



# Facies and Classification of Sedimentary Architectural Elements in Triassic Sandstone at Ban Muang, Chang Nuea Subdistrict, Mae Moh District and Ban Na Yab, Hua Suea Subdistrict, Mae Tha District, Lampang Province



Author : Thanwaret Kankit 640510424

Advisor : Dr. Kritsada Moonpa

Department of Geological Sciences, Faculty of Science, Chiang Mai University

## ABSTRACT

The Triassic sandstone of the Phra That and Pha Daeng Formations, Lampang Group, is well exposed in Ban Muang, Chang Nuea Subdistrict, Mae Mo District, and Ban Nayap, Hua Suea Subdistrict, Mae Tha District, Lampang Province. The outcrops exhibit distinct sedimentary structures, well-preserved sedimentological characteristics, and architectural elements. Sedimentological details, stratigraphic study, and laboratory studies are used to describe and characterize the sedimentological characteristics, lithofacies, and mineral compositions of sandstones to interpret the architectural elements and depositional environment. The petrographic analysis of 18 thin-section samples under a polarizing microscope to classify the sandstone samples by following the scheme of Pettijohn et al. (1973). Petrographically, the sandstone samples are classified as sublitharenite, lithic arenite, and lithic wacke, respectively. Additionally, conglomerate samples are classified as the polymictic paraconglomerate based on the criteria of Boggs (2009). The lithology and sedimentary structures, such as erosive surfaces, cross-bedding, flute cast, ripple marks, and normal grading, are used to analyze and characterize the facies and the classification of architectural elements. These results provide crucial evidence for interpreting the depositional environment of the studied sandstone. Nine lithofacies types (Gm, Gmm, Sc, Smc, Smm, Sfc, Sfl, Sfr, and Fl) were identified. Based on facies classification and groups of facies associations are arranged into three distinct architectural elements (channel-fill (CH) element, point bar (PB) element, and floodplain (overbank) (FB) element). From the study results, the sandstones in the study areas were formed under the sedimentary condition in a meandering river system, reflecting a paleoenvironment influenced by continuous water flow and historical changes in water levels and river position.

## OBJECTIVES

- To describe the sedimentological characteristics, facies, and mineral compositions of sandstones.
- To analyze facies and classify sedimentary architectural elements in sandstones.
- To interpret the depositional environment of sandstones.

## METHODOLOGY

- Field study
- Stratigraphic Column
- Preparation of rock samples to analyze in the laboratory
- Study of mineral compositions and texture
- Sandstone classification
- Facies classification and facies association
- Architectural elements interpretation

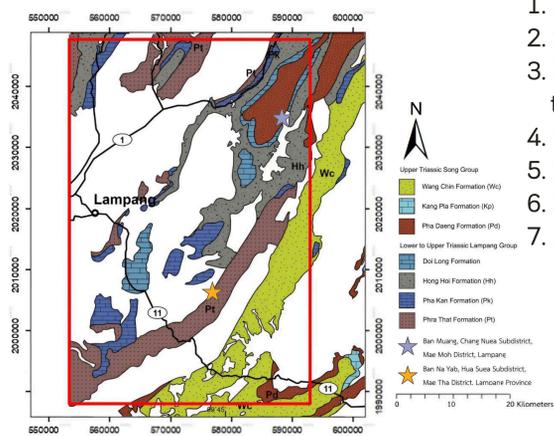


Fig.1 The geological map showing the study area (red boundary) and the distribution of the Phra That Formation (Pt) and Pha Daeng Formation (Pd) of the Lampang Group (Modified from Charoenprawat et al., 1994)

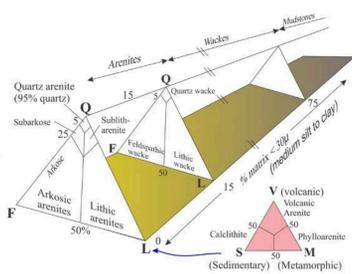


Fig.2 The ternary diagram showing the classification of sandstone (Pettijohn et al., 1973)

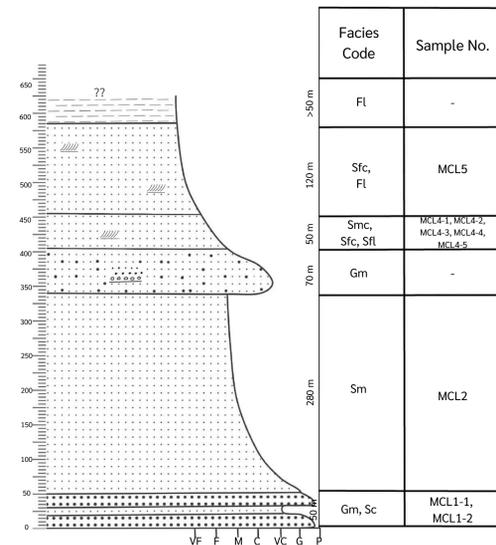


Fig.3 Stratigraphic column of Hui Mae Chang Lao at Ban Muang, Chang Nuea Subdistrict, Mae Moh District, Lampang Province

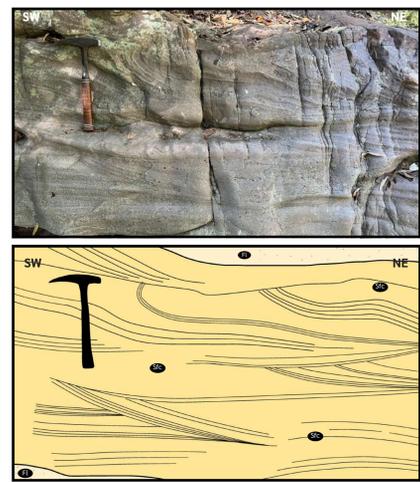


Figure 4. A field photograph showing a sandstone outcrop of the Pha Daeng Formation with cross-bedding, accompanied by a sketch illustrating the characteristics of a Point Bar (PB) consisting of Sfc and Fl facies. (looking northwest, hammer length: 35 cm)

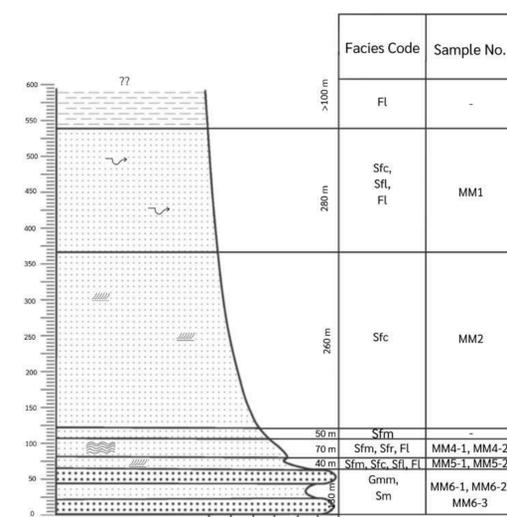


Fig.5 Stratigraphic Column of Hui Mae Mon at Ban Na Yab, Hua Suea Subdistrict, Mae Tha District, Lampang Province

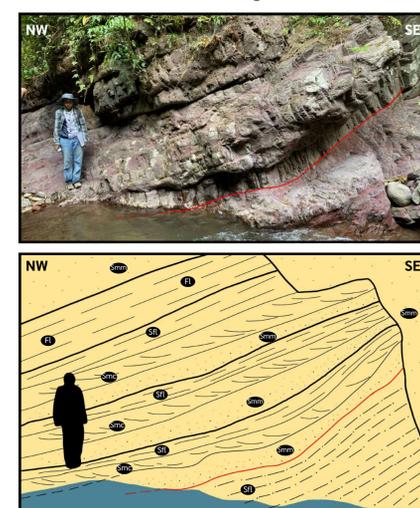


Figure 6. A photograph of a sandstone outcrop showing an erosive surface at the base of the layer (top). A sketch illustrates the characteristics of a Point Bar (PB), consisting of Sfl, Smm, Scm, and Fl facies. (looking northeast, observer height: 156 cm, pencil length: 14.5 cm)

## RESULTS

Table.1 Architectural Element and Facies Association

Architecture Element	Code	Description	Facies Association	Environmental Interpretation
Channel	CH	The sedimentary deposition process of a fining-upward sequence, where coarser gravel sediments accumulate at the base, while finer sand sediments are deposited in the upper part.	Gm Gmm Sc	Channel (CH): Represents a high-energy depositional environment. It is often characterized by cross-bedding structures, which provide evidence of paleocurrent directions.
Point bar	PB	Sediment deposition on the inner bend of a river occurs through lateral accretion, driven by cut bank erosion and point bar formation as the river shifts. This process results in a fining-upward sequence.	Smc Smm Sfc Sfl Sfr	Point Bar (PB): Reflects changes in river channel position. It is typically characterized by cross-bedding structures formed by flowing water, along with ripple marks. These features are commonly found in fine-grained sediments.
Overbank	OB	Overbank deposition takes place during floods when fine sediments are transported beyond the river channel and spread across the floodplain, forming thin layers of clay, silt, and very fine sand.	Fl	Overbank (OB): Indicates sediment accumulation in a low-energy environment. The sediment layers are generally thin, laterally continuous, and form sheet-like deposits.

## Reference

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- Charoenprawat, A., Chuaviro, S., Hinthong, C., and Chonglakmani, C., (1994). *Geologic Map of Sheet Changwat Lampang*, Scale 1:250,000, Geological Survey Division, Department of Mineral Resources, Bangkok, Thailand.
- Pettijohn, F. J., Potter, P. E., & Siever, R. (2012). *Sand and sandstone*. Springer Science & Business Media.

## CONCLUSIONS

From the study results, the sandstones in the study areas were formed under the sedimentary condition in a meandering river system, reflecting a paleoenvironment influenced by continuous water flow and historical changes in water levels and river position.

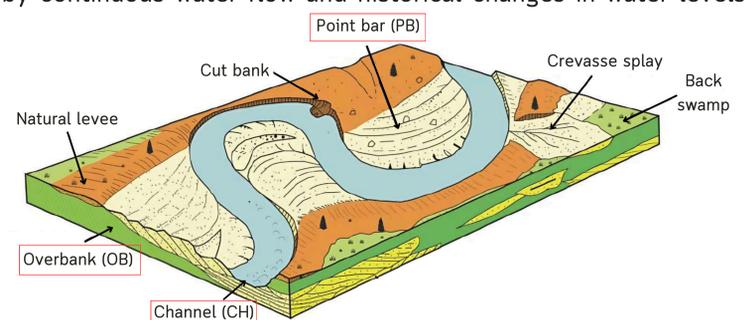


Fig.7 Three architectural elements are interpreted from this study, representing the meandering river environment for both of sandstones of the Phra That and Pha Daeng Formations, Lampang Group (modified from Einsele, 2000)