CHAPTER II

METHODOLOGY

2.1 Introduction

The general methodology of geoarchaeological study in this area was based on the analysis of geomorphology and sedimentology from the excavation area. The physical geography within the investigated vicinity such as topography, landforms are also discussed. Geological and geomorphological analyses using aerial photos were the first step and field survey in the area is then cross checked with other analyses. Subsequently, the sediment from excavated area was collected for the detail analysis aiming to explain the major geological process and stratigraphic sequences. Finally, the correlation between stratigraphic sequences and archaelogical remains was carried out in comparison with chronological sequence and site function in the area. Research methodology can be described in Figure 2.1.

2.2 Data Collection in Office Work Study

The data concerning a regional geology have been provided by the Geological Survey Division, the Department of Mineral resources in Bangkok. The data comprise geological map of Thailand with 1:1,000,000 scale, geological map of Northern Sheet with 1:500,000 scale and geologic map of Sheet 4 Chiang Dao with 1:250,000 scale.

The detailed study of geology and geomorphology in the area were classified from aerial photos and followed by geological and geomorphological maps. Aerial photos interpretation was undertaken on the 1:50,000 scale of PCD. Project 2/39 17/12/95 number 094, 095, 096 and 097 (covers approximately 12 square kilometers).

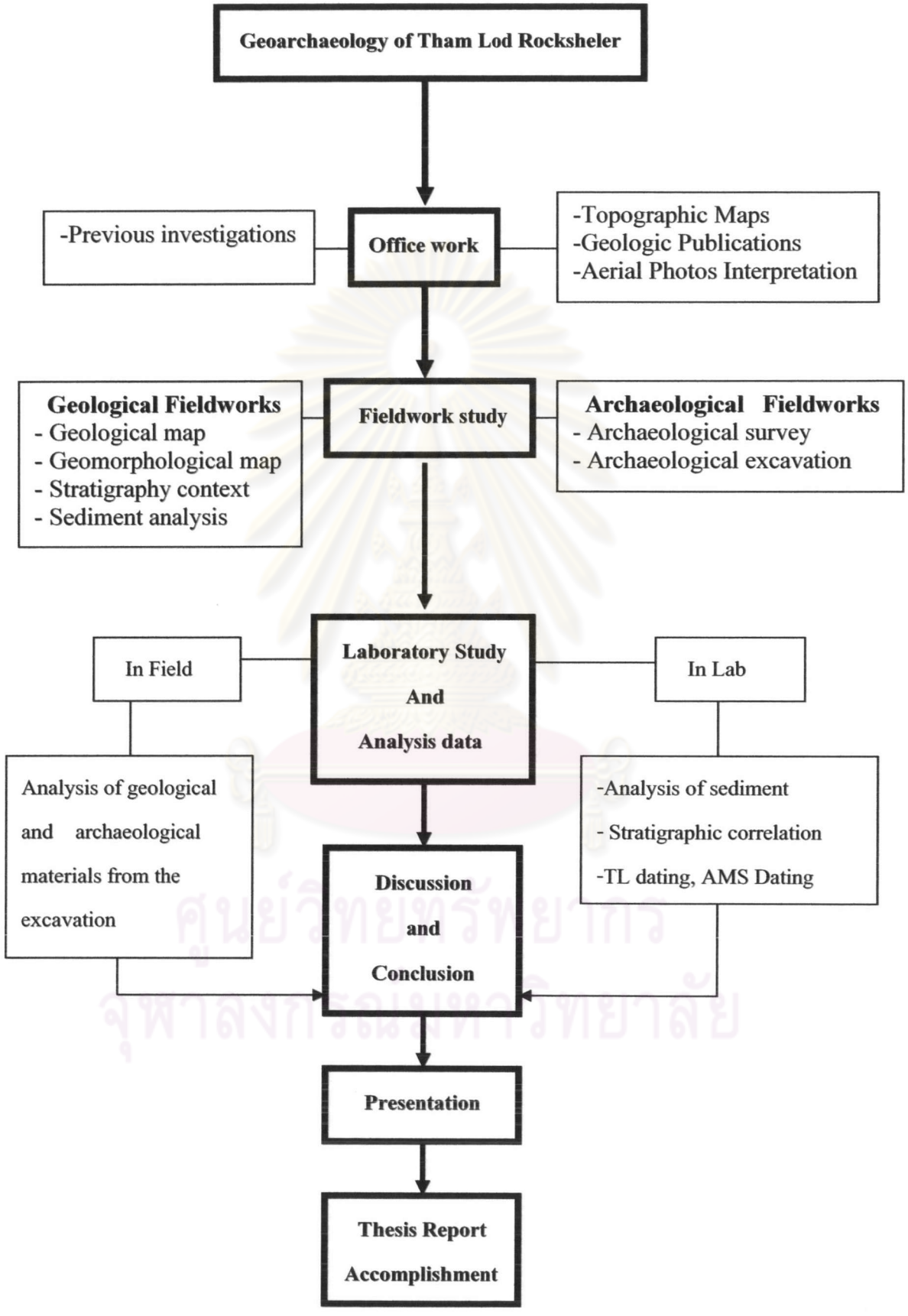

Figure 2.1 Flow chart illustrates the methodology using in the research.

2.3 Geological Study

The field mapping especially surrounding the excavation area was carried out after data colleted in office work and excavation were finished. Sediment sampling and field description were done in order to obtain detailed information of sedimentary characteristics.

2.3.1 Field Description

Based on the archaeological excavation at Tham Lod rock shelter, description of sediments was done by observing the different soil layers. The description of soil requires a set standard terms, correlation with Munsell charts and pH of soil was also examined as follows.

Layer observation: the description in different sedimentary layers is carried out in the terms of representative strata.

Color: the Munsell soil color charts are undoubtedly the best method of describing color all sedimentary layers.

Texture: field determination of sediment texture is made by hand that both major and minor sediment compositions will be noted together for identification of sedimentary types such as sandy clay, silty sand etc.

Coherence: Coherence is the strength of the boundary between the individual grains, measured on the scale such as non-coherent, very friable, friable, firm, very firm etc.

Mottle or concretions: The pisolitic concretion is abundantly observed in the lower part of the general profile, especially the sterile soil beneath excavation area indicating chemical alteration occurrence.

Layer contact: the deposition of the unconsolidated sediments was very often not continuously accumulated. The record of depositional layer contact can indicate the continuity of the deposition. The general description in layer contact can be divided into sharp contact, gradual contact and unclear contact.

2.3.2 Sediment Sampling

The locations for sediments sampling from each layer have been planned.

Area excavation 1: 14 soil samples were collected from the west profile (Figure 2.2).

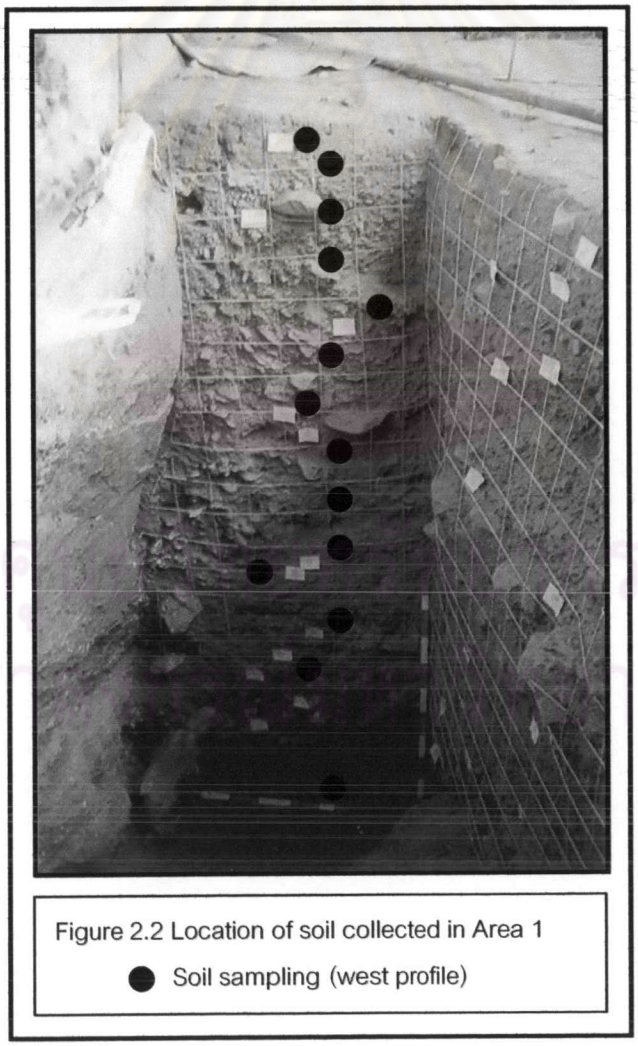

Figure 2.2 Location of soil collected in Area 1

● Soil sampling (west profile)

Area 2: The excavation Area 2 was higher in slope than the other areas and showed very complex deposition mixing of natural layer and cultural layer. Thus, soil sampling was designed carefully to collect soil sediments from three blocks excavated. Sample set of S21W10 SEQ3 including 10 soil samples was taken from the upper part of the area. Sample set of S21W10 NEQ1 was picked up from the middle part of the area containg 10 soil samples. Sample set of S20 W10 SEQ3 was taken from the lower part of the area consisting of 10 soil samples (Figure 2.3).

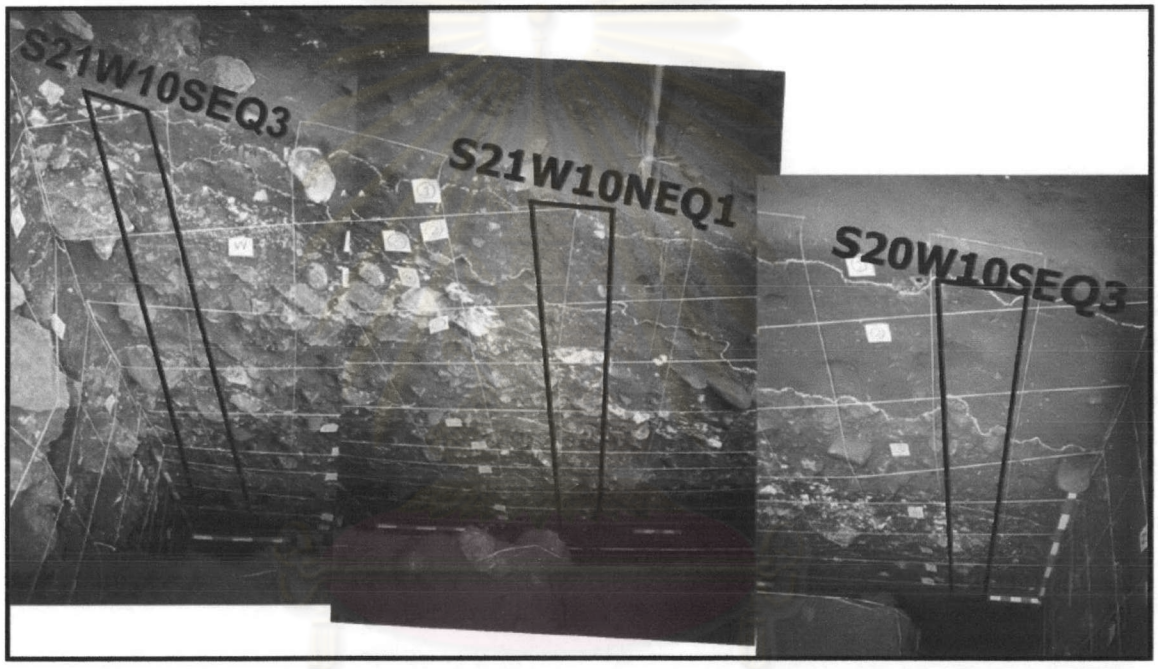

Figure 2.3 Location of soil samples collected in Area 2 (West profile).

☐ Collected block of soil sample

Area 3: The excavation of area 3 was located on foot slope of the area. Soil sampling was designed carefully to collect from two excavated blocks. Sample set of S20W9 SWQ3 was picked up from the upper part of the area including 8 soil samples. Sample set of S19W9 NWQ1 was taken from the middle part of the area consisting of 8 soil samples (Figure 2.4).

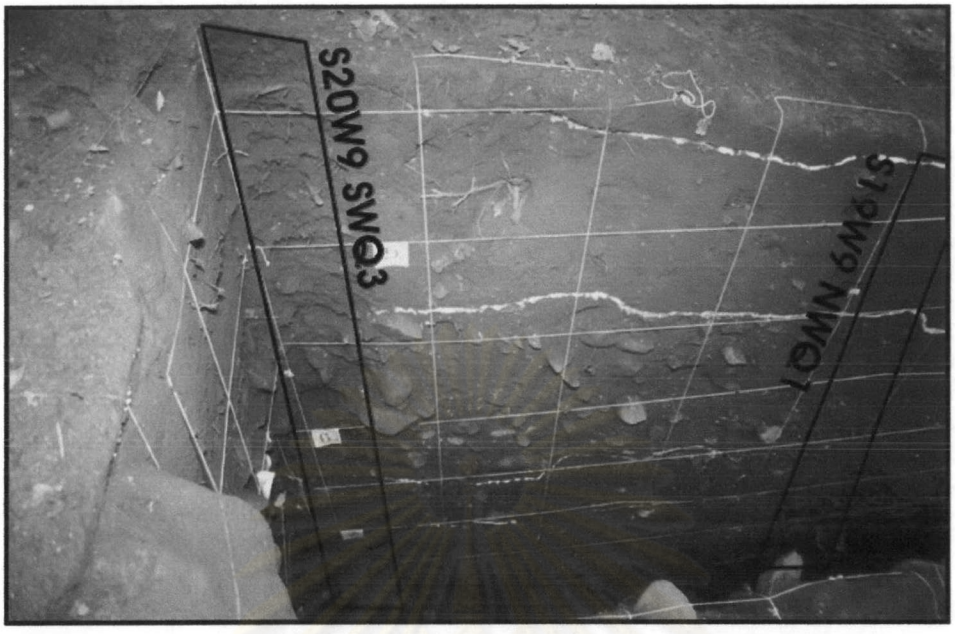

Figure 2.4 Location of soil samples collected in Area 3 (West profile).

☐ Collected block of soil sample

2.3.3 Laboratory Analysis

Particle size and chemical analyses are applied to describe size distribution and specific characteristic of unconsolidated sediment, respectively. Furthermore, the chronology of stratigraphy was examined by 2 dating methods as AMS dating and TL dating.

1. Particle Size Analysis

Sieve and hydrometer analyses were used in this laboratory research in order to describe particle size distribution. All of samples containing high silt and clay were analysed by using hydrometer for particle size distribution.

Hydrometer analysis is used to measure the concentration changes, which occur in a setting suspension, by withdrawing samples at fixed depth

and time intervals. It works according to the principle that if two particles start setting out from a suspension at the same time the larger falls to the bottom of the sedimentation cylinder faster than the smaller, according to Stokes law. One can, therefore, calculate the particle size distribution by dispersing the mixture and withdrawing samples from known depth and height to correspond to particular particle sizes.

2. Chemical analysis

Organic matter analysis and identification of trace elements by X-ray powder diffraction method, and chemical analysis method for soil samples is used in this laboratory research in order to describe the difference of soil sample from each layer.

Organic matter method was analysed all of soil sample but X-ray powder diffraction is chosen to test soil sample from the difference contact boundary about the origin of source of deposition. 4 samples from area 2 and 3 were analysed by X-ray powder diffraction.

3. Dating Method

The dating method is used to determine the absolute age of organic materials from the deposit. Four radiocarbon datings and Accelerator Mass Spectrometric (AMS.) (from Beta Analytic, Inc.) from organic sediment and shells. Six thermoluminescence datings (TL dating). From Research Institute of Materials and Resources, Faculty of Engineering and Resource Science., Akita University) from sediment and calcrete were also dated.

Unfortunately, there was very little amount of charcoal available from the excavation, the majority of AMS dating was, therefore, run in organic sediment and shell (Table 2.1 and Figure 2.5). However, the caution of the AMS dating age estimates obtained from organic sediment and shells was also taken into account in this

research because it is often unreliable. Because of some rockshelter sediments and shells may obtain carbon from the ingestion of limestone. Therefore, in order to establish a chronology of The Tham Lod site, TL dating is also applied to crossed check the C-14 and AMS dating.

Table 2.1 Characteristic of sample for AMS dating (Shoocongdej and other 2002)

No.	Area	Code	Sample contexts	Sample Type	Weight (g)
1	1	MHSTLar1-402	Ash near Tibia from burial no.1 (190-196cm.Dt. or 50 cm.s.)	Organic Sediment	1900
2	1	MHSTLar1-710	Ash near Tibia from burial no.2 (210-234 cm.Dt. or 80 cm.s.)	Organic Sediment	665
3	1	MHSTLar1-1526	Shell (350-360 cm.Dt. or 2.10 cm.s.)	Shell	-
4	1	MHSTLar1-1526	Shell (420-430 cm.Dt. or 2.60 cm.s.)	Shell	-

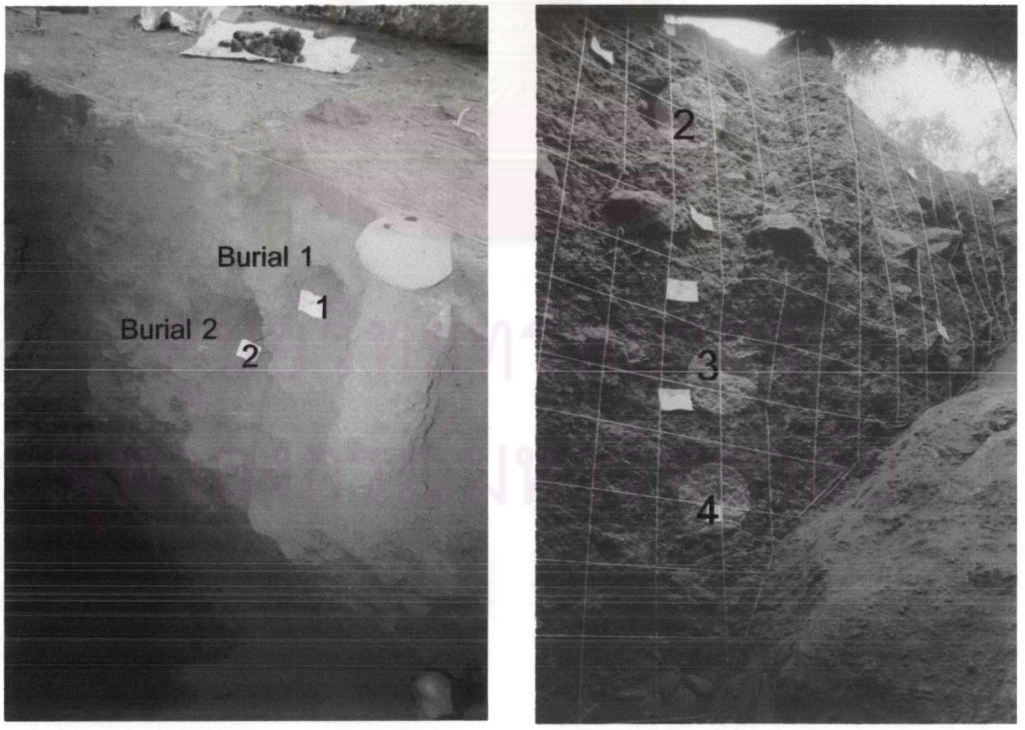

Figure 2.5 Location of samples in area 1 for AMS dating.
(View from North profile)

Six samples were dated by TL technique, consisting two samples of calcrete from area 1 (Figure 2.6) and four samples of sediment (contact boundary) from area 3 (Figure 2.7). The error of TL dating may be occurred while collecting samples in the field. Therefore, knowing a historical review of geologic environment is very important for getting a precised TL age determination in order to avoid samples error. The method to collect the samples were mostly used by hand auger drilling. In this research steel pipe (1- 1.5 m.) was carefully cored (Figure 2.8). To avoid contamination, soil surface was cleaned up before drilling every time.

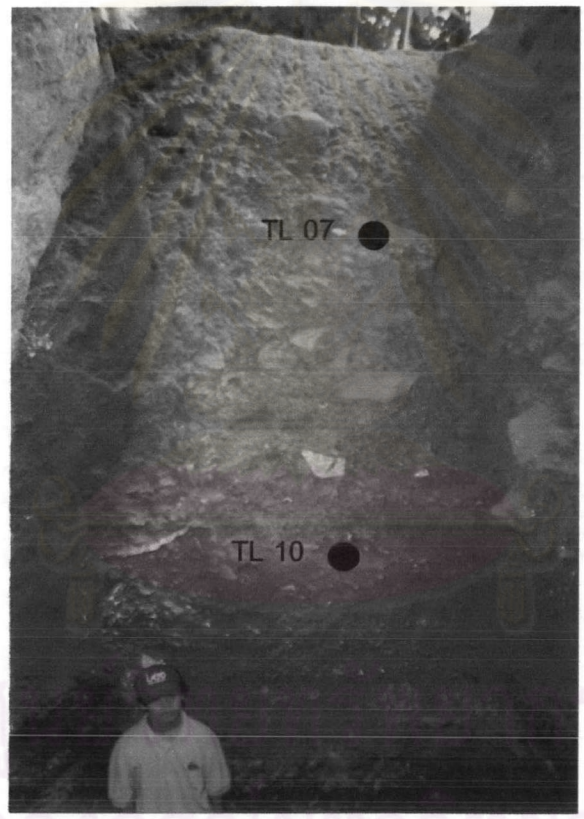

Figure 2.6 Location of samples in area 1 for TL dating (view to the west profile)

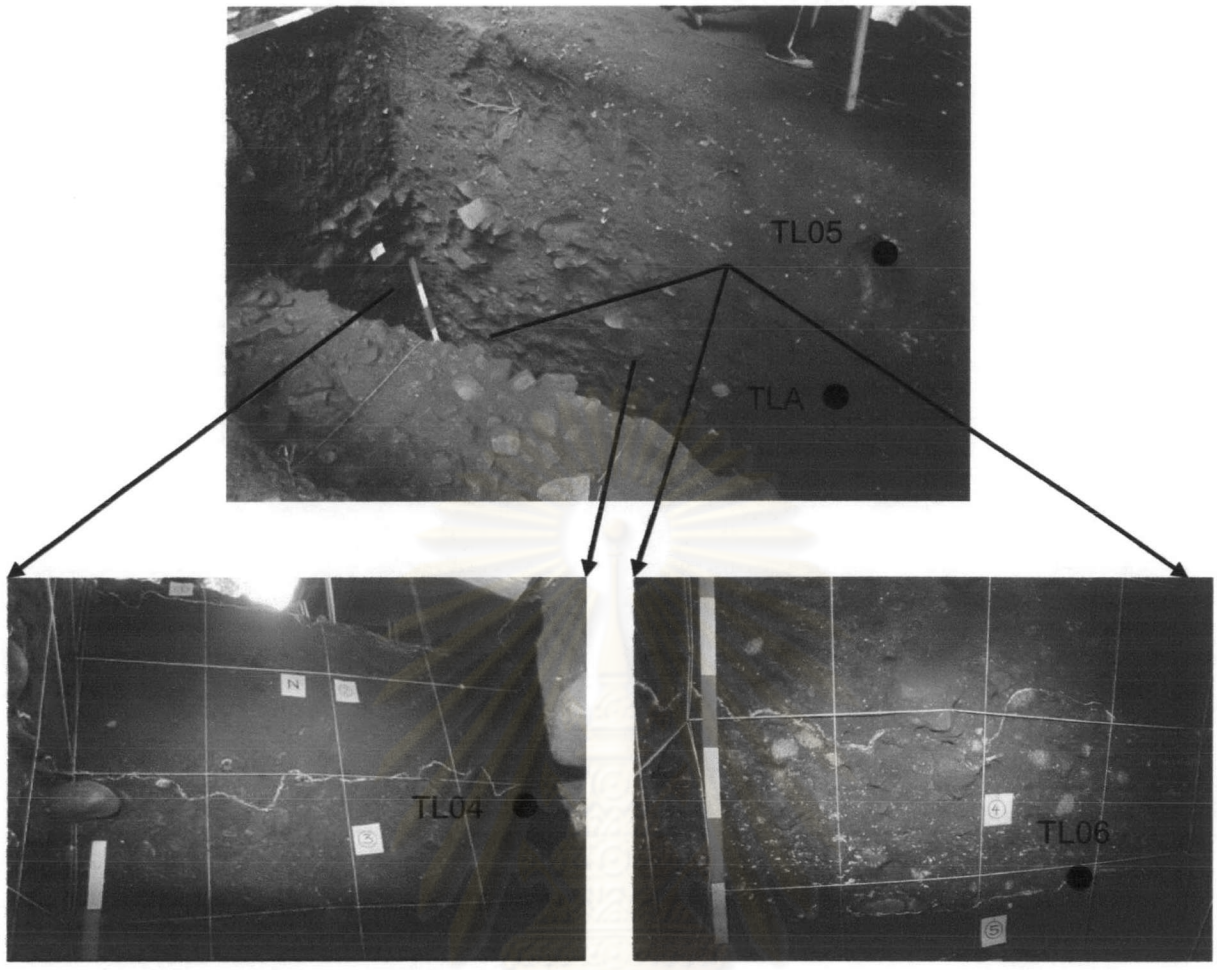

Figure 2.7 Position of collected soil samples in area 3 for TL dating (view from the west profile)

2.4 Archaeological Study

In term of archaeological study in the area, preliminary stratigraphic sequences were described after excavation finished. The main point of archeological study is to describe archeological remains from the excavation and to correlate them in relation to stratigraphy, sedimentology, chronology and some other archaeological data (artifacts and occupation layer).

A number of archaeological remains were discovered especially stone tools, animal remains, shells and potsherds. However, this research will focus only on detail study of stone tools as a representation of artifact density and other archaeological

remains will study only on preliminary basis because stone tools are the most abundant remains in comparison to others. In addition, size of stone tool can imply us about depositional process.

2.4.1 Stone Tools analysis

The stone tools analysis were done on basis of Highland Archaeology Project classification. The lithic classification is divided assemblages into 2 types: core and flake according to reduction sequence.

Core : Morphological and technical analyses of core were are classified into four categories, which can be described below.

1. **Utilized Core (UC)**. A unifacial core with clear used wears.
2. **Wasted Core (WC)**. A Core that was considered as waste during stone tools production sequence. Generally, the shape of wasted core is amorphous sgape.
3. **Broken Core (BC)**. A Core is broken during the production.
4. **Hammer.**

Flake : Flake is small pieces of stone after production sequence of core tools. Morphological and technical analysis of flake were started by dividing the finds into six preliminary categories as follows:

1. **Classified by types**
    - 1.1 Primary decertification flake
    - 1.2. Secondary decertification flake
    - 1.3 Tertiary decertification flake
2. **Classified by function**
    - 2.1 Wasted flake (WF)
    - 2.2 Utilize flake (UF)

2.3 Resharpening flake (RF) which flake has been repaired or maintained.

In order to analyses stone tools, raw materials of lithic were described lithologically in the field and selected of sampling stone tools for thin section analysis.

Systematic block sampling was designed to correct for lithic analysis (Figure 2.8).

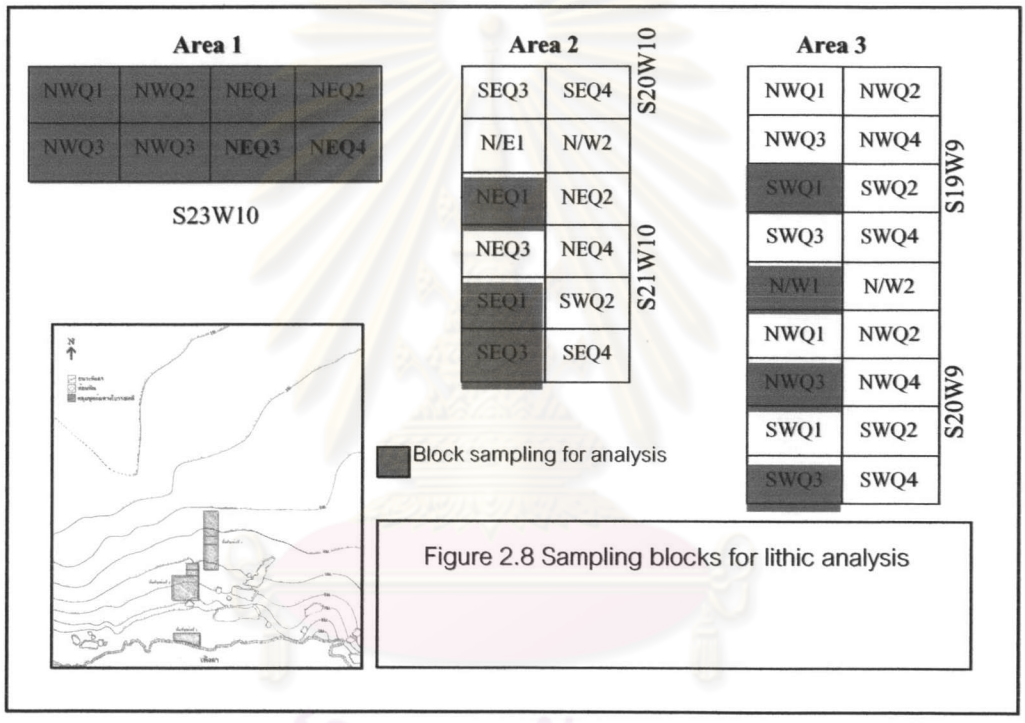

Figure 2.8 Sampling blocks for lithic analysis

2.4.2 Animal Remains Analysis

A large number of animal bones was discovered especially in area 1, comprise of fragments of animal bone (Figure 2.9). Both burnt and un burnt bones were found. A preliminary classification from each layer and the identification of animal teeth from within layers of area 1 were carried out in this research in order to describe amount distribution within each layer.

Figure 2.9 Fragments of animal bone remains found in area 1.

2.4.3 Potsherd

Likewise, a large number of potsherd was discovered from all of excavated areas which appeared only in the upper layer. Potsherds were mostly earthenware potsherd (Figure 2.10). A preliminary classification from each layer (all area excavation) was used in this research in order to describe amount density and distribution within each layer.

Figure 2.10 Fragments of earthernware sherds from excavated area.

2.4.4 Shell

A large number of shells was discovered in areas 1 and 2 especially in area 1 where numerous of shells appeared mostly in the middle to bottom layers. Most shellfish remains are fresh water shells (Figure 2.11). A preliminary classification of shells from each layer (only area 1) was done in this research in order to describe amount, density and distribution within each layer.

Figure 2.11 Shell remains found in area 1

2.5 Correlation of Geological and Archaeological Studies

This stage, correlation of data from fieldwork and laboratory studies, was carried out aiming to find the relationship among stratigraphy, sedimentology and archaeological data (artifacts and occupation layer from excavation) and describe the stratigraphic sequence, chronologic sequence, site function and paleolandscape. Geoarchaeological models will be presented to explain both geological and archaeological contexts.