

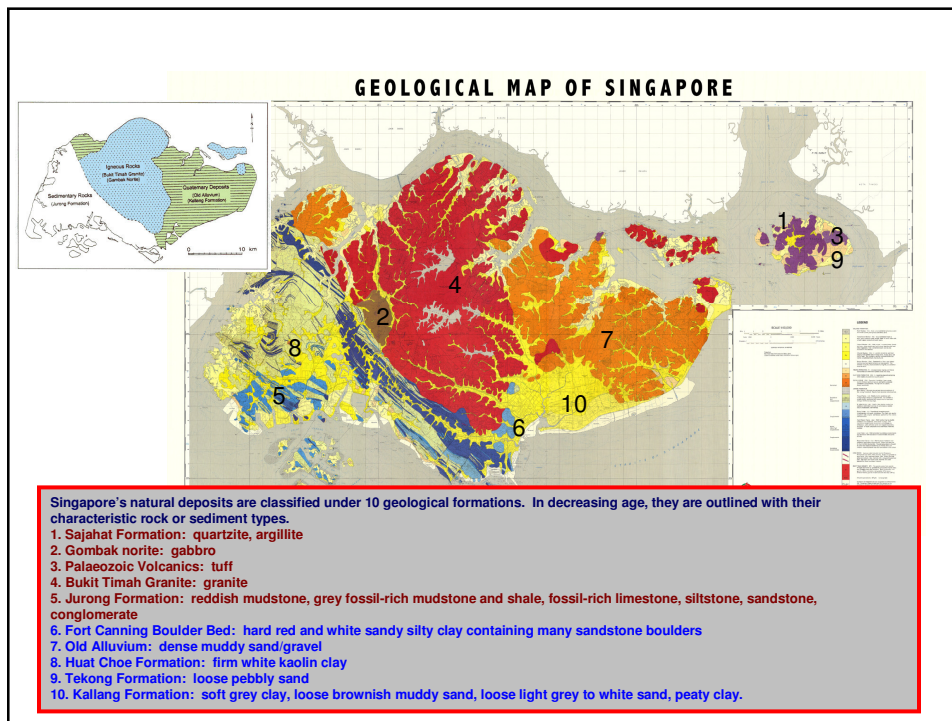
# GEOLOGY OF SINGAPORE

Mr Lee Kim Woon

Tritech Consultants Pte Ltd

SRMEG-GEOSS Workshop on Geology of Singapore

05 April 2010



GEOLOGY is an observation  
science and not an experimental  
science

... like CRIME DETECTION.

A geologist gathers facts from observations

... and then makes inferences on  
what had happened in the past.

INFERENCES have two interesting properties ...

1. an unobserved fact can invalidate them
2. they are never certain

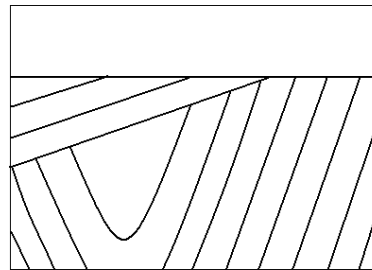
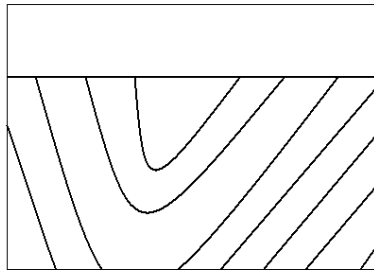
"Site investigation did not detect any faults but there is a high chance of faulted material in the project area."

INFERENCES are never certain  
... but they are more valuable than facts

OBSERVATIONS  
are  
fundamental to Geology

HELP  
THE NATIONAL GEOLOGICAL OFFICE

PROMPTLY INFORM  
SIMPLE AND COMPLEX OUTCROPS TO NGO



WHEN INFORMATION ends ...

... IMAGINATION begins.

**TOWARDS THE 1976 PWD REPORT ON THE  
GEOLOGY OF SINGAPORE**

Dr Tan Swan Beng

Dr Peter Morris  
Dr Hans Bader  
Mr Graham Mansergh

Mr Lee Kim Woon  
Mr Pun Yun Tat  
Mr Loy Wei Choo

Marine Police  
Mapping Unit in the Ministry of Defence  
JTC  
PUB  
HDB  
PSA  
Department of Geology, University of Malaya

## ACCOUNTS ON SINGAPORE'S GEOLOGY

Jack, W. 1822  
Crawford, J 1824  
Low, J 1847  
Logan 1851

Scrivenor, J.B. 1924  
Alexander, F.E.S. 1950  
Mainguy 1968  
PWD 1976

DSTA 2009  
BCA 2015?

DSTA'S 2009 GEOLOGY OF SINGAPORE (2ND EDITION)  
is the UPDATE to  
PWD'S 1976 GEOLOGY OF SINGAPORE

describes the Pandan facies in the Jurong Formation

relates the manner of deposition of the Jurong Formation

relates the manner of uplift of the Jurong Formation

describes the Fort Canning Boulder Bed

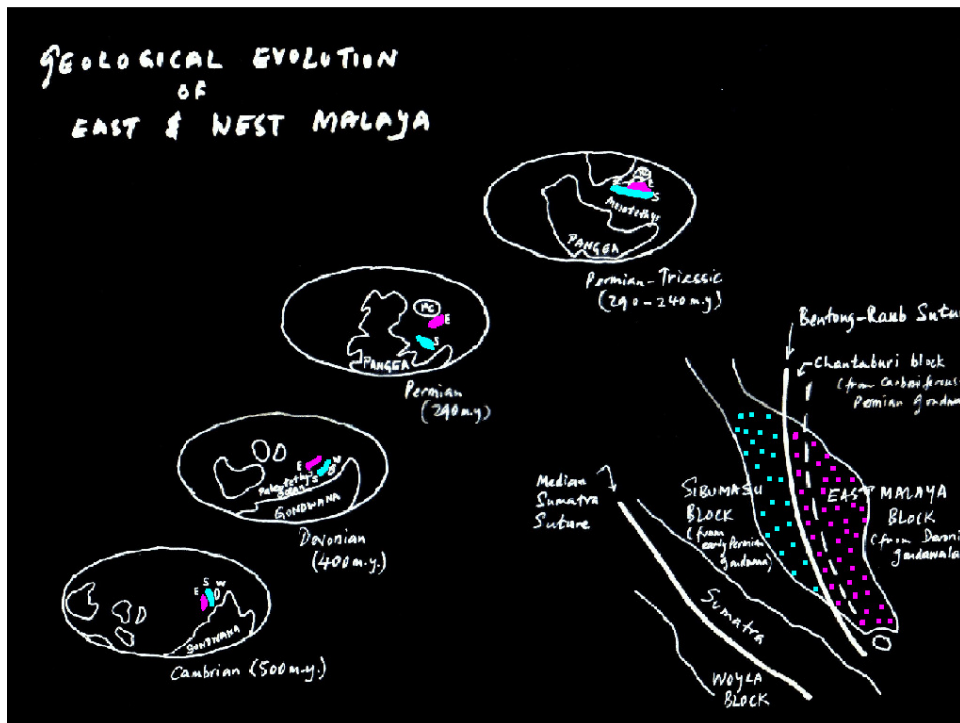
references literature on Singapore's geology since 1976

presents the engineering properties of Singapore's major rock types

MALAYA is West Malaysia.  
East / West MALAYA is the eastern / western half of West Malaysia.

SINGAPORE ISLAND is the biggest island in Singapore.

MALAY PENINSULA is Malaya and Singapore.

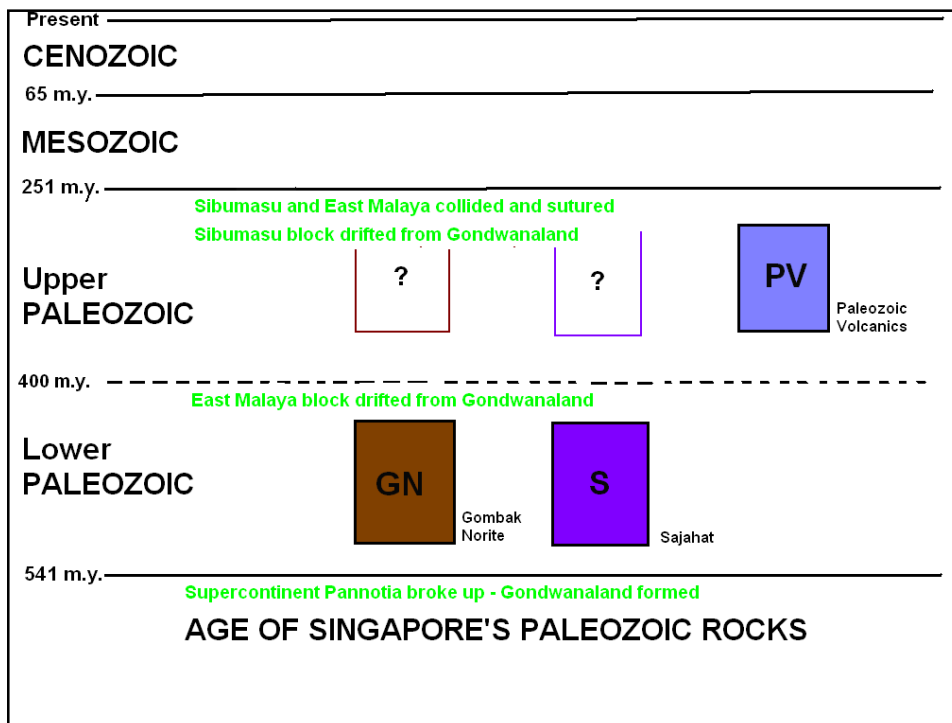


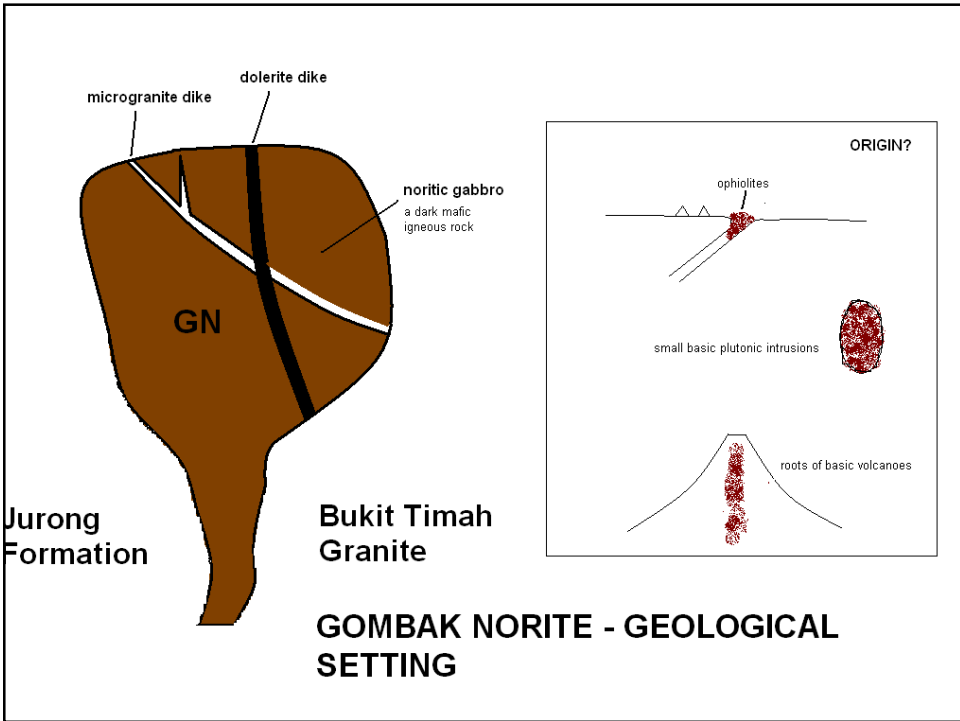
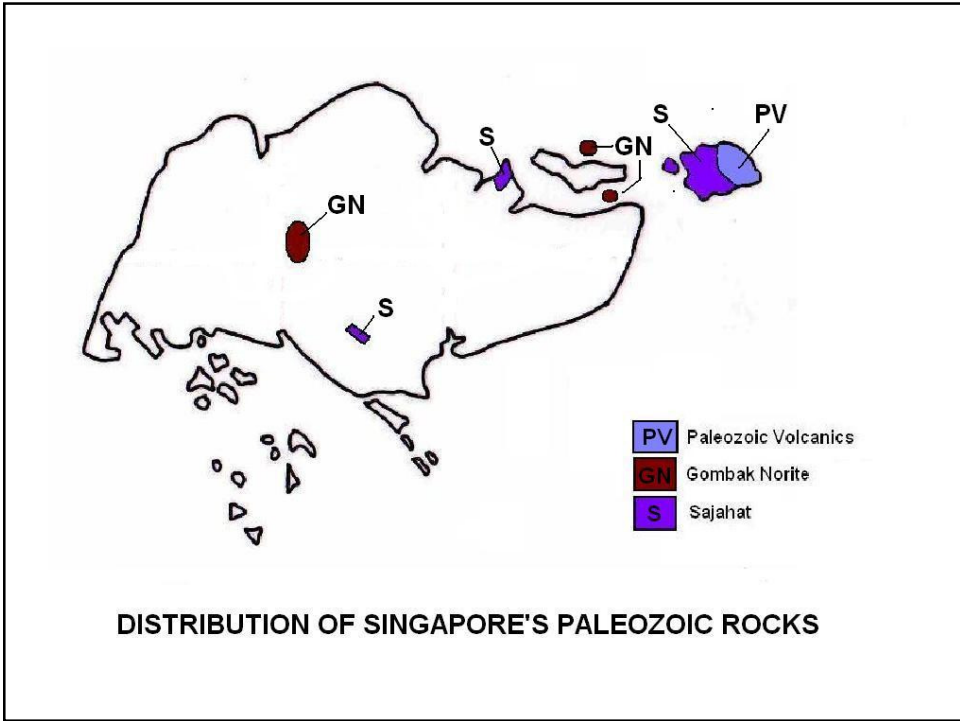
# PALEOZOIC

542 - 251 m.y.

## THE AGE OF LIFE

THE FIRST VERTEBRATES  
THE FIRST LAND PLANTS  
THE FIRST FISHES  
THE FIRST INSECTS  
THE FIRST PLANTS  
THE FIRST REPTILES  
THE FIRST INSECTS





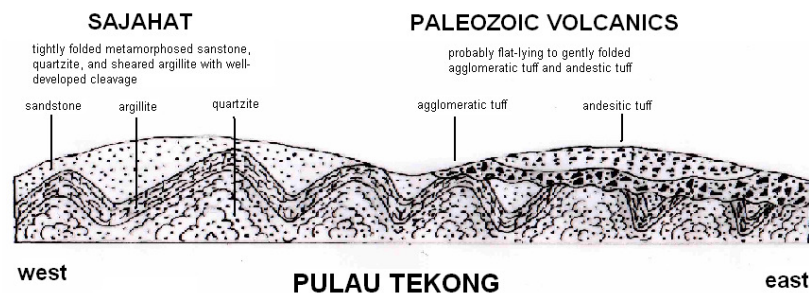
## GOMBAK NORITE

### IDEAS FOR FUTURE INVESTIGATION

obtain a potassium : argon date

defines its shape and dimensions

investigate its occurrences at Pulau Ubin



### SAJAHAT AND PALEOZOIC VOLCANICS - GEOLOGICAL SETTING



**OCCURRENCES OF SAJAHAT AND PALEOZOIC VOLCANICS  
ON SINGAPORE ISLAND**

**SAJAHAT and PALEOZOIC VOLCANICS**

**IDEAS FOR FUTURE INVESTIGATIONS**

**date the Sajahat Formation**

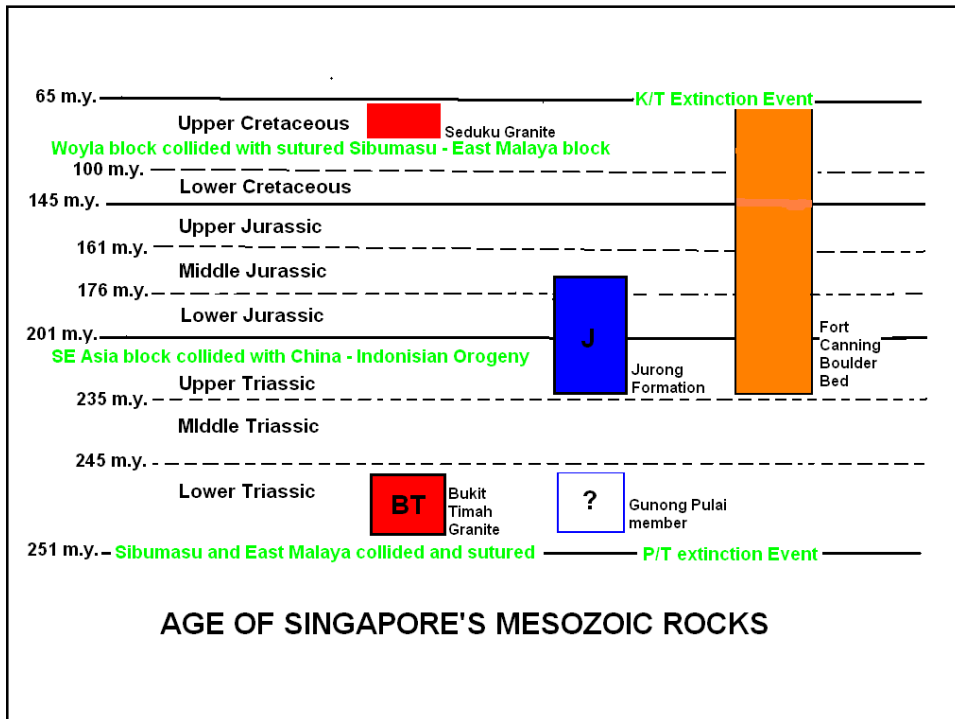
**define their contact relationship in east Pulau Tekong**

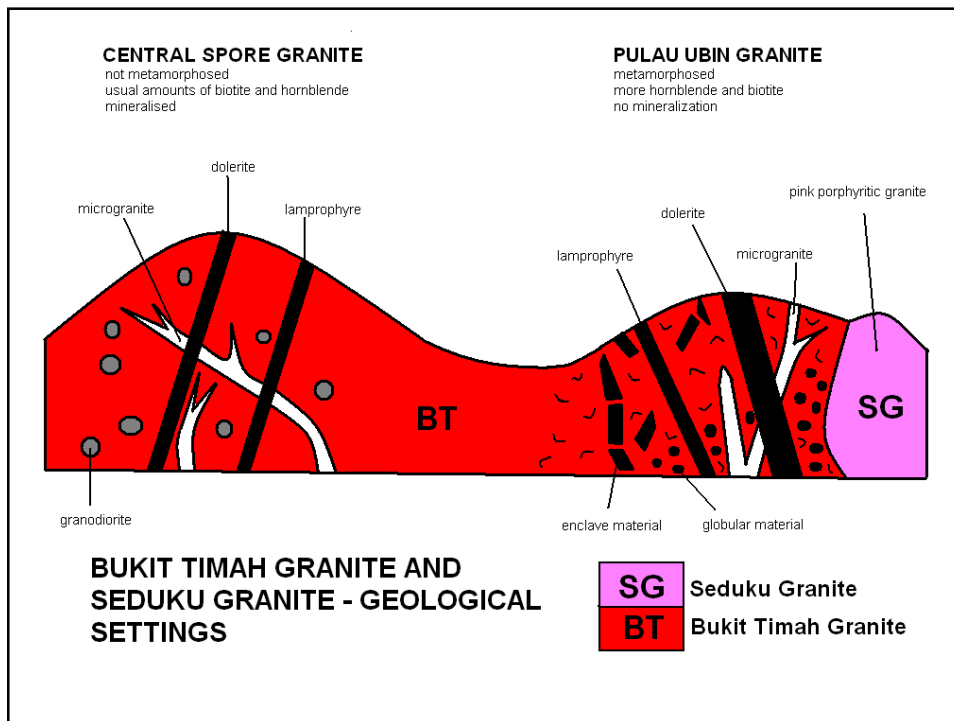
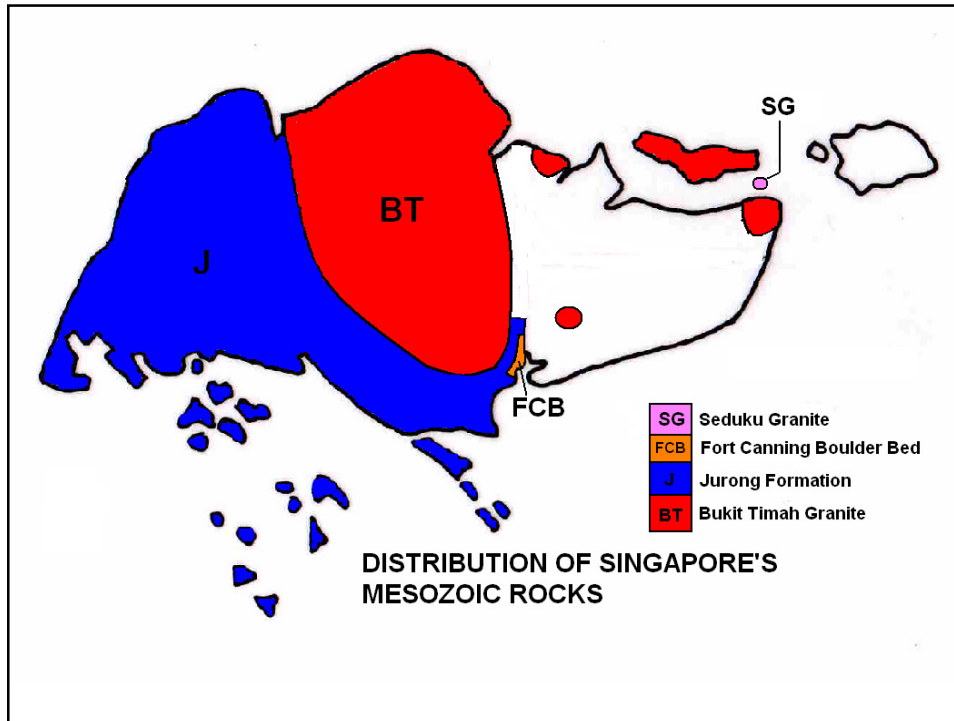
**investigate their occurrences under the Old Alluvium and the Jurong Formation and on the Bukit Timah Granite as roof pendants**

# MESOZOIC

251 - 65 m.y.

THE AGE OF REPTILES  
FLOWERING PLANTS ARRIVED



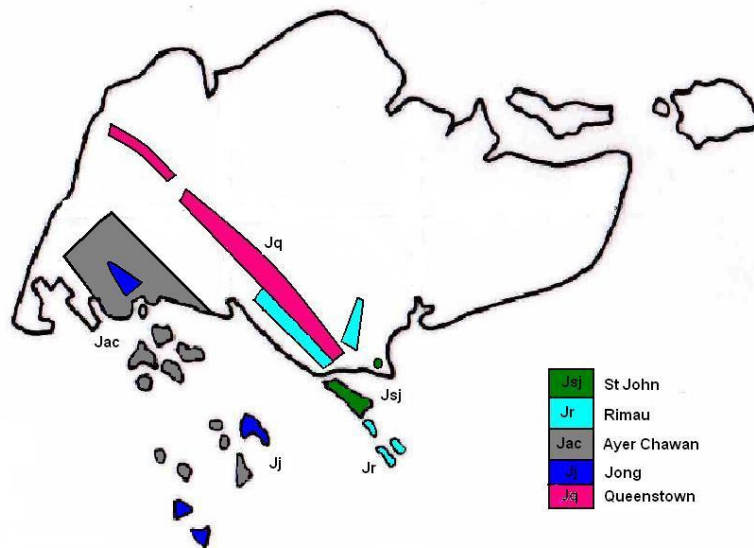


## BUKIT TIMAH GRANITE AND SEDUKU GRANITE

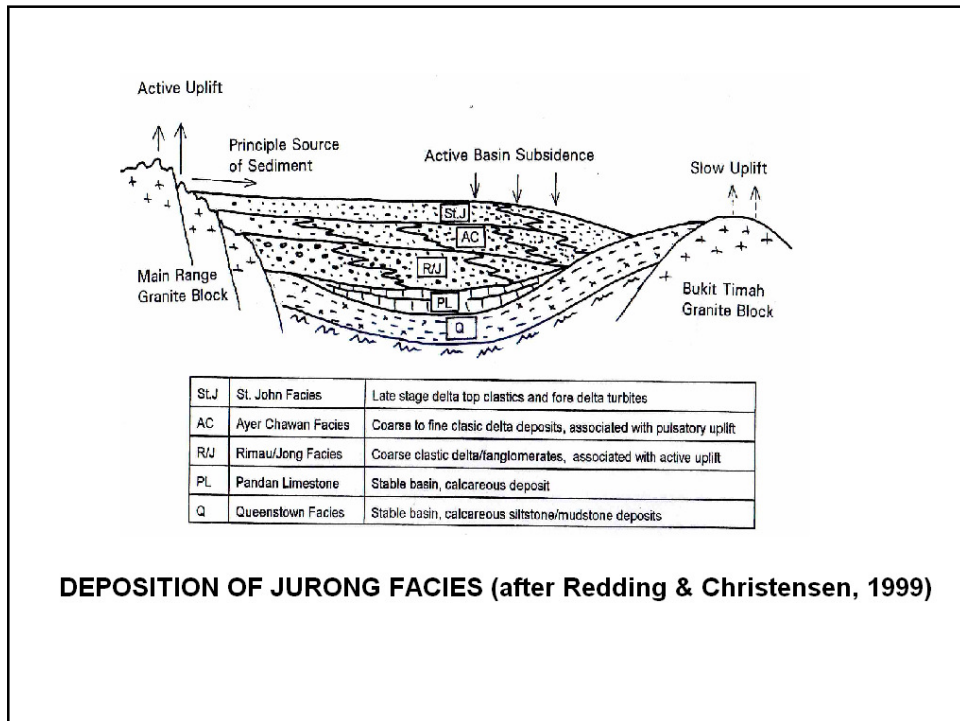
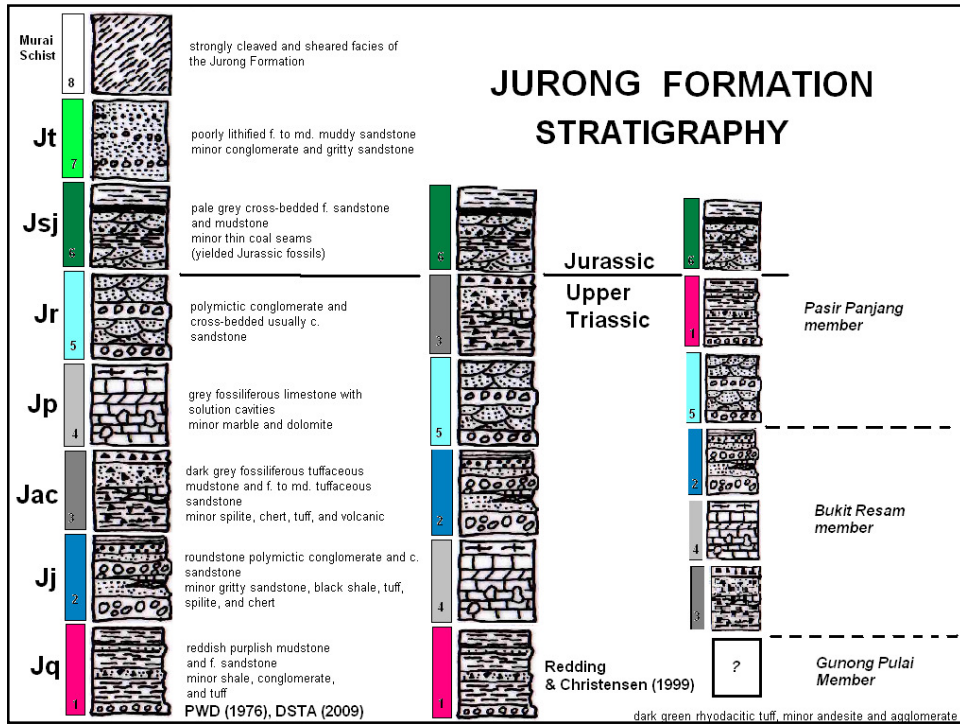
### IDEAS FOR FUTURE INVESTIGATIONS

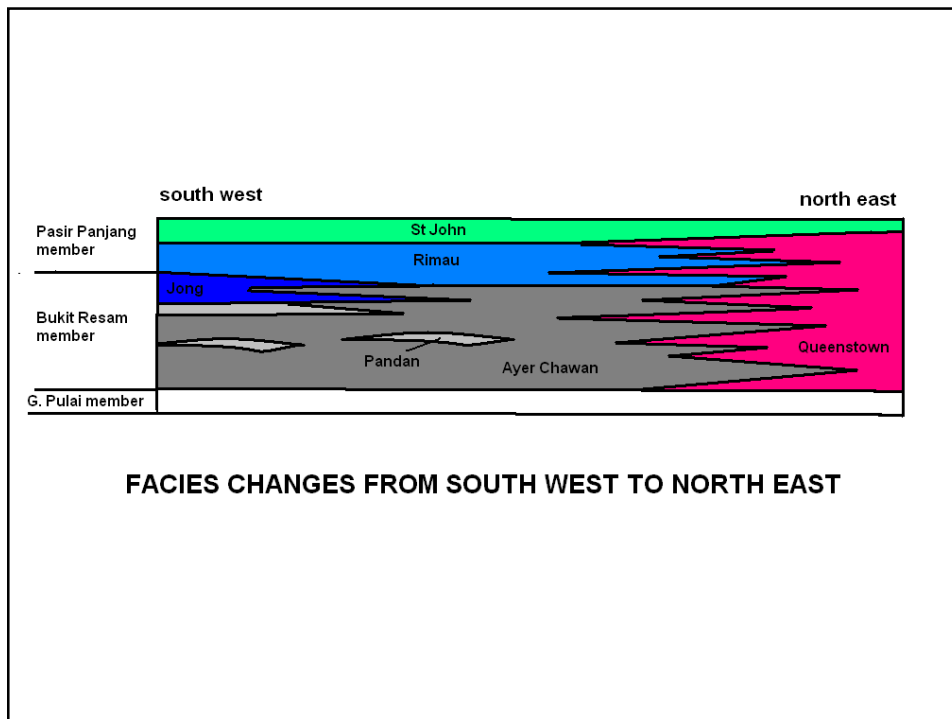
date Pulau Ubin Granite

investigate the enclaved dikes and globular inclusions in the Pulau Ubin Granite



DISTRIBUTION OF THE JURONG FORMATION FACIES





## JURONG FORMATION

### IDEAS FOR FUTURE INVESTIGATIONS

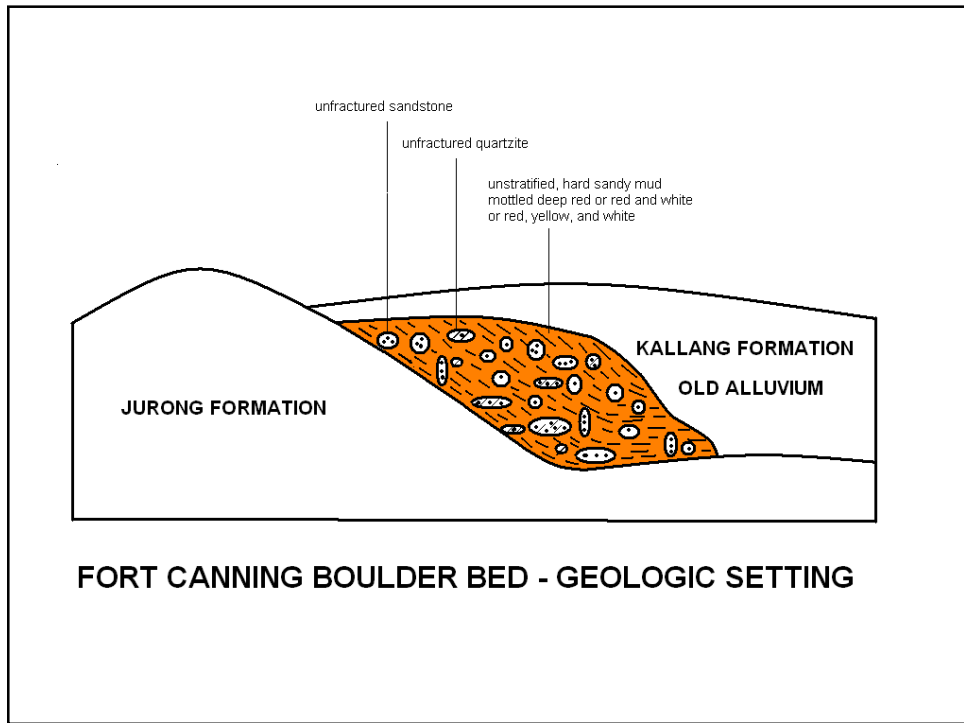
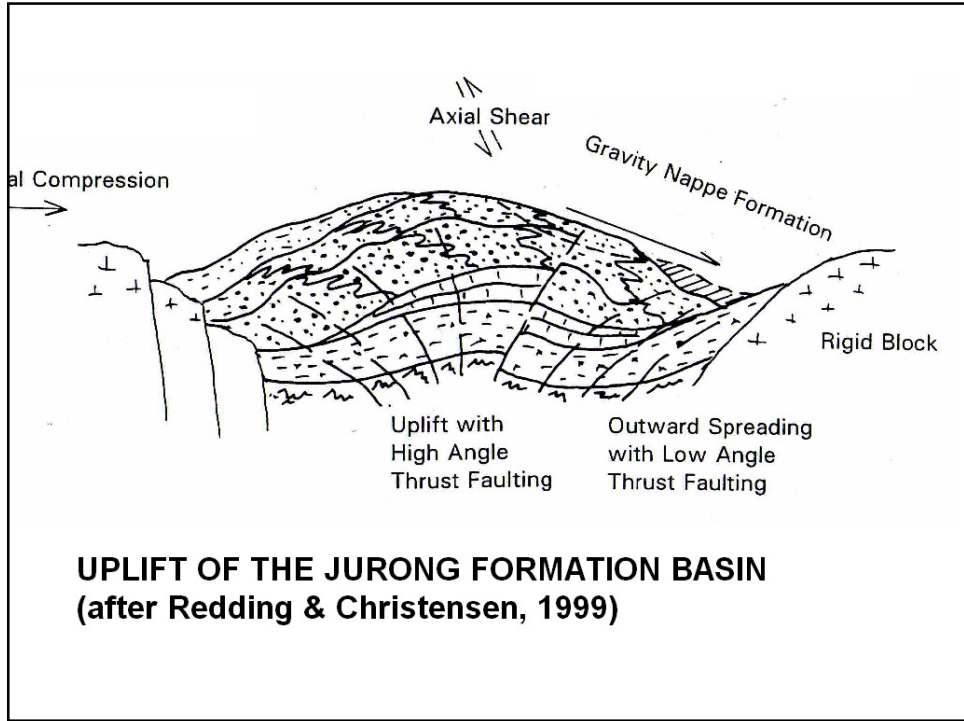
conduct a literature and material search for the Jurassic fossils from Mt. Guthrie

investigate the status of Tengah as a facies

investigate the occurrences of the Gunong Pulau member, the Paleozoic Volcanics, and the Sajahat underlying the Jurong Formation

investigate the contents of Mt Faber and Kent Ridge

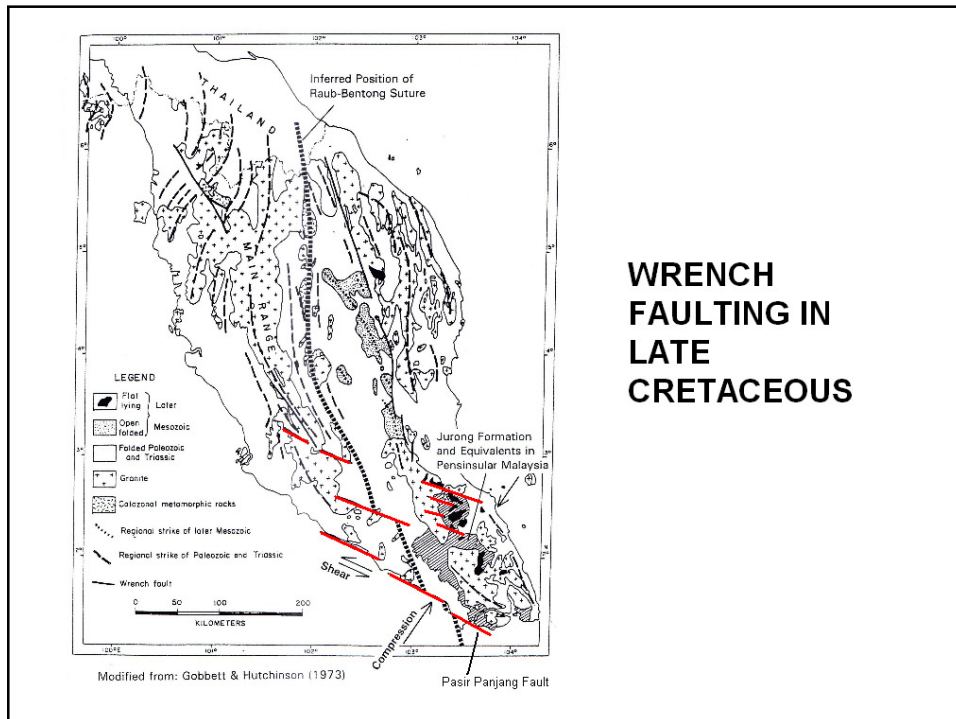
evaluate the stratigraphy after Redding & Christensen (1999)



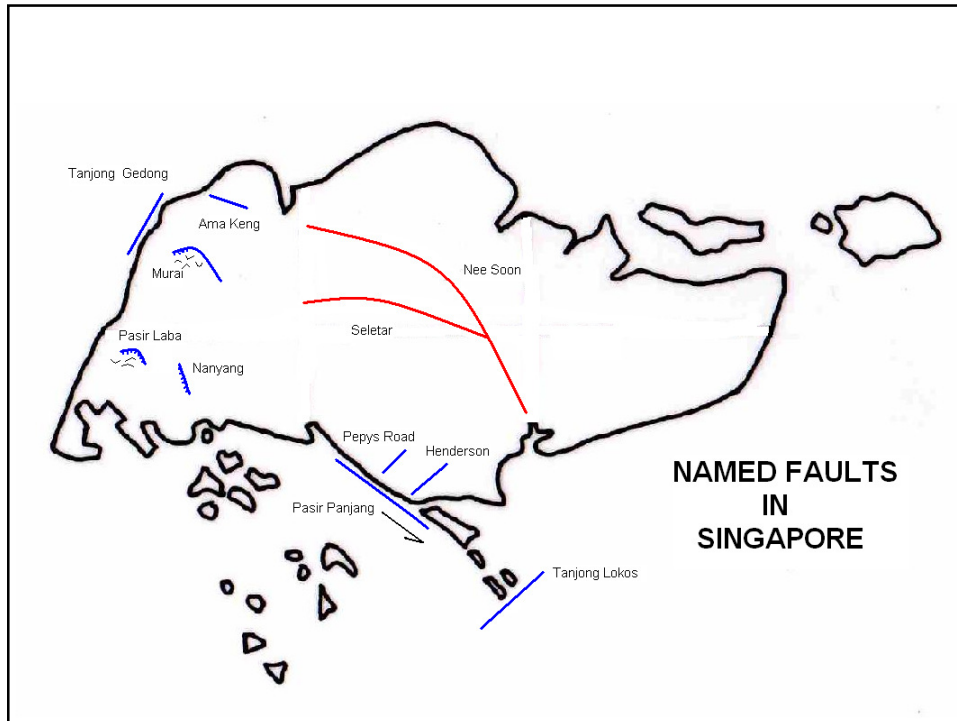
# FORT CANNING BOULDER BED

## IDEAS FOR FUTURE INVESTIGATION

confirm the absence of outcrops



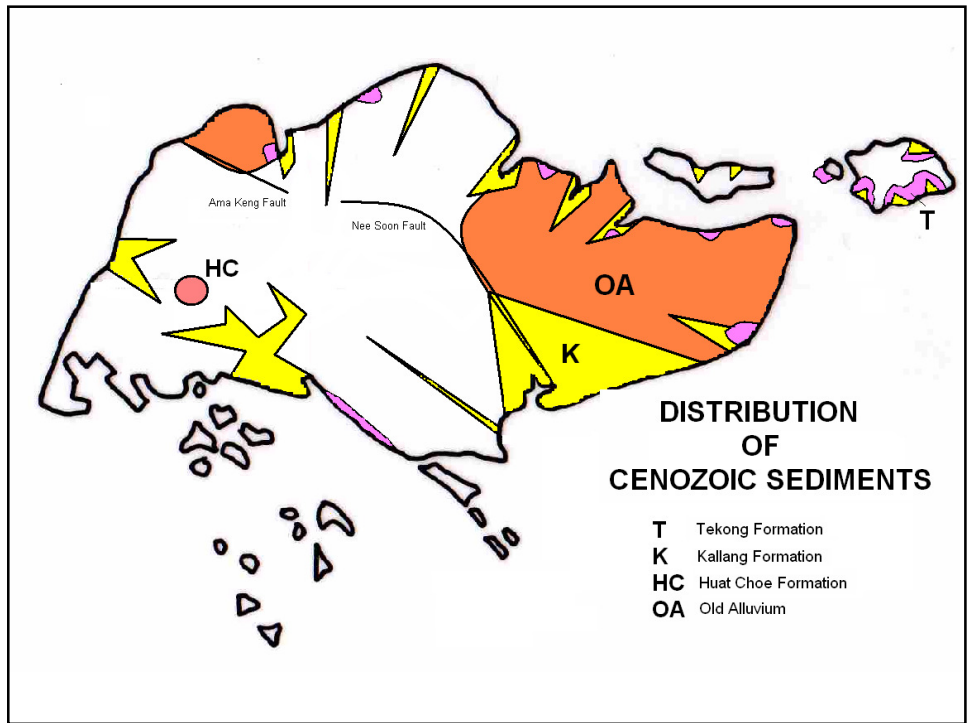
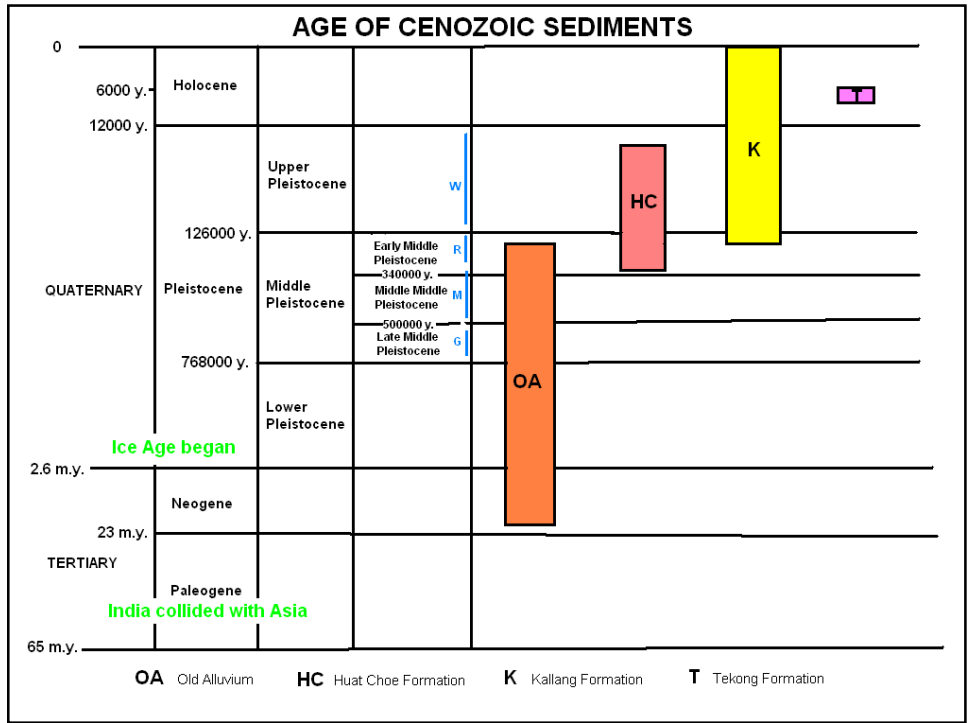
**WRENCH  
FAULTING IN  
LATE  
CRETACEOUS**

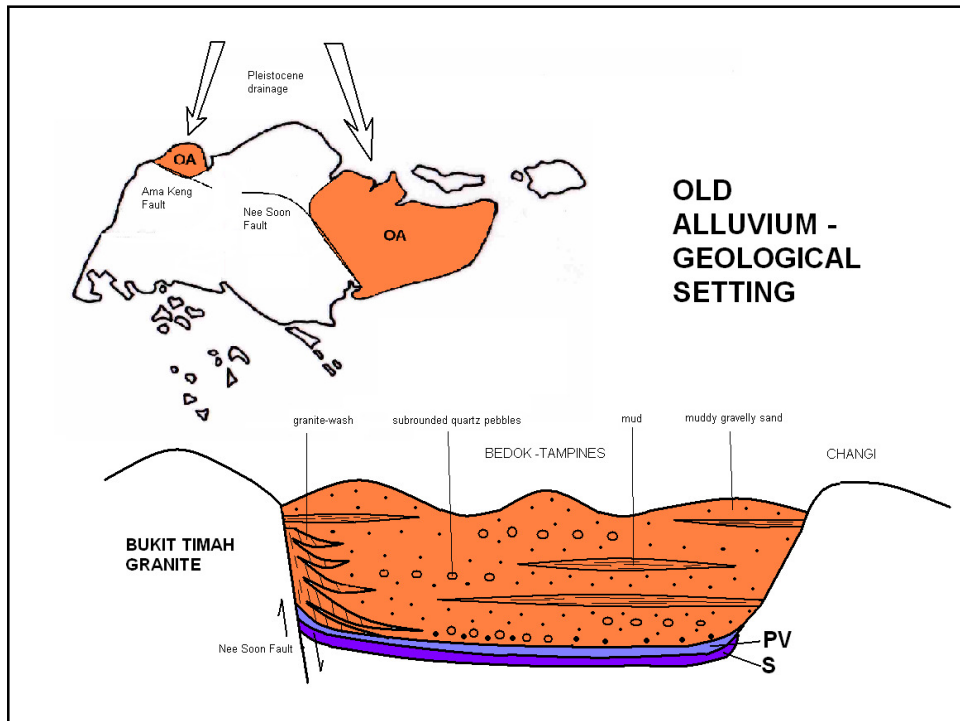
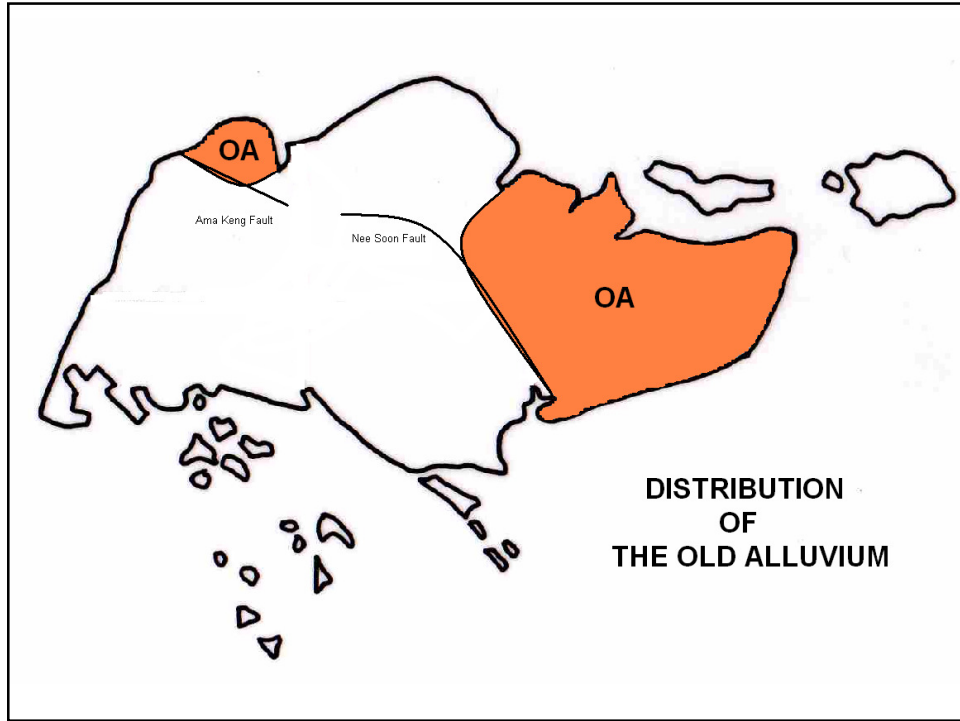


## CENOZOIC

65 m.y. - Present

THE AGE OF INSECTS  
 THE AGE OF FISHES  
 THE AGE OF BIRDS  
 THE AGE OF MAMMALS  
 THE EVOLUTION OF MAN IN THE QUATERNARY





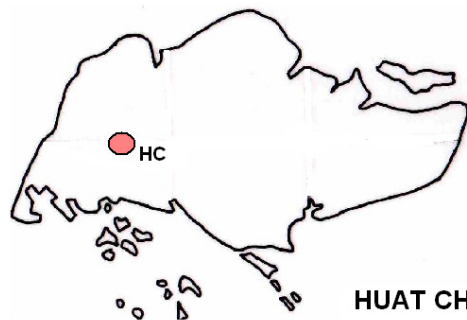
## OLD ALLUVIUM

### IDEAS FOR FUTURE INVESTIGATIONS

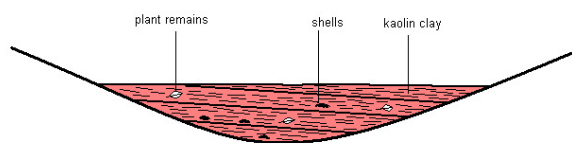
investigate the formation that lies in the northwest Singapore

investigate the formation for peat and marine sediments

assess its age with carbon dating on peat and fossil identification from fossils in marine sediments.



**HUAT CHOE FORMATION  
- GEOLOGICAL SETTING**

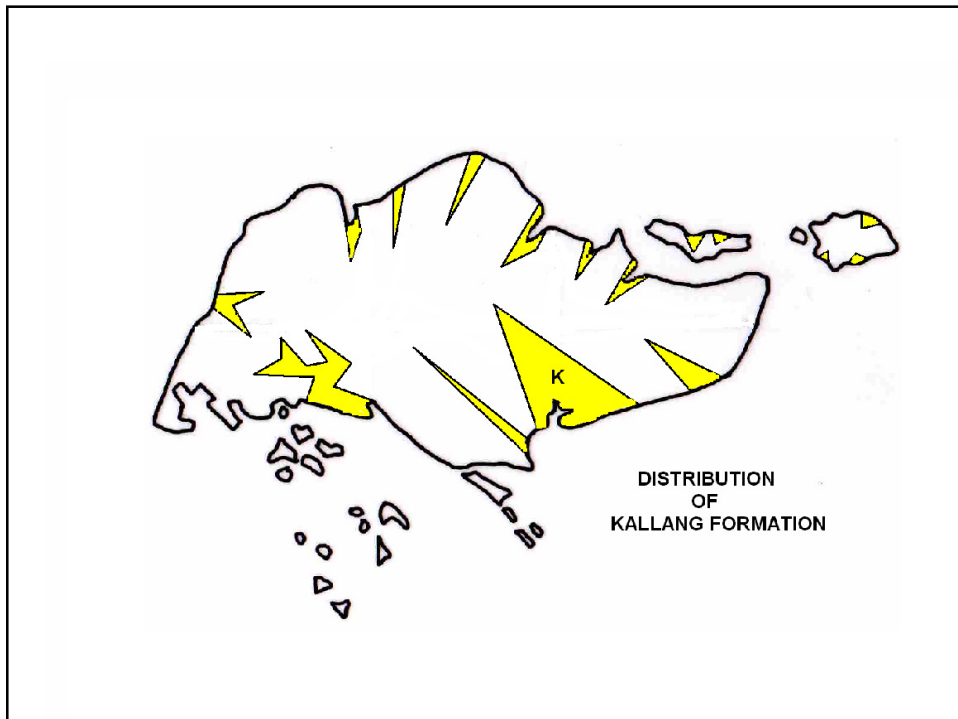


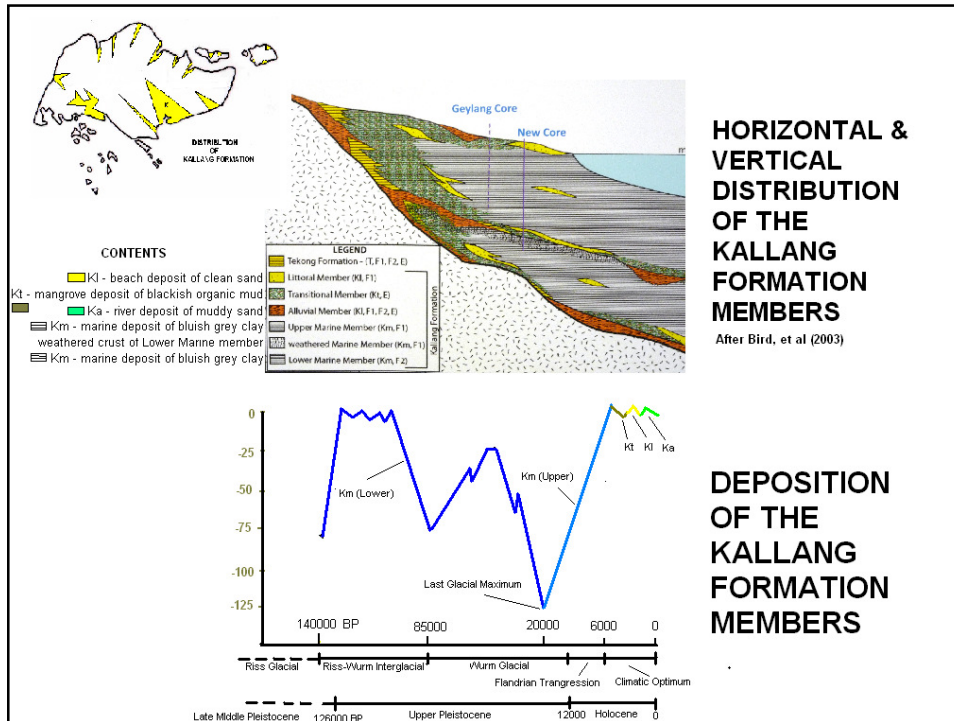
**JURONG FORMATION**

# HUAT CHOE FORMATION

IDEAS FOR FUTURE INVESTIGATION

date the formation



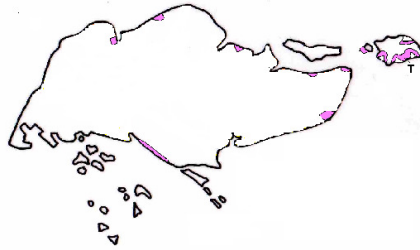


## KALLANG FORMATION

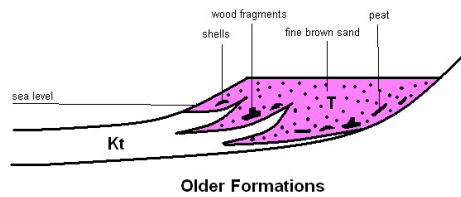
### IDEAS FOR FUTURE INVESTIGATION

investigate its extent offshore to establish Quarternary sea level changes

\* EOS with BCA and LTA will analyse piston samples obtained from bore hole sunk into the Lower Kallang Marine Member to investigate climatic changes since the late Middle Pleistocene.



## Tekong Formation - Geological Setting



## TEKONG FORMATION

### IDEAS FOR FUTURE INVESTIGATIONS

Is the Tekong a piece of the Kallang Formation?

**MAN-MADE FILL?**

**END**