CHAPTER III

PHOTOGEOLOGIC STUDY

In the following chapters, the study results in the aspects of photogeology, stratigraphy and petrography, and structural geology are listed. The chapters are arranged according to the order of the work procedure and of the different nature of methodology and objectives. This chapter is dealing only with the photogeologic study.

The photogeologic study is to obtain a broad view of the rock types, their extention and limit, and other observable large scale geologic structures, especially the lineaments and significant bedding traces, by means of an interpretation of the air-photographs and satellite imageries.

The present chapter, the photogeology of the area is discussed. The interpretation was done on the black-and-white vertical air-photographs of the approximate scale 1:46,000. The interpretation was transferred to the corresponding 1:50,000-scale topographic map sheets previously mentioned. The satellite imageries (LANDSAT imageries, ERTS-1) of the scale 1:1,000,000 were also used to supply the additional data. The study is to describe the geomorphology, distribution of rock types and outcrops locations, lineaments and drainage patterns. The feature criteria are recognized by the quality of photo tone of darkness, texture and morphological expression of drainage patterns and rock property-and structure-controlled landforms. The rock types are

identified using the criteria listed in Table 1. Figure 7 illustrates the interpretation results of the air photographs and sattelite imageries.

The rock unit classification of this region is based on photo-characteristics and the other geomorphologic characters. Four rock units, namely, A1, A2, A3 and A4 plus the Quaternary deposit (Qt) were recognized.

The geologic interpretation of the LANDSAT imagery (ERTS-1) of the much boarder area (Figure 7 b) reveals twelve recognizable rock types, a, b, c, d, e, f, g, h, i, j, k and v plus the Quaternary deposit. All rock types were interpreted to be the sedimentary rock, except "v" which indicates an igneous rock area.

The drainage patterns are of two types, one occurs on the flat terrain and the other in the hilly areas. The latter is quite useful since it indicates the major weak zones in the rocky areas hence suggesting the lithology and/or structure. The drainage patterns are noticed to be subdendritic, subparallel, angulate and swallow hole types. The degree of drainage density is fine, medium and coarse. The drainage patterns are believed to be under the structure and lithologic control.

Based on the findings, the characteristics of the following geomorphology units in this region (Figure 7 a) are described below.

Unit A1

1. Continuous, extensive, none undulating terrain.
2. Ridge, crest; sharp and not sharp ridge, slope; moderate, poorly stream channel.

3. Uncultivated.
4. Moderate to dense forest, composed of deciduous trees.
5. Obtained attitude of bedding 40 - 60 degrees dipping, joints and faults are systematic, texture - homogeneous, age; post - Permian, well bedding.

Unit A2

1. Continuous, extensive, slightly to moderately undulating terain.
2. Small intermontane basins.
3. Agricultural uses in broad valley (stream channel) and small intermontane basins.
4. Moderate to dense forest composed of deciduous trees.
5. Obtained attitude of bedding lying mostly east-west, joints and faults are systematic; age - post - Permian, strike-slip fault, high angle normal faults, fault scarp, karst topographic terrain.

Unit A3

1. Continuous and discontinuous ridge, gently to moderately undulating terrain, dissected area.
2. Non small intermontane basin, no sharp ridge.
3. Moderate to dense forest composed of deciduous trees.
4. Uncultivated.
5. Karst topographic terrain, very massive, no sharp ridge.

Table 1 Rock type comparison chart(After Avery,1965).

Sedimentary rocks	Climate	Landforms	Drainage pattern	Photo tone	Construction material source
Sandstone and conglom-erate	Arid	High relief, bold cliffs, massive, angular	Dendritic, angular, trellis	Light	Excellent
	Humid	High relief, massive, rounded	Dendritic, trellis	Light to medium	Crushed rock, fill, rip rap
Limestone	Arid	High relief, angular	Dendritic, trellis, angular	Light	Excellent
	Humid	Intermediate to low relief, rounded	Internal, dendritic, trellis	Light to medium	Crushed rock, cement
Shale	Arid	Low relief, slopes and valleys, angular dissection	Dendritic, parallel	Medium to dark	Poor
	Humid	Low relief, valleys smooth and rounded	Dendritic, parallel	Medium to dark	Poor
Igneous rocks					
Intrusive	Arid	Massive outcrops, bald domes	Dendritic, angular, annular, radial	Light, uniform	Excellent building stone and fill
	Humid	Rounded outcrops, subdued topography	Dendritic, angular, radial	Light, uniform	
Extrusive	Arid	Inclined flows, flat-topped plateaus, cliffs	Dendritic, parallel	Dark	Excellent crushed rock and fill
	Humid	Subdued and undulating topography	Dendritic	Dark	

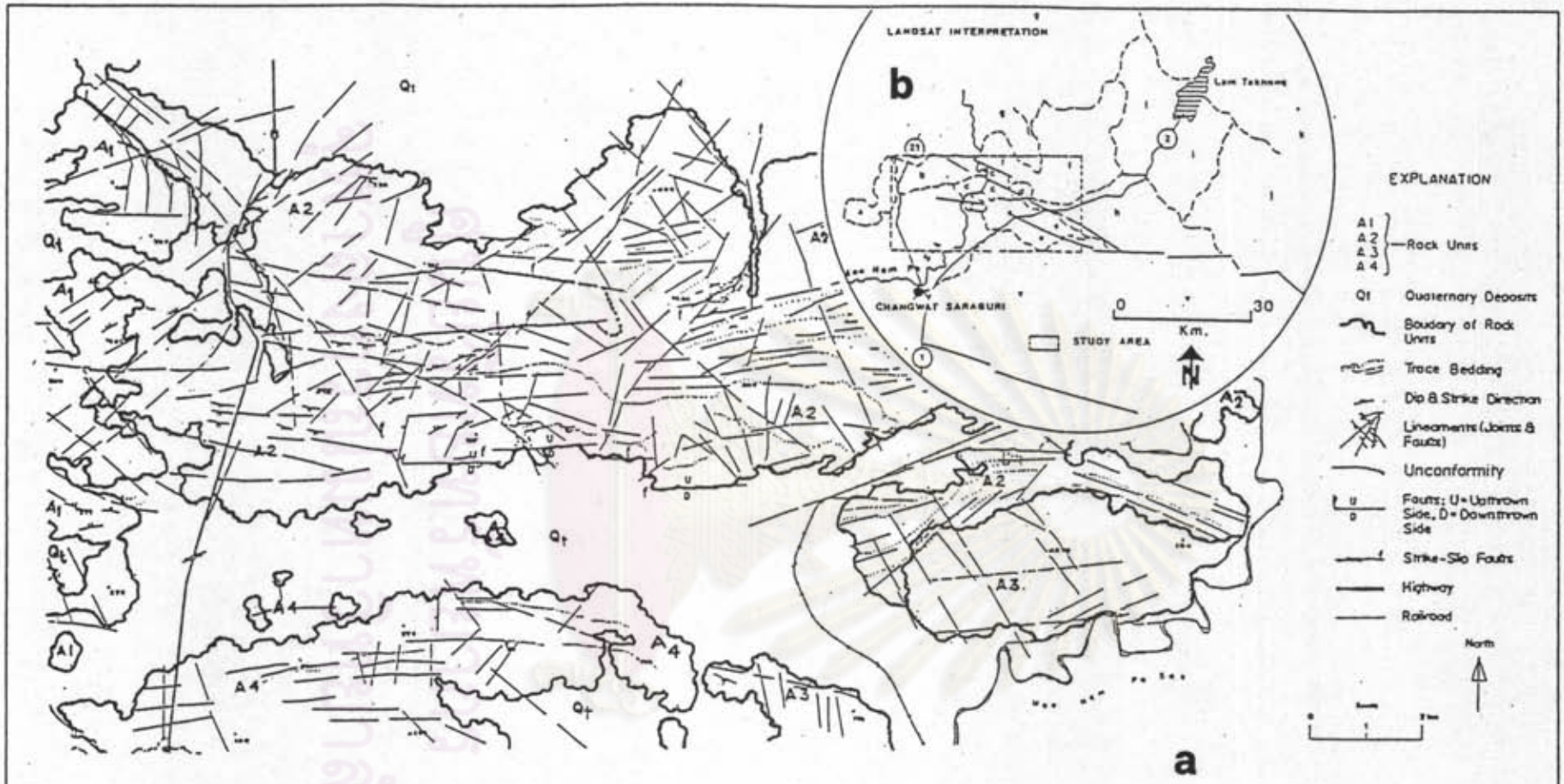

Figure 7 Photogeology of the study area.

Unit A4

1. Discontinuous ridges, very massive, undulating terrain, dissected area.
2. Small intermontane basin.
3. Cultivated; seasonal row.
4. Moderate to dense forest composed of deciduous trees.
5. Trace bedding; east-west dominant, joints and faults are systematic, karst topography, monadnocks.

Talus-slope, grass covered (Q_t)

- Extensive, gently undulating terrain.
- Low relief.
- Cultivated; seasonal row.
- Moderate to dense composed of deciduous trees.
- Slope; less than 5 degrees.

The lineaments include the large-scale joints and faults and other large-scale linear structures. The trend of these lineaments were displayed in the rose diagrams for the statistically significant orientation. The separate rose diagrams characterizing the rock units A1, A2, A3 and A4 are displayed in Figure 8, while the lineaments in the study area are shown in Figure 9. These lineaments in Figure 9 have 3 distinctive directions of trending - east-west, southeast-northwest and north-south. The first two directions are better recognized in the LANDSAT imageries. Some these lineaments, i.e. large-scale joints and faults, are the indicators of the brittle of rocks under stress which relate directly to the mass movement and folding in the rock region (See Hobbs et al., 1976 and Price,

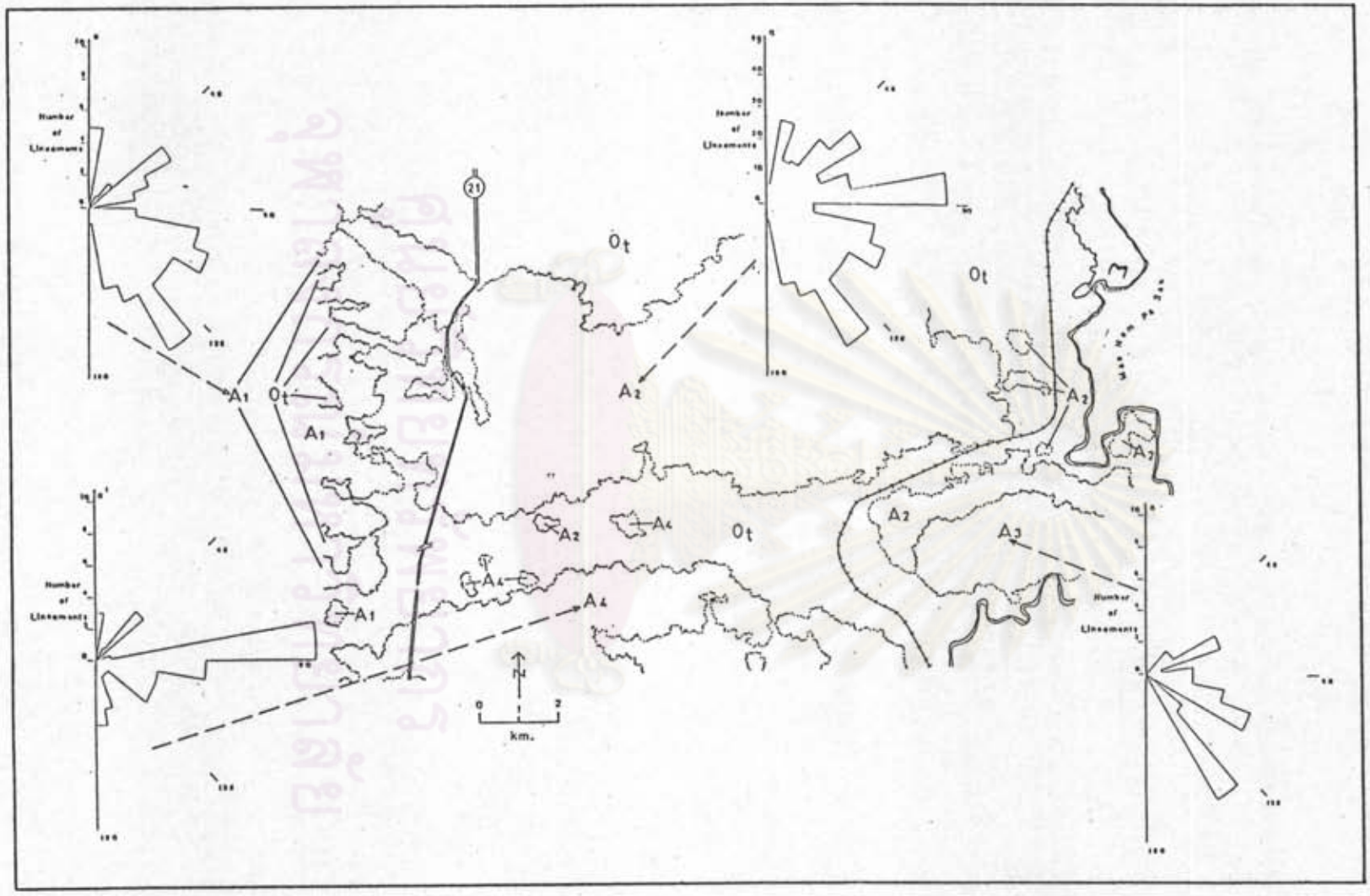

Figure 8 Rose diagrams of lineaments (joints and faults) in the rock units A_1, A_2, A_3 and A_4.

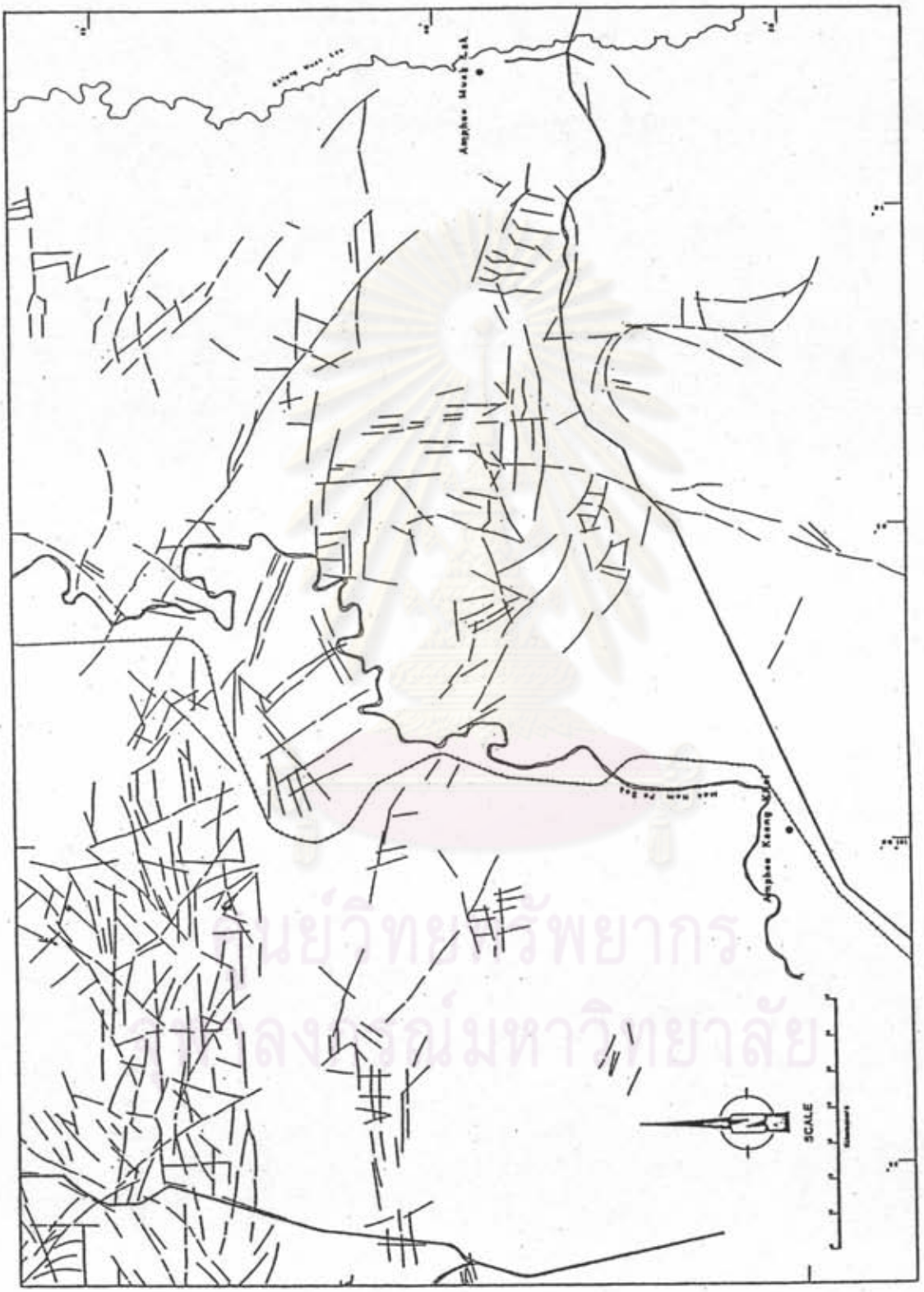

Figure 9 Photolineament map of the study area.

1981). Other lineaments may only be controlled by the stratigraphy. The east-west and southeast-northwest groups of lineaments may have a close relationship to the stratigraphic trend, or some fractures (see further) which have a similar trend. The north-south lineament group may associate the fractures only.