CHAPTER - II
( Location, Physiography and Geology )

Gauhati, the gateway of Assam is one of the largest towns in Northeastern India. It is located at 26°11'N. latitude and 91°45'E. longitude, on the southern bank of the river Brahmaputra in the district of Kamrup and at this point the river is the narrowest, so can be easily crossed. With its commanding position on the river Brahmaputra and direct link with Calcutta by surface and air-routes, Gauhati is an eminent commercial centre and river port.

The area of Gauhati town in its Municipal limits is about 4.45 sq. miles and its population is 1,00,702 (1961 Census) with a density of population of about 22,629.64 per square mile.

SITE

The town is situated on an undulating plain with varying altitudes of 165 to 185 ft. above the sea level. It is surrounded by a semi-circle of thickly-wooded hills on all sides except in the north where the mighty Brahmaputra is flowing. The fastoorn of hills are Kamakhya and Fatasil in the west, Kalapahar and Narakasur in the south and Navagraha and Japarigog in the east. In the centre of the Brahmaputra river lies a line of three rocky islands - Karmanasha, Urbasi and Umananda. These surrounding balanced landscapes provide the town with one of the most beautiful settings and in this respect Gauhati may be said as an unique city in India.

PHYSIOGRAPHY

Though the height of the town is less than 200 ft., the hills mentioned above maintain varying elevations on their three sides. With the thick grassy vegetation on these slopes with the far contours of the distant hills with the gliding course of the Brahmaputra during the winter days, embossed with the Umananda
Island and bordered on the north with the line of guarding low ranges, all of which are picked out in blue tones, Gauhati has a fascinating look to the stranger’s eye.

The maximum elevation of the Kamakhya hills is 960 ft. and the average height of the peaks being 750 ft. The hill ranges end abruptly towards the south leaving a gap through which the railway tract and the A.T. Road pass. Close to the south of this gap rise gently broken ranges of hills with a maximum elevation of 1,175 ft. Thus these two broken hill ranges guard the western border of the town leaving little space for any further extension of the settlement westward. Shelving upwards from the Brahmaputra with moderate strides, rises another mass of broken hill ranges shutting down the north-eastern extremity of Gauhati. These hill ranges which checked the expansion towards the north-eastern extremity of the town are known as Navagraha-Chitrachal ranges. The altitudes of these ranges vary from 250 ft. to 712 ft. The isolated Sarania hills stands on a monotonous plain on the south-east of the town with a maximum elevation of 578 ft.

Towards the east and south of the town one can see a low plain filled up with scattered swamps and marshes and small water-pools. The swamps and marshes specially found in the Rehabari-Ulubari area. “Chala-Bill” of Ulubari is the biggest marsh within the town.

These marshes together with other marshes which are now reclaimed and made available for living-space formed an elongated zone of depressed area starting from present High Court building, through State Museum, Railway Station, Paltanbazar, Rehabari to Santipur near Kamakhya foot hills. Perhaps the whole area of the present Gauhati town was highland, a part of the Shillong plateau. This highland was dissected by innumerable streams flowing from the southern high ranges and formed small plains in between
hills. A channel of the present Brahmaputra river was perhaps flowing through the depressed zone mentioned above. But due to the deposition of the mighty Brahmaputra as well as of the side streams descending down the slopes of the southern hills, the channel shifted to the parent river and then the original course of the channel dries away forming the patches of lowland filled up by swamps and marshes. The present patches of marshes and swamps as described above are the remnants of this said channel flowing through the Brahmaputra.

An interesting feature of these marshes is that they are slowly filled by an age-long alluviation. Most of these marshes are now gradually reclaimed for residential and other purposes. Big marshes are now used as fisheries.

The river Brahmaputra with its broad expanse of water, flows from northeast to southwest, washing the feet of the Navagraha and Kamakhya hills. An almond-shaped sand island locally known as "Chapari" is found near the foot of the Kamakhya hills, which is created by the deposition of sand of the Brahmaputra. The sandy shoals with their broad backs bask in the sun throughout the dry season, only to be lost under flood water during the rainy season.

The lowlying plains of Ulubari and Rehabari used to be inundated often at the time of high flood of the Brahmaputra river. But after construction of the Sluice-gate on the Bharalu river near Bharalu, the lowlying plains of this region are protected from the havoc done by the Brahmaputra flood.

The fastoon of islands - Umananda, Urbasi, Karmanasha bear an intimate relationship with the nearest hills - Janardan, situated on the southern bank of the mainstream where the D.C.'s "Bungalow" is located. The presence of similar types of rocks, mainly granite and gneisses in these rocky islands and hills prove that they were
once contiguous. Perhaps due to prevalence of weak zones among them, the mighty Brahmaputra could flow through these zones and thus separated them by gaps forming small islands. This festoon of rocky islands is the relic of once continuous range. Due to lateral erosion of the Brahmaputra the island group has been reduced down to its present elevation. A time will come when this island group will be completely eroded away by its own effective action.

Thus Guwahati is located in a small lowland surrounded by broken ranges on three sides, with a sharp water boundary on the north.

**DRAINAGE**

The Brahmaputra, which marks the northern boundary of the town is one of the most astonishing rivers in the world. The river is not truly dependent upon the monsoon rainfall alone for their water supply; but it has also a supply from the melting of the Himalayan snow. At high stage, after snow melt and in the rains it is an immense corridor of water five miles and more wide, with a discharge at Goalpara of over half a million cusecs. "During the second half of the monsoon period the main river rises by as much ten to fifteen feet, near Guwahati. Such a rise in level may not appear great if one forgets the general dimensions of the river, viz. an average width of fifteen hundred yards". (1) The general width of the river herein Guwahati is ½ mile.

The Bharalu river, a tributary of the Brahmaputra runs from southeast to northeast and after bending like a hairpin near Fatasil Pahar flows towards north to reach the Brahmaputra.

It has its source in the Bashistha hills (Sandhyachala) at a distance of seven miles south from Guwahati town. There are 3 streamlets
Gauhati Town - A general view

A view of the Brahmaputra River
Sandhya, Lalita and Kanta and Sandhya after being united to form one stream i.e. Bharalu river and then the latter runs towards Guwahati to meet the river Brahmaputra.

It is said that Great Bashisthamuni offered his daily prayer "Sandhya" by sitting on the confluence of those streamlets - Sandhya, Lalita and Kanta and hence the place is known as Sandhyachala, a sacred place for the Hindus.

Over and above these rivers, the hilly area of Guwahati is traversed by innumerable streamlets, many of which of course die out during the winter season. Most of these streams originate from underground source of aquifer. The groundwater level as noted from the well is from 20-25 ft. These streams together with main streams show a well marked dendritic pattern of drainage.

**G E O L O G Y**

The relief here bears an intimate lithology and structure of the rock. The geologists are of the opinion that the floor of the area is made up of Archaean rocks which is covered by the Brahmaputra alluvium except the hills that exist in the form of monadnocks.

The hills around Guwahati are said to be the extensions of the Shillong plateau. The Shillong plateau is principally composed of gneisses and schists of Gondwana land (Leviscean) with intrusive granite rock. This region has completed a cycle of erosion before the deposition of the rocks of the Huronian age, in the central part of the main plateau. Next in the palaeozoic era it formed a stable land mass and was subjected to sub-aerial denudation.

During that period it was reduced almost to the stage of a peneplain for a number of times and each time it was uplifted and put to new cycle of erosion.
PRINCIPAL ROCK TYPES OF THE AREA

The rock types found in the hilly regions of Gauhati town may be grouped as Granite Gneiss, Granite, Porphyritic Granite, Quartzite, Pink Granite, Hornblende - Biotite - Schist, pegmatite and Quartz (in the quartz-veins). The outcrops of these rocks are few and are confined to the hills, the intervening areas are mostly covered by alluvium and residual soil. The hills are mostly covered with red soil. Rock exposures are mainly found in hilly streams which appear to be in situ. It is generally found in some places that rocks are highly weathered and soil formation is continuing.

The following are the main characters of the different rock groups mentioned above.

**Granite Gneiss:** The predominant rock found in this area is granite. It covers the largest area and formed the hillocks. The contact of the rock with other varieties are mostly obscured due to soil covering. While examining the rock in surface quarry it appears that granite shows internal characters. Well developed joints are noticed, pegmatite and quartz veins are often associated with this kind of rock. Microfolding of different intensities are marked and well represented by the quartz-feldspathic vein.

The colour of the rock varies from ashgrey to blackishgrey. The presence of biotite mineral has made the rock much more black in some places. The constituent minerals are quartz, feldspar and biotite. The texture generally varies from fine to medium grained. Granite with magnetite minerals are found in some parts of Navagraha and Sarania Hills.
Pink Granite: This type of rock is prevalent in the northern part of Navagraha Hill i.e. towards the southern side of the river Brahmaputra. The rock is fine-grained in texture. The colour of the rock is pink due to the high content of pink microcline.

Quartzite: It occurs as small outcrops in the northwestern part of the water works hills and in northern Kharughuli area. The rocks are fresh and compact. Weathered variety shows alternation of the feldspars to Kaolin, but cases are rare.

The texture varies from fine saccharoidal variety to medium-grained variety. The constituent minerals are mainly quartz and feldspar.

Hornblende-Schists: This type of rock occurs as intrusions. It has clear relationship with the gneissic rocks. In general, they are associated with the gneissic rocks as inclusions. The colour of the rock is greenish black due to the presence of high percentage of hornblende and biotite. The texture of the rock is fine-grained.

Granite: The outcrops of this rock are found at Fatasil, near water works and Sarania hills.

This type of rock can be divided into two varieties according to their mineralogical content. First one is the Muscovite. Microcline granite which is mainly found in Sarania and water works hills and the second variety is seen in the northern side of Fatasil. The rocks are found "in situ" with little weathering or no weathering at all. These rocks show uneven fracture, while broken.

Pegmatite: Some veins of pegmatite are mostly seen in parts of Navagraha and Sarania hills. They varied in shape and size. The dominant minerals in this type of rock are quartz, feldspar,
biotite, muscovite and magnetite.

**Biotite-Sillimanite Schist** :— Most common minerals are sillimanite, quartz, garnet and biotite with some accessories.

**Biotite schist** :— These are dark coloured rocks and are highly folded.

**Quartzites, Feldspathic-Granulites and Granite-Gneisses** :—

This group of rocks is seen at the foothill of the Kamakhya Hills on the southern side. Granite Gneisses are seen northeastern side of this hill.

**Porphyritic granite** :— Porphyritic granite is the most predominant rock in the Kamakhya area. It forms hillocks and extends to a large area. The rocks are coarse grained and are characterised by the occurrence of large phenocrysts of potash feldspar.

Another variety of porphyritic granite i.e. the grey variety is found in the Kalapahar Hills. Outcrops of this rock type are seen throughout this area. The contact between this rock type and other variety is seen in many places in the area. Its contact with the granite gneiss, the pegmatite and the fine grained granite is quite sharp.

**ECONOMIC GEOLOGY**

The entire hilly region as described above is covered by the various types of granite and gneissic rocks. These rocks are hard, compact and fresh and used extensively as building materials for the construction of roads and buildings. The rocks after crushing are and meshing used in plastering and polishing the floors and walls of the buildings. The red soil of the hills is often used for reclamation of marshes. The sands of the Brahmaputra are also
used as building materials. The grey soil in the marshy land is suitable for the preparation of bricks.

**SOIL TYPE OF GAUHATI AREA**

The soil development of any region is always determined by the major factors namely nature of topography, parent rock material and climate.

As no systematic soil survey in this region has yet been done, it is very difficult to give a correct description in regard to composition and characteristics of soil of this region. Here soils have been formed both *in situ* and by the transported materials according to the above mentioned fundamental laws of Pedology. Considering their structure character, mode of origin and colour, soils of Gauhati can be named as red soil, alluvium and marshy soil.

The red soil is by far the most widespread. Red soils that are found on the hills and at their feet are formed by weathering of the metamorphic rocks of gneiss and other rock types of acid composition. These soils become very sticky when wet.

Often the foothills are also covered by this red soil being brought down by rain wash. This type of red soil is known as colluvial deposit and it consists of debris carried by the slope wash mainly in the foothills and mixed with varying amount of talus. In physical composition they resemble alluvial fans being coarser in texture. Owing to this coarseness of the constituent materials the soil is exceedingly permeable to water. Their colour light brown to yellowish red.

The plains and in between the hills of Gauhati are mostly covered by the Brahmaputra alluvium. Generally alluvium of this
part consists of sandy loam with few rocks. The soils are mainly composed of unconsolidated sands and silts. The colour varies from white to grey and is porous when dry.

Marshy soil is found in perennial waterlogged areas. This type of soil is greyish black in colour. The typical areas where such soils are developed are the sides along the railway roads and near Rehabari area.