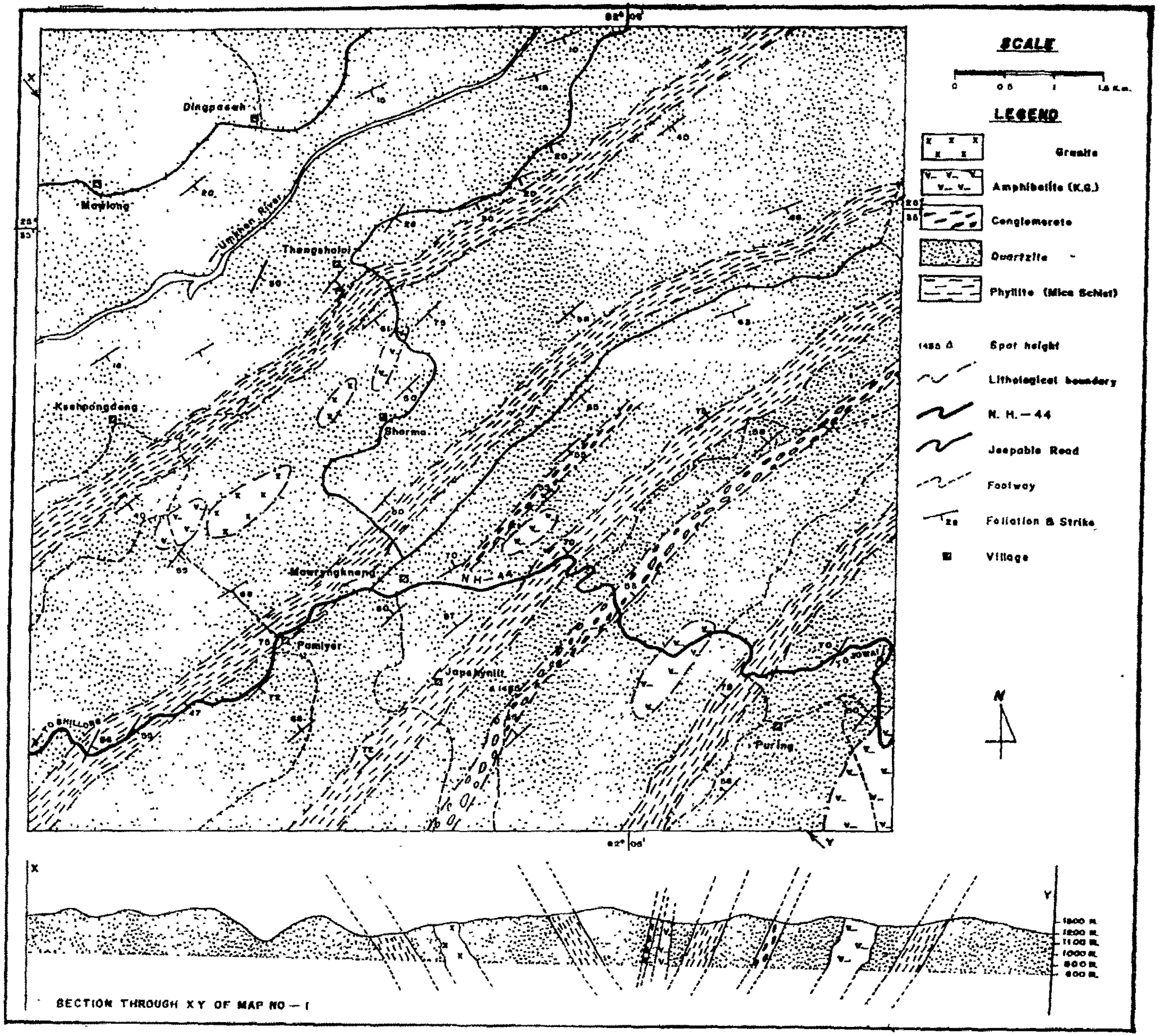
Amphibolite(Khasi greenstone): The Khasi greenstones are well exposed at five stations of the investigated area (map No.1). In the field, the presence of the rock is characterized by (i) yellowish brown soil cover (ii) greenish colored rock and (iii) the typical spheroidal weathering. The boulders showing spheriodal weathering is well observed at Ksehpangdeng, Lulung and Mawryngkneng (Photo -3.1c). The trend of the rock is parallel to that of the quartzites. So they are considered as sills in Shillong group. Epidiorites of Shillong group are locally referred to as khasi greenstone because of their dark green color, which is typical in the whole of Meghalaya plateau. The rocks are massive and compact.

Photo-3.1c: Spheroidal weathering in amphibolite at Ksehpongdeng.

Granite: The granitic bodies are often encountered at Ksehpangdeng near water pump (Photo-3.1d) and at Shormo near the valley. The rock is massive and compact. They are very hard and hence they have resisted weathering. They are criss crossed by quartz veins.

Photo-3.1d: Boulders of granite at Ksehpongdeng

Quartz veins: Quartz veins are present in the quartzite and phyllite. Their thickness ranges from a few centimeters to about 50cm. They occur both along and across the foliation of the rocks. They are milky white, brittle and fractured. They are very hard and hence resistance to weathering.


SCALE
0
0.5
1
1.5 Km.
LEGEND
Granite
Amphibolite (K.G.)
Conglomerate
Quartzite
Phyllite (Mica Schist)
Spot height
Lithological boundary
N. H. — 44
Jeepable Road
Footway
Foliation & Strike
Village
N
Dingpasah
Mawlong
Umkhen River
Thangsholoi
Kshoongdeng
Sharma
Mawryngkneng
NH - 44
Pamiyer
Japaknylit
Puring
TO SHILLONG
TO JOWAI
X
Y
SECTION THROUGH XY OF MAP NO — I

Map No 2. Structural Map of The Mawryngkneng Area