

CHAPTER I
INTRODUCTION



Background

The widespread terrain of our country that situated in the tropical zone is covered by the Quaternary sediment. The different of sedimentary thickness around the mentioned area depends on the geography, depositional processes and sedimentary characters. The Quaternary sediments within the low land area of our country deposited extensively especially in the Central Plain. The high mountain range can dominantly observed in the northern part of the country and also respected along western and southern regions. The Central Plain boundaries distributed upperpart in Nakorn Sawan province, recorded in the northeast part by Khorat margin and limited in the southern by the Gulf of Thailand. Kanchanaburi, Suphan Buri and Ratchaburi provinces limited the west of the Central Plain boundaries.

The large area of Kanchanaburi province is noted by the mountainous zones, especially in the west of this region which adjoins with Myanmar. The recent sedimentary deposition masks largely scale in the east part of the town which provided the marginal boundaries of the Central Plain and joining with Suphan Buri vicinity. Geomorphologically, the eastern terrain of Kanchanaburi is situated on high terrace, middle terrace, contact with the Don Chedi fan of the huge plain. (Thiramongkol, 1983). The extreme landforms which were also mentioned in these area are made by prominent fluvial action. The present landuses in Kanchanaburi and adjacent area such as Nakon Pathom, Suphan Buri and Ratchaburi are influenced for the country

industrial development together with the potential area for natural material resources discovery, for example, the construction sand, limestone, coverage soil and economic minerals such as tin-ore, fluorite and gemstone. The center of the investigated area locates at Bo Phloi district, north of Kanchanaburi town. The flat low land area was also mentioned in this region. The surficial materials of recent sedimentary deposition in the middle part of this area are recorded. The dominant sediment feature was presumed that it occurred from broadly river process; furthermore, the other areas are covered by sediments from flash-flooding action which formed very thick deposit. The areas are extensively cultivated. The production of precious gemstone from Bo Phloi area is significant export of the country. Blue sapphire together with some associated minerals such as black spinel, black pyroxene are plentiful observed in the area. The previous exploitation of gemstone was carried out only in the low hills due to the manually digging. The opencast have just operated for the last five years using modern mining machines in order to increase the production. The main presumption is that more gemstones would be recovered from the deeply weathered underground basalt source rocks occurring within the middle part of the basin.

The regional geological investigation in this area was carried out by many geologists from the Department of Mineral Resources and reported that the occurrence of gemstones are genetically related to the basalt. Subsequent researches have dealt with age dating, petrochemistry and petrography of the basalt. Nevertheless, the research of Quaternary deposition of transported gemstone in particular, has not been sufficiently recorded. This research was carried out after mining activities, even though the final progressive result of this work could give some detail for the distribution of gemstone potential-field selection. The prominent result of this study is to describe sedimentary characteristic associated with explanation the depositional evolution in

this basin. Furthermore, the sequence of this Quaternary application will be a case study for other minerals exploration.

The Quaternary geological studied in the area under investigation can be useful for natural phenomenal explanation especially gemstone deposition. The emphatic research concerning physical sedimentary characters, relationship between geological processes and geomorphological landforms will also discuss.

The Study Area

Amphoe Bo Phloi locates approximately 40 kilometres in northern part of Kanchanaburi town. The northern part of the district adjoins King-Amphoe Nong Pru of the same province and Amphoe U-Thong of Changwat Suphan Buri. The eastern part of this region joins with Amphoe Phanom Thuan bounds by Khao Chong Insi mountain ranges. The area is bounded by Amphoe Muang Kanchanaburi in the south, and adjoins Amphoe Si Sawat in the west mountain ranges.

Physiographically, the area contains the basin so-called Bo Phloi trending from north to south which is sandwiched on both sides by mountain ranges to the west and east directions. The upper boundaries are approximately at latitude $14^{\circ} 38' 40''$ and longitude $99^{\circ} 22' 00''$ to $99^{\circ} 35' 00''$ east, and end of the area at Khwae Yai river. The total area is approximately 1,200 Square-kilometres, covers some areas of topographic map with a scale of 1: 50,000. The number of map sheets are 4838 II (Ban Nong Pru), 4938 II (Ban Krap), 4837 I (Ban Lam Hoei), 4937 IV (Amphoe Bo Phloi), 4837 II (Ban Lad Ya), and 4937 III (Changwat Kanchanaburi)(Fig 1.1, 1.2). The total area is situated in the geological map sheet Changwat Suphun Buri, ND 47-7 with scale of 1: 250,000. The coverage aerial photographs of the area consist of the area

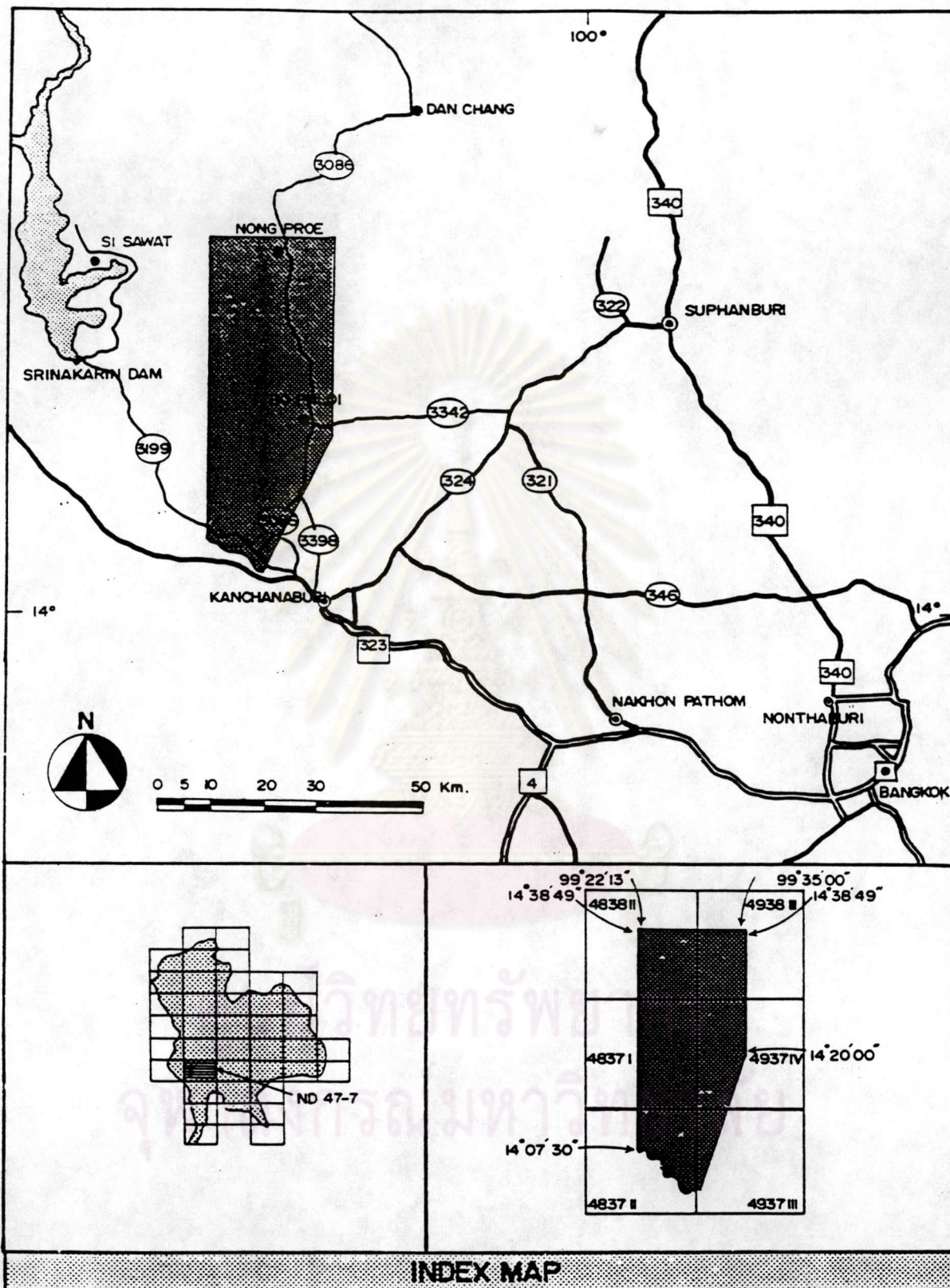


Figure 1.1 The study area with its accessibility.

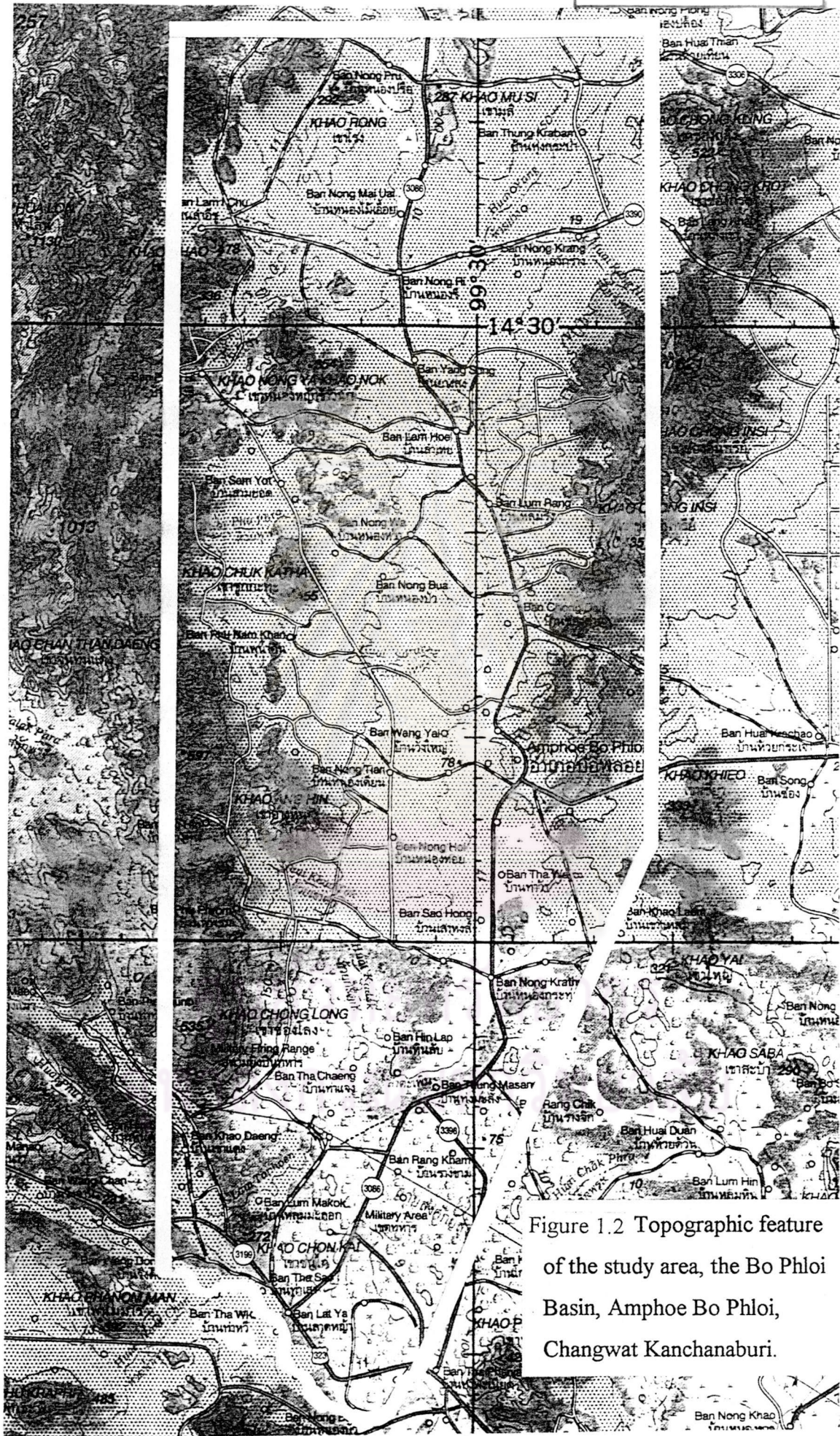


Figure 1.2 Topographic feature of the study area, the Bo Phloi Basin, Amphoe Bo Phloi, Changwat Kanchanaburi.

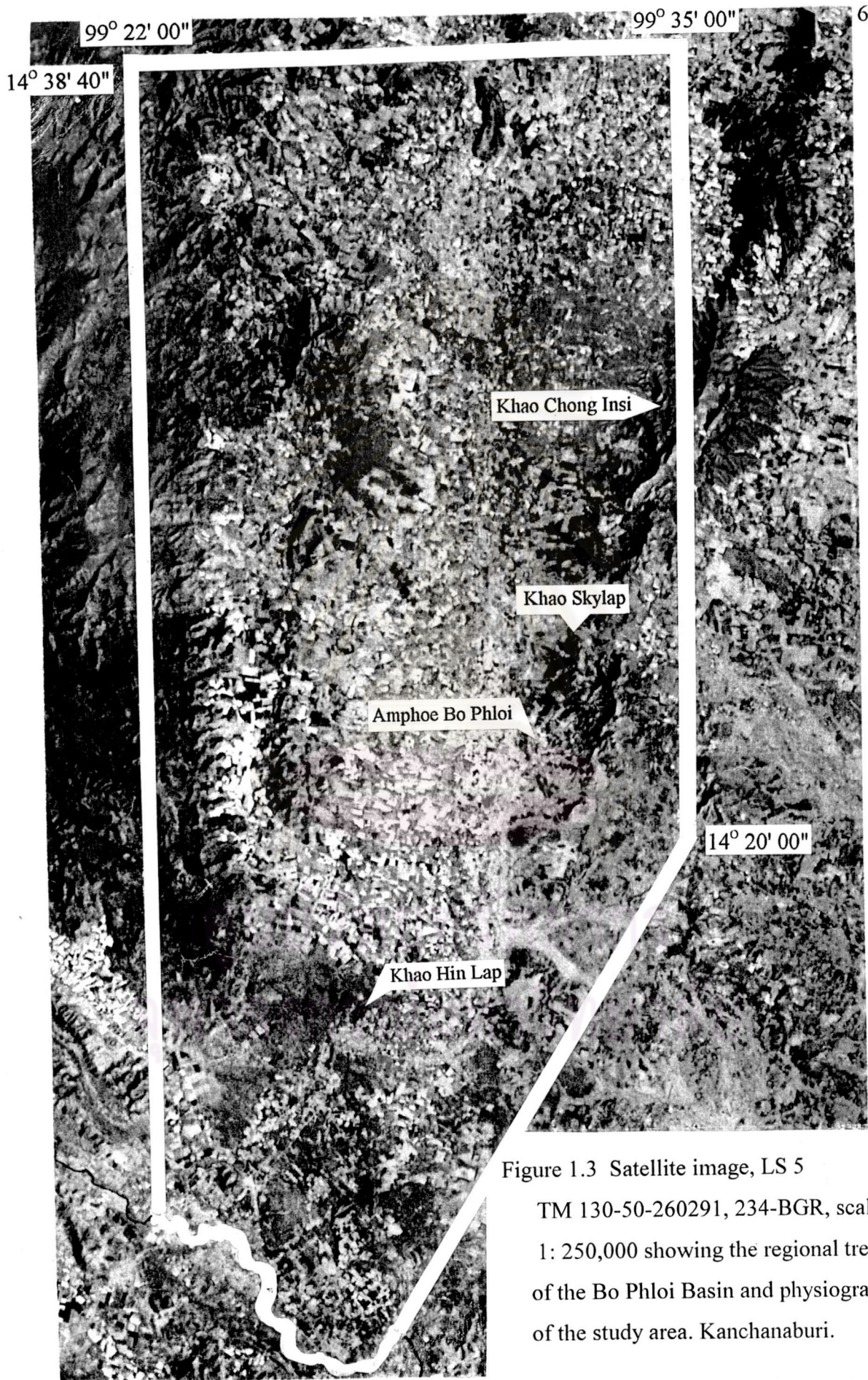


Figure 1.3 Satellite image, LS 5
TM 130-50-260291, 234-BGR, scale
1: 250,000 showing the regional trend
of the Bo Phloi Basin and physiography
of the study area. Kanchanaburi.



Figure 1.4 A panorama view of the study area. Amphoe Bo Phloi, Changwat Kanchanaburi. (Looking west)

priority 1 sheet 3 of 4, strip number 8 to 18 and the area priority 6 sheet 3 of 23, strip number 80-84. The total negative film number of the aerial photographs about 114 photos were noted.

The prominent perennial stream, called Lam Ta Phoen flows from north to south and adjoins with Khwae Yai river at Amphoe Muang Kanchanaburi.

Accessibility and Local Communication

Changwat Kanchanaburi locates about 130 kilometres to northwest of Bangkok Metropolis. At present, the journey to Kanchanaburi and its adjacent area is very comfortable along the highway number 4, Petchakasem, then changes to the number 323 highway at Amphoe Ban Pong, Ratchaburi province and continues throughout Kanchanaburi town. Amphoe Bo Phloi locates approximately 40 kilometres to the north of Kanchanaburi town. It can be reached by using the road number 3199 joining with the road number 3086. The total distance is approximately 170 kilometres, or about 3 hours trip by car from Bangkok.

The importance asphalted road that using for research work and local people transportation in the investigated area is the road number 3086 with many laterite road branch which constructed and donated by gemstone-mine producers.

Objectives and Outputs

The main aim of this research is to creates the methodology of data collection from the surficial deposits of each landform and respect to describes subsurface sedimentary characters with a good opportunity provided by gemstone-mine producers.

The detail of each lithological landform deposit has not been explored before. Furthermore, the author presumes that the deposition of gemstone is directly related to geomorphological processes during Quaternary period. The major aims of the present study can be divided into four points as follows :

- i) to explain the characteristics of Quaternary sediments which accumulated in the Bo Phloi Basin.
- ii) to conclude its paleoenvironment during Quaternary period.
- iii) to investigate the relationship between sediment characteristics and gemstone deposition, and
- iv) to delineate the most-likely boundaries of the gemstone secondary deposit.

The result may bring an insight into the physical characteristics and geological processes of the sedimentary deposition related to gemstone distribution and its economic potential within the basin. The author believes that this research methodology will be applicable to other gemstone placer deposits.

Literature Surveys

It is uncertain when gemstones were first discovered at the Bo Phloi Basin. Several geologists, for example, Charaljavanaphet (1951), Bunopas and Bunjitradulya (1975), Barr and Macdonald (1978,1981), Vichit and others (1978), Vichit (1988) and Yaemniyom (1982), have carried out extensive research related to their origin that can be concluded as follows :

Swanhome reported that there was basalt in Amphoe Bo Phloi. Then, Khun Pian and Phra U-Dom (see Bunopas and Bunjitradulya, 1975) reported that basaltic flow in Bo Phloi was the source of corundum and spinels.

Bunopas and Bunjitradulya (1975) reported the regional geology of the western Thailand covering Bo Phloi area on the geological map scale of 1: 250,000, ND 47-7, Suphan Buri quadrangle. They concluded that the rock types in the area can be divided by their lithological characteristics into six categories as Precambrian Thabsila Gneisses, Cambrian-Ordovician U-Thong Marbles, Ordovician of Thung Song Limestone, Silurian-Devonian of Kanchanaburi (Bo Phloi) Formation in Tanaosri Group, Quaternary deposits, and igneous rocks.

Vichit and others (1978) reported the distribution and some characteristics of corundum-bearing basalts in Thailand including the basalt in Amphoe Bo Phloi, Changwat Kanchanaburi (Fig. 1.7). In 1988, Vichit presented the location of gemstone in Thailand, especially Bo Phloi region with the area where gemstone mining position (Fig. 1.6).

Barr and Macdonald (1978,1981) studied geochemistry and petrogenesis of late Cenozoic alkaline basalts of Thailand as well as geochemistry and geochronology of late Cenozoic basalts of Southeast Asia. They reported that the Bo Phloi basalt was nepheline hawaiite, and 3.14 ± 0.17 Ma using K-Ar dating method.

Yaemniyom (1982) studied the petrochemical of corundum-bearing basalt at Bo Phloi district, Kanchanaburi, and concluded that the basalt consists of normative olivine and nepheline without normative hypersthene. Petrographically, the basalt is

porphyritic and contains megacrysts such as clinopyroxene, olivine, sanidine and plagioclase with xenoliths of ultramafic inclusion.

Based on magnetic anomaly, Songkran and Tulatumakul (1984) reported that Bo Phloi area showed dominantly magnetic anomaly indicating other potential areas for basaltic eruption, such as Ban Chong Dan, Huai Krok Krak, Ban Bo Heang. In addition, a major fault was also revealed in the vicinity of Khao Chong Insi. (Fig. 1.5)

Aranyakanon (1988), Formerly Senior Expert Geologist of DMR, wrote historical background of the sapphire deposit at Bo Phloi as well as its geological characteristics (Fig. 1.8), genesis and mining activities.



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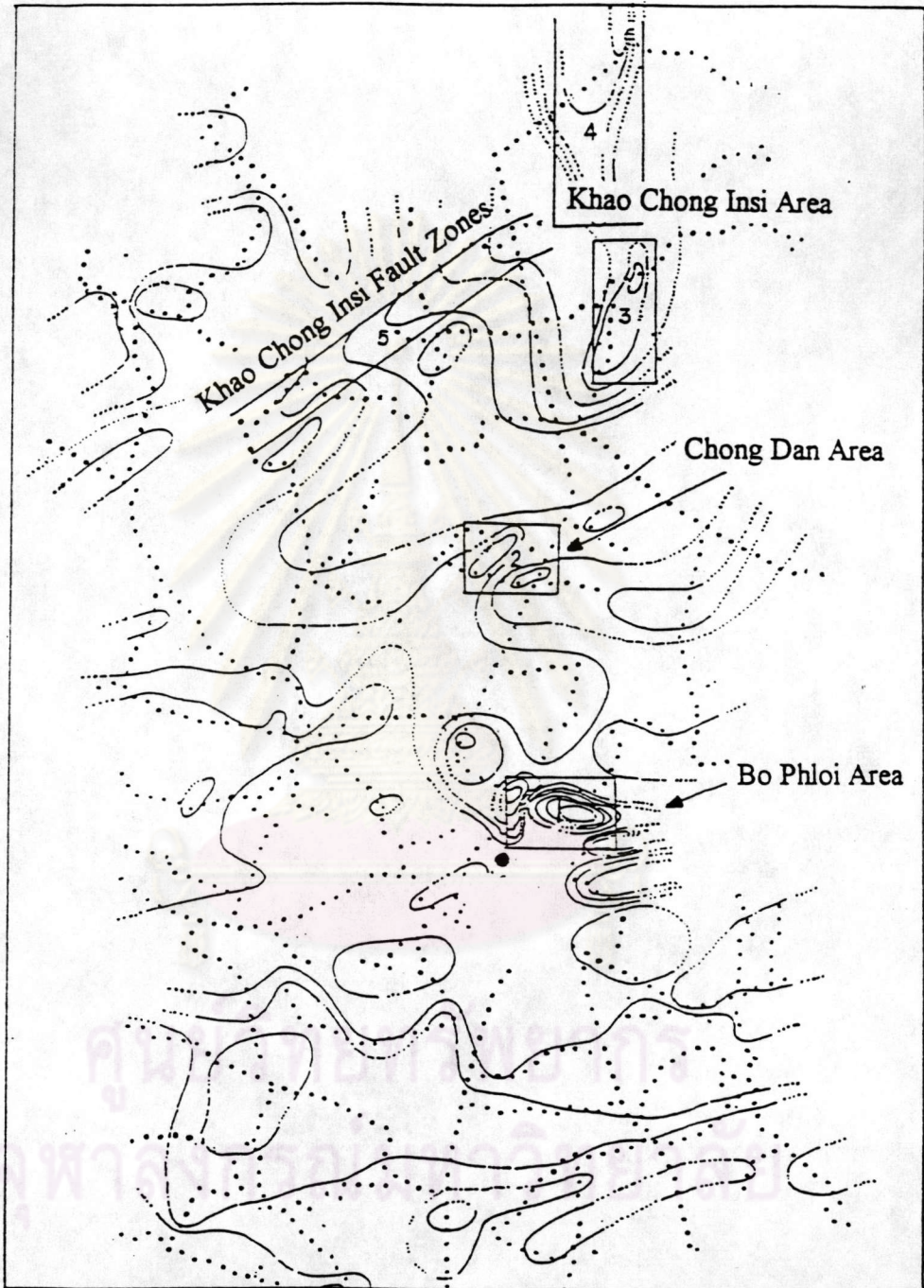


Figure 1.5 Magnetic anomaly in the study area, Amphoe Bo Phloi, Changwat Kanchanaburi. (modified from Songkran and Tulatumakul, 1984)

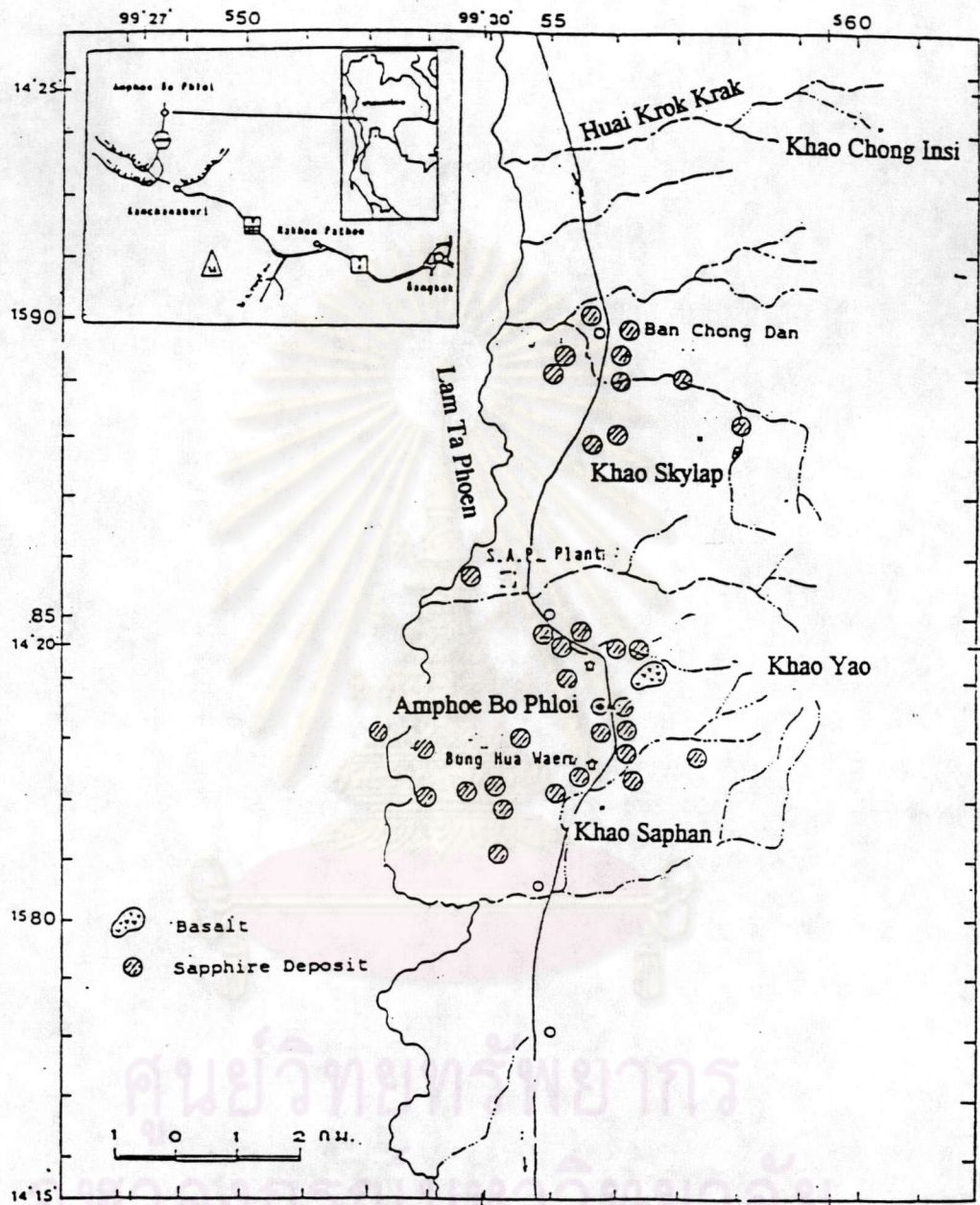


Figure 1.6 Locations of sapphire prospects in the study area, Amphoe Bo Phloi, Changwat Kanchanaburi. (modified from Vichit, 1988)

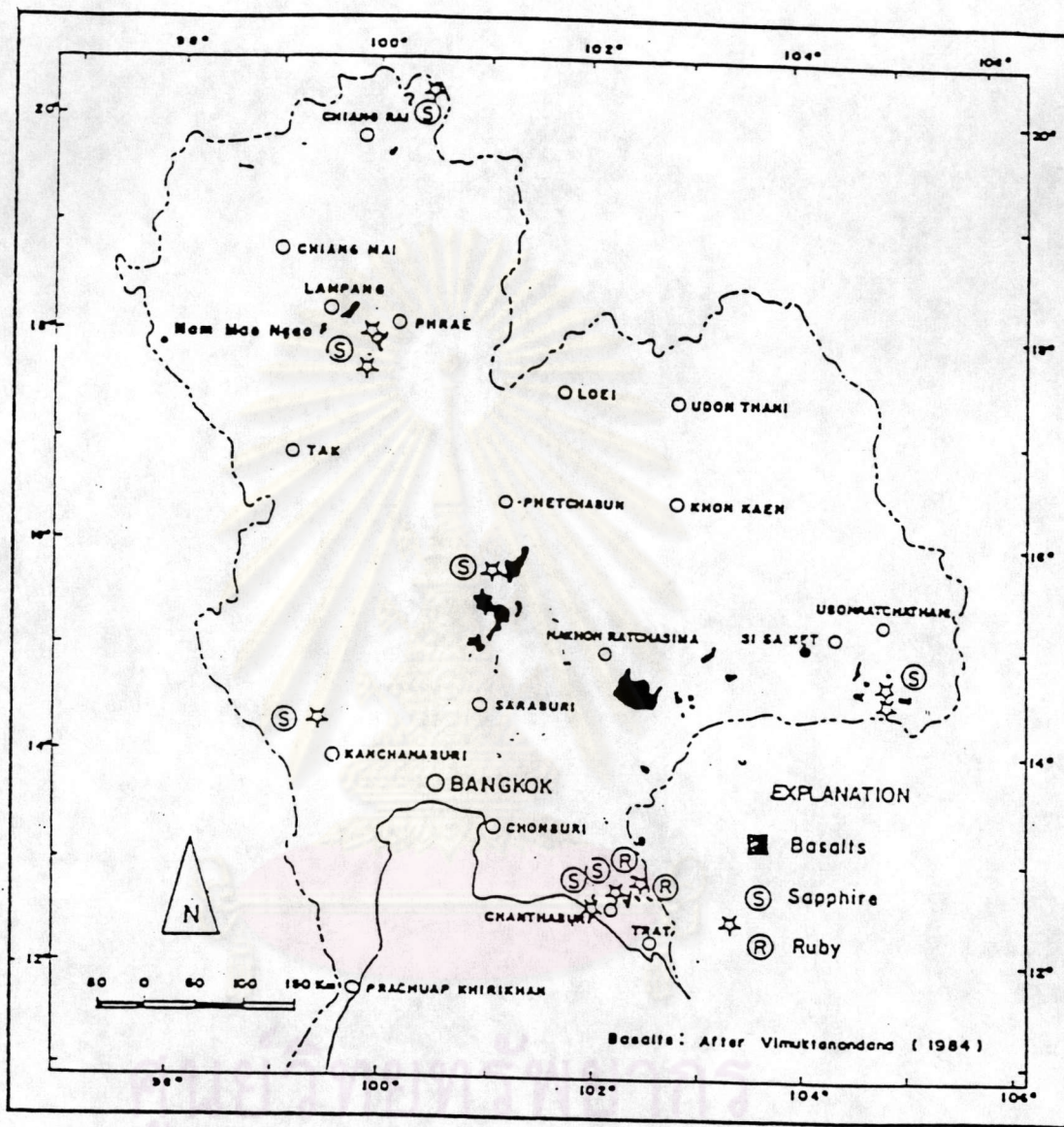


Figure 1.7 Distribution of basalts and locations of ruby and sapphire deposits in Thailand. (modified from Vichit, 1988)

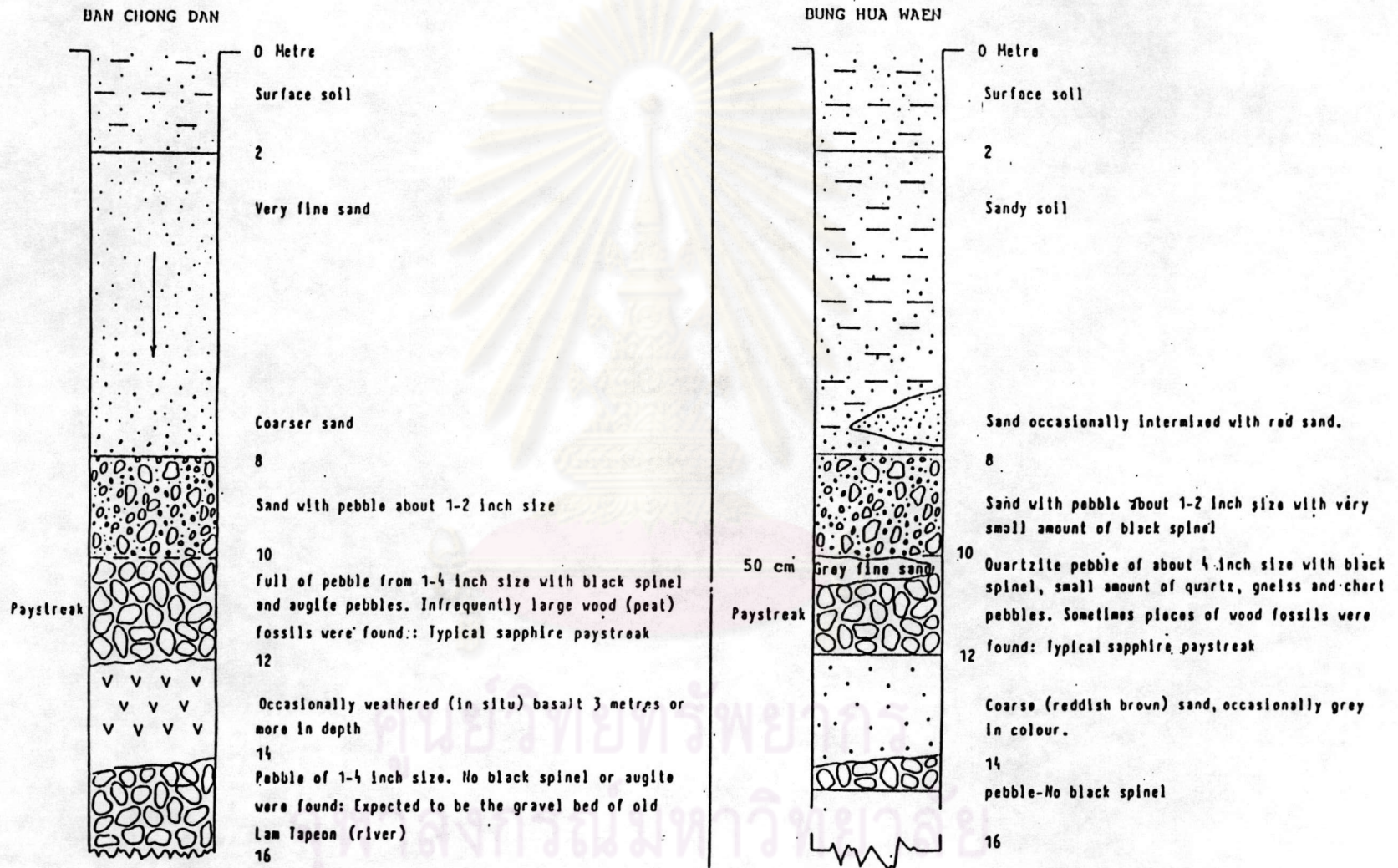


Figure 1.8 Idealized section of sapphire alluvial deposits, Amphoe Bo Phloi, Changwat

Kanchanaburi. (after Aranyakanon, 1988)