

# **Geology and Tectonics of the World Trade Center**

## **HCLAS 4th Annual Division of Natural Sciences**

### **Research Day**

**Charles Merguerian**  
**Geology Department**  
**Hofstra University**

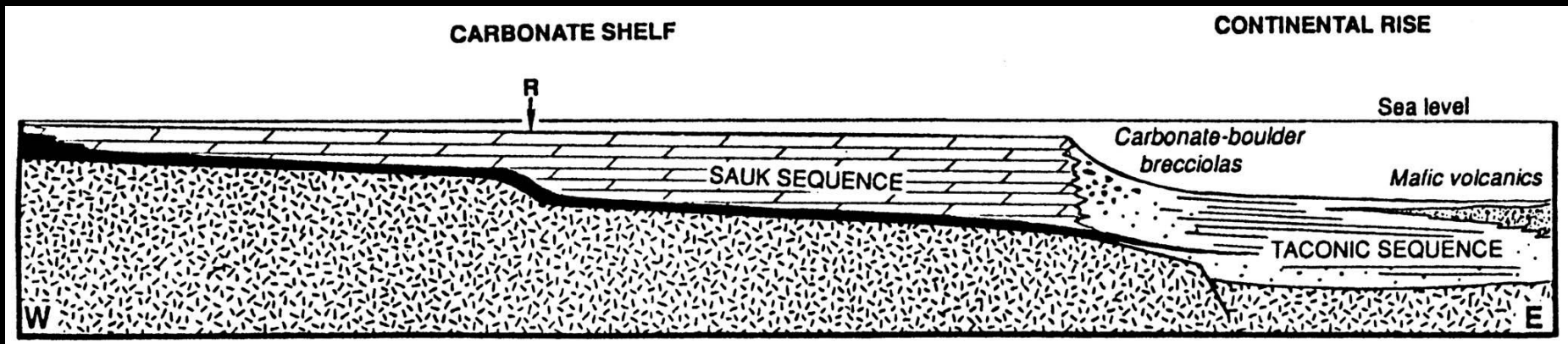
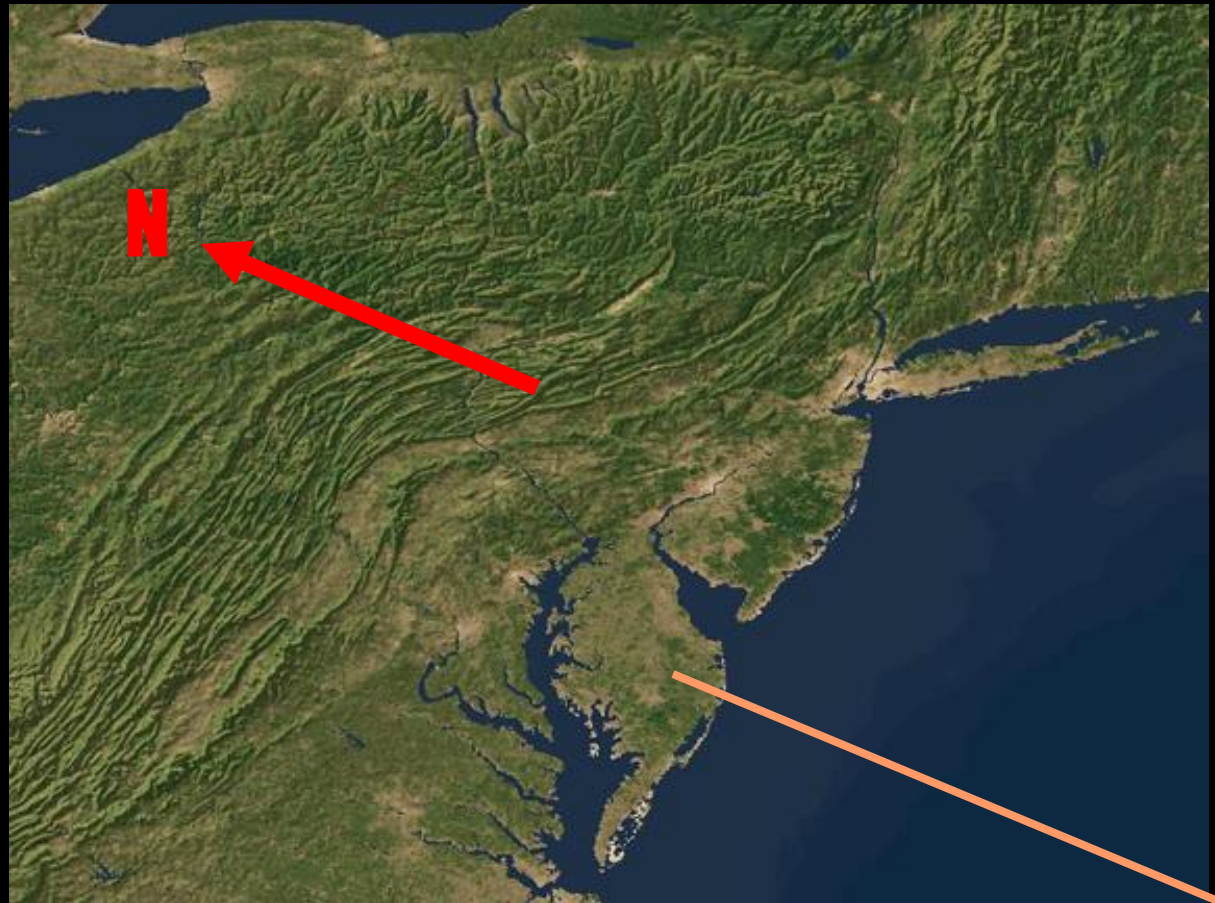


**Sequences:**

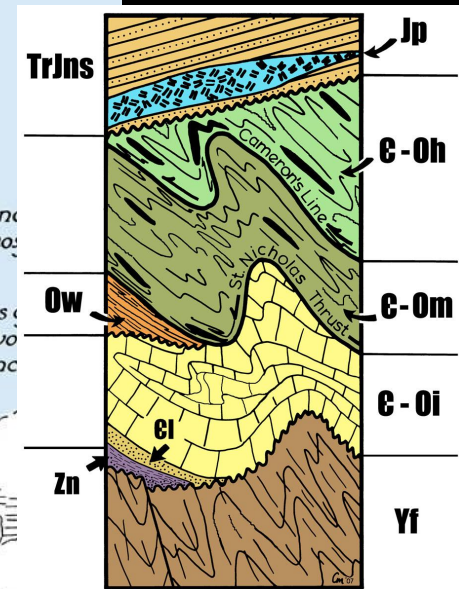
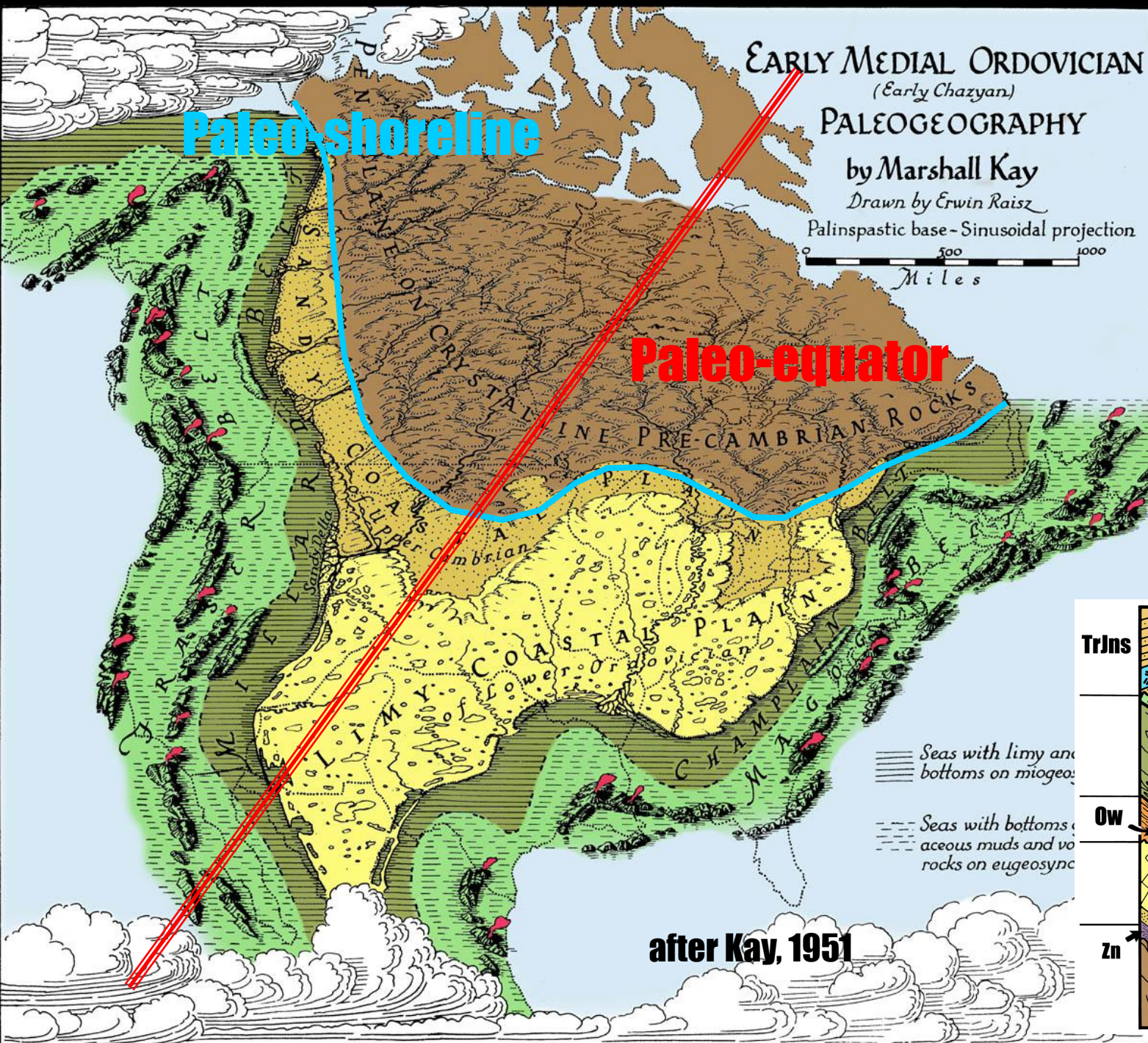
**Tippecanoe**

**Sauk**

**Taconic**

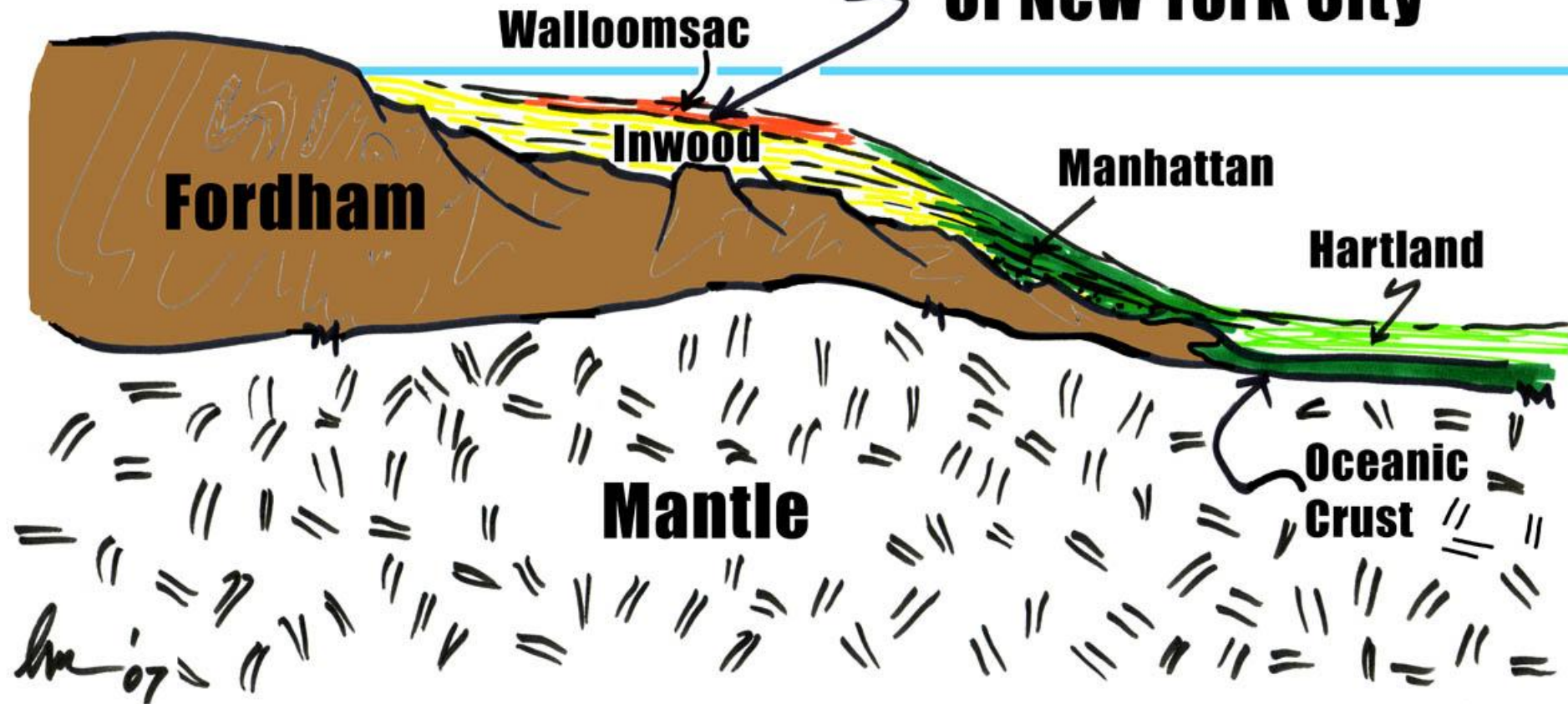




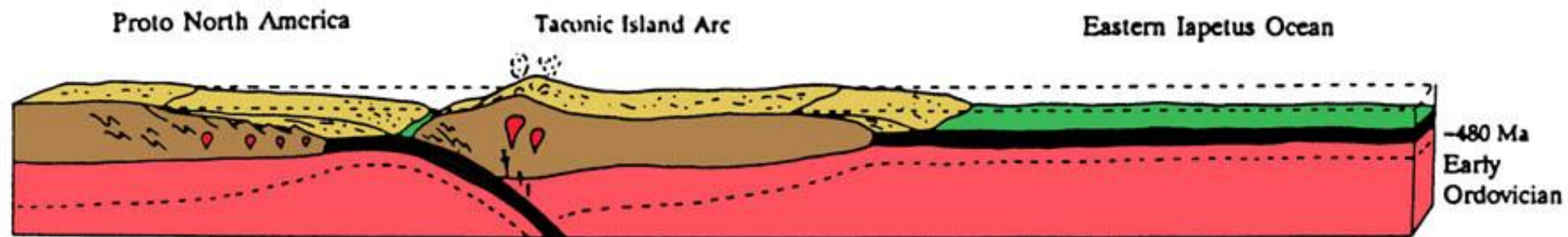




# Future Site of New York City

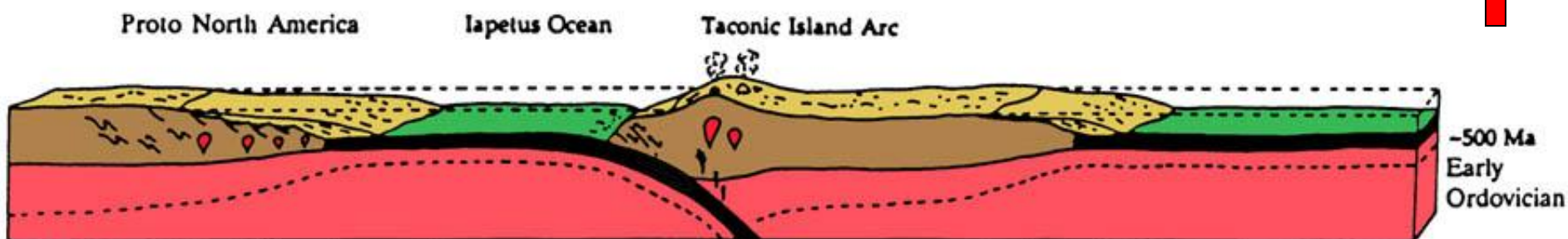






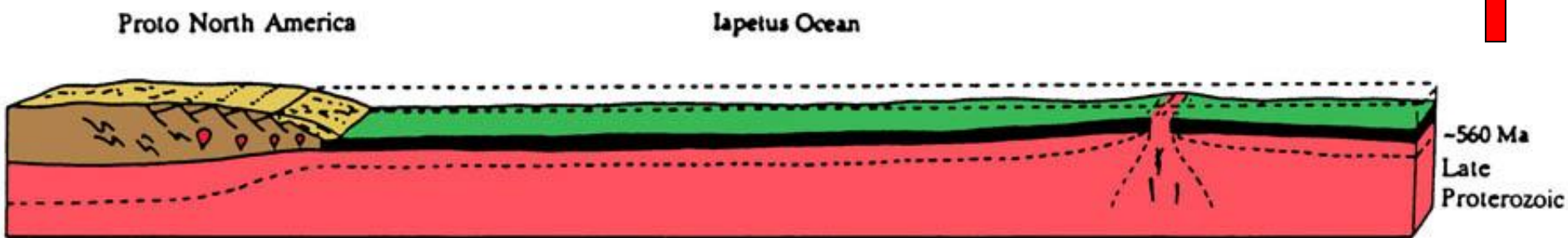
Continued Subduction and Final Stages of Closing of Western Iapetus Ocean

~480 Ma  
Early  
Ordovician



Continued Subduction

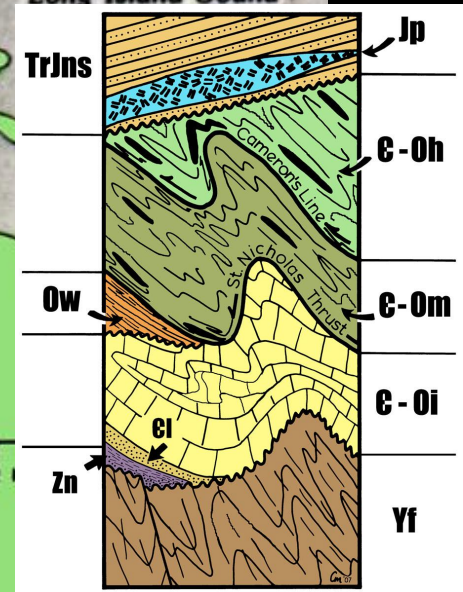
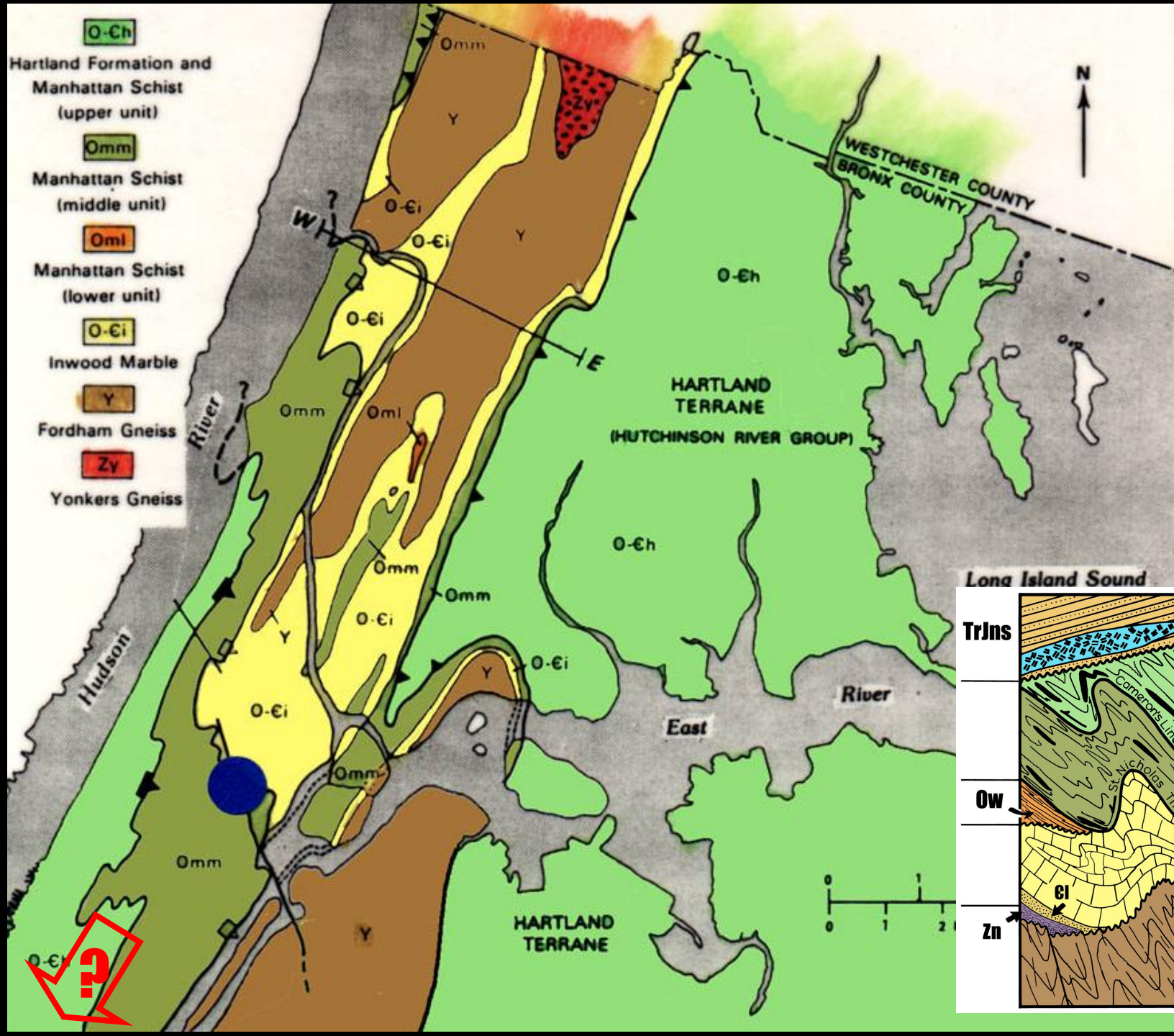
~500 Ma  
Early  
Ordovician



Development of Passive Margin on Proto North America

~560 Ma  
Late  
Proterozoic



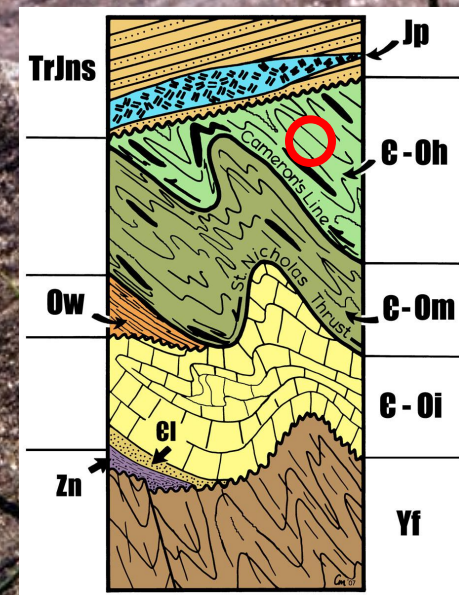




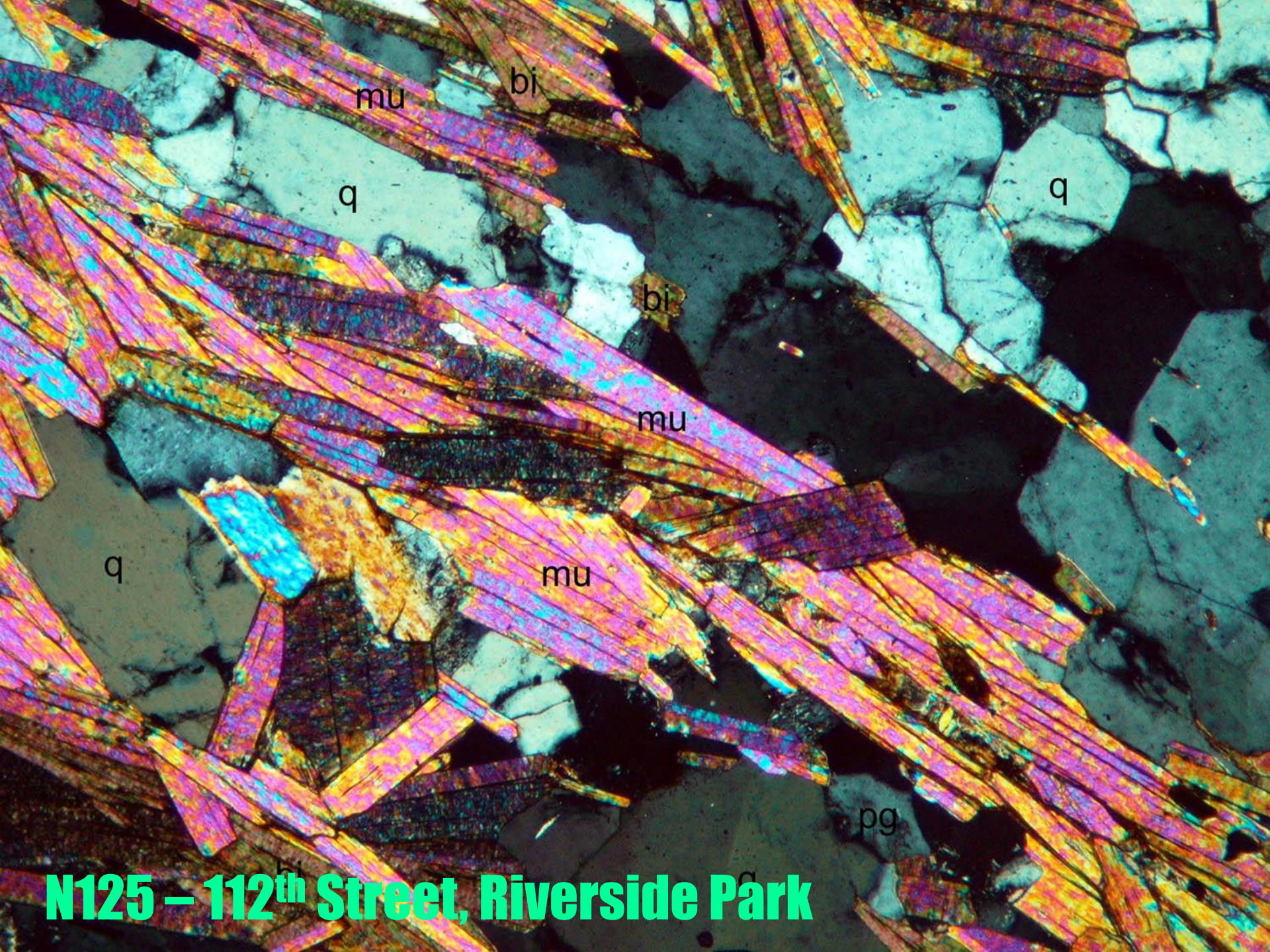
**Taconic**



**Hartland Schist, Riverside Park**







**N125 – 112<sup>th</sup> Street, Riverside Park**



**Taconnic**

**Hartland Amphibolite N567**

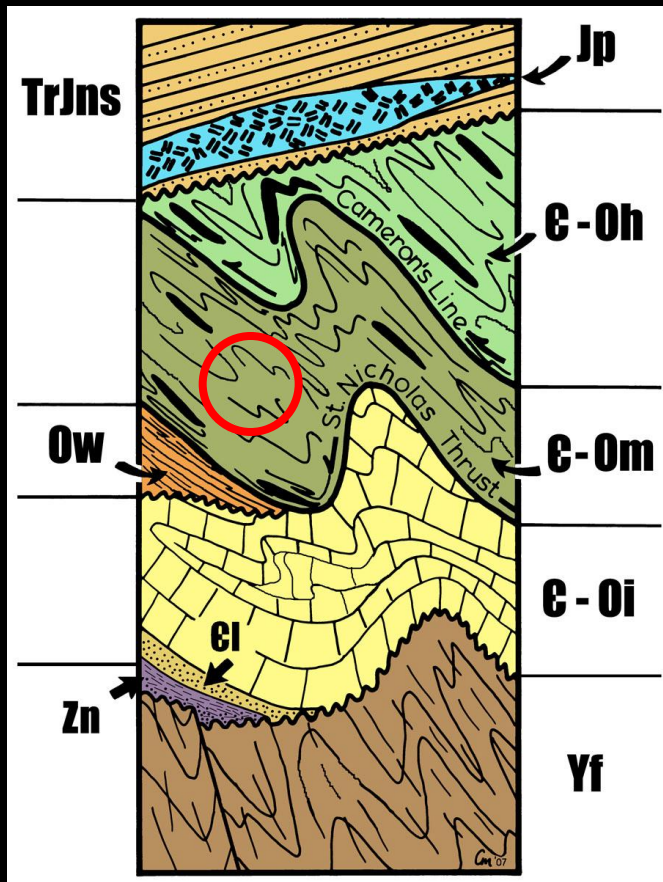




# Manhattan Schist

## F<sub>3</sub> Folds of S<sub>2</sub>

### Central Park, NYC

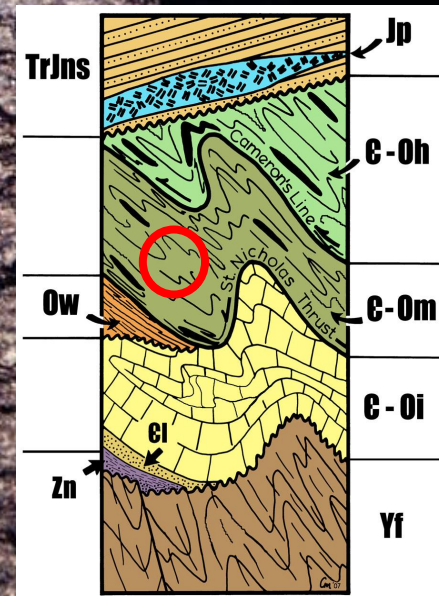


Taconic

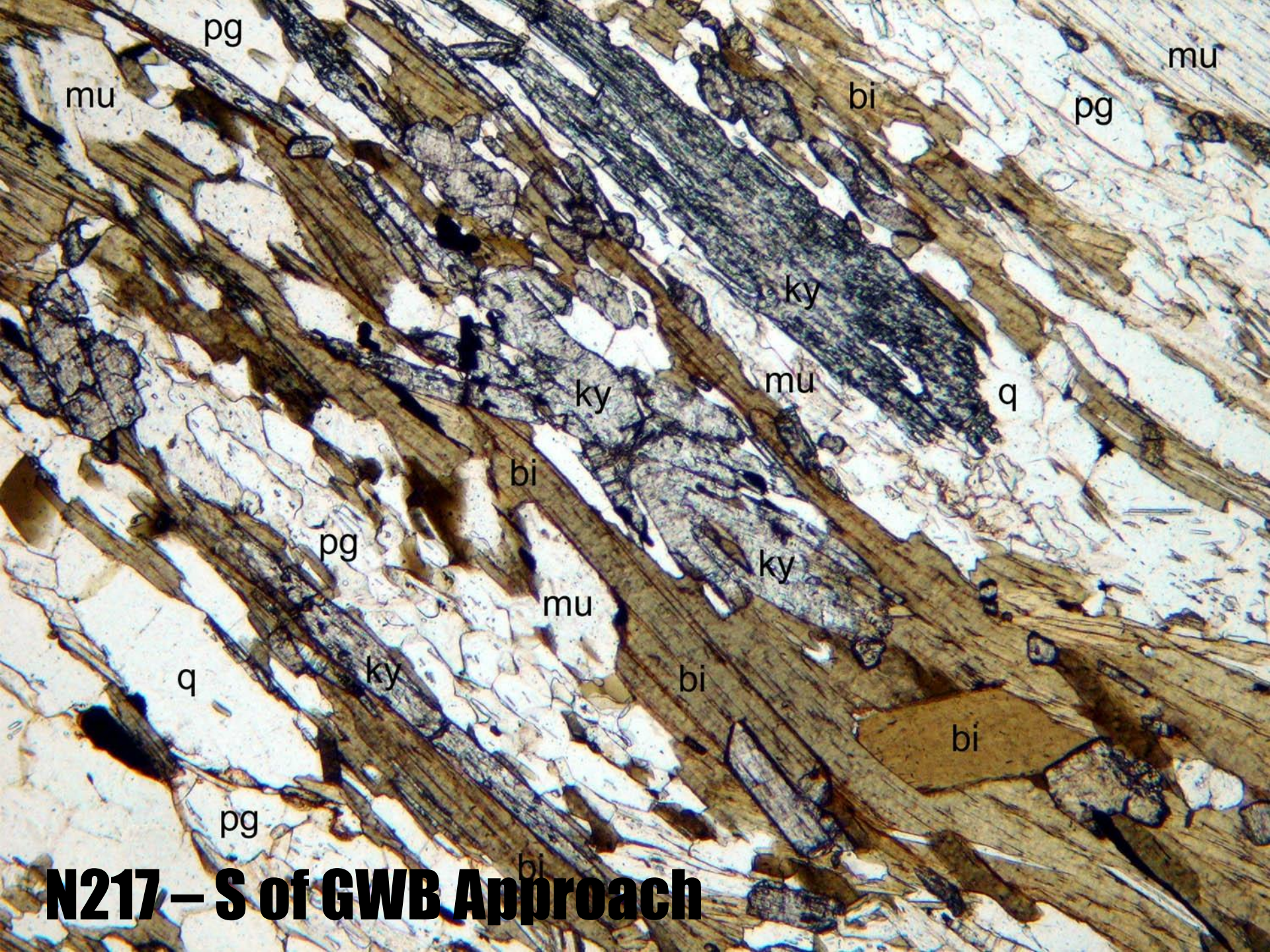


**Taconic**

**N283 - Mt Morris Park Kyanite Nodule**



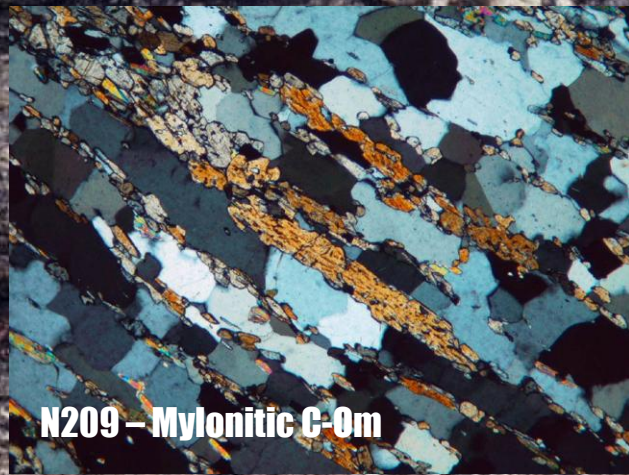




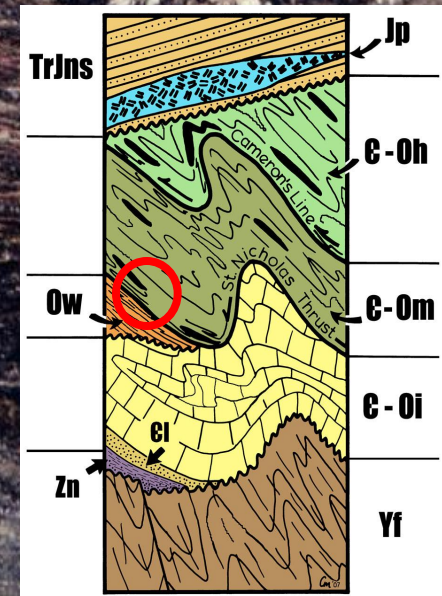
**N217 – S of GWB Approach**



**Taconic**

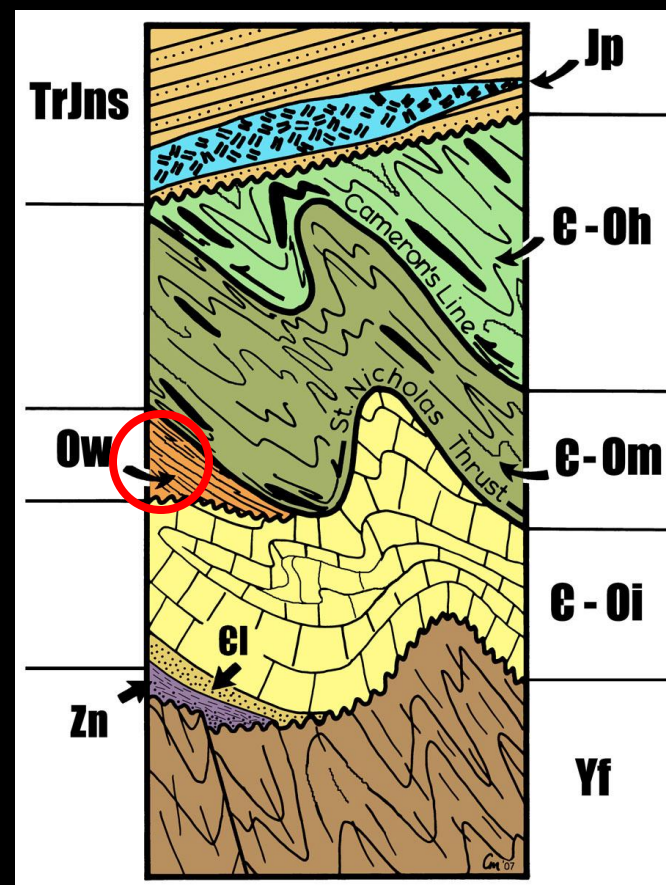


**Sheared Manhattan Schist, St. Nicholas Park**



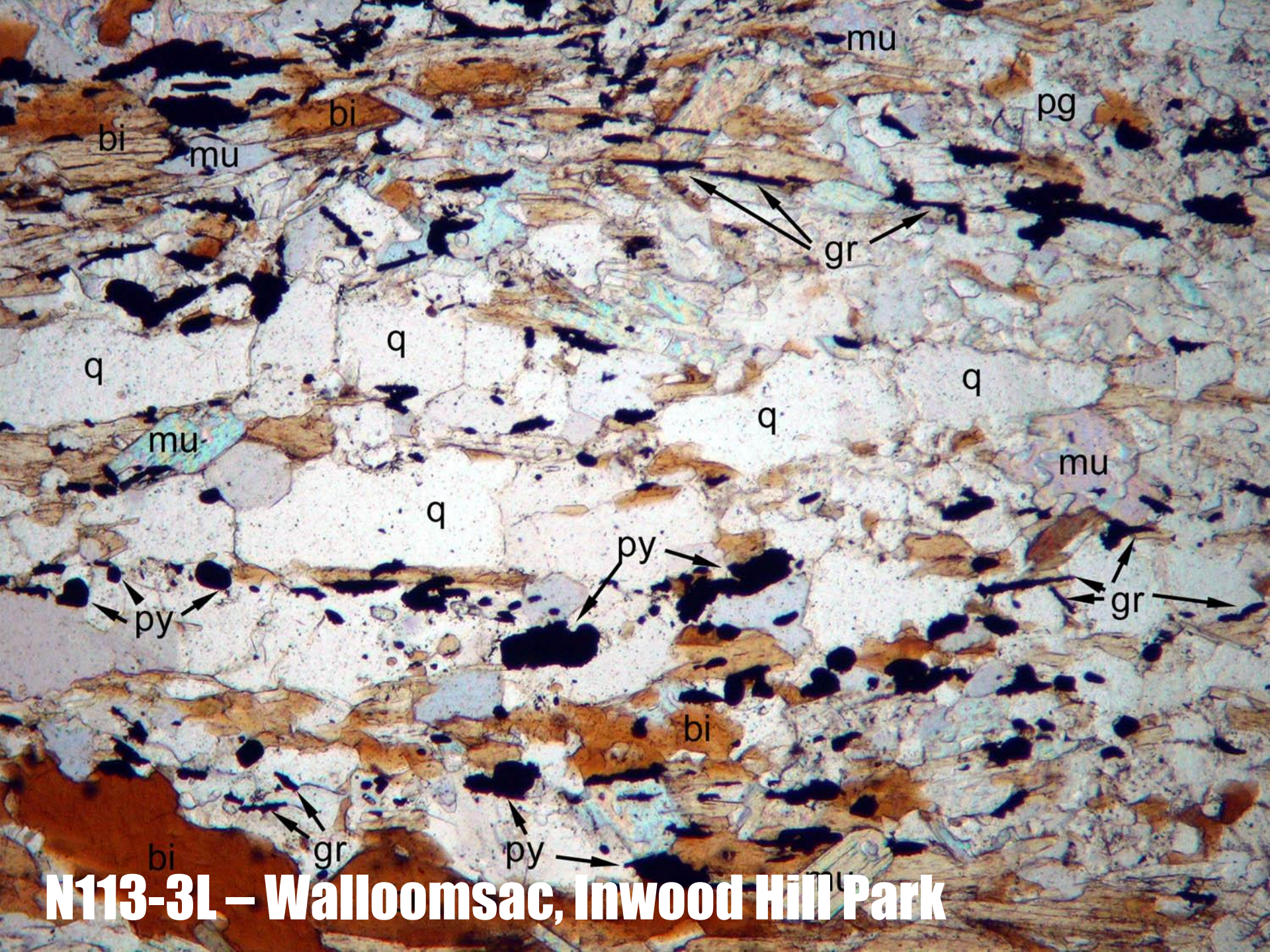


# Tippecanoe



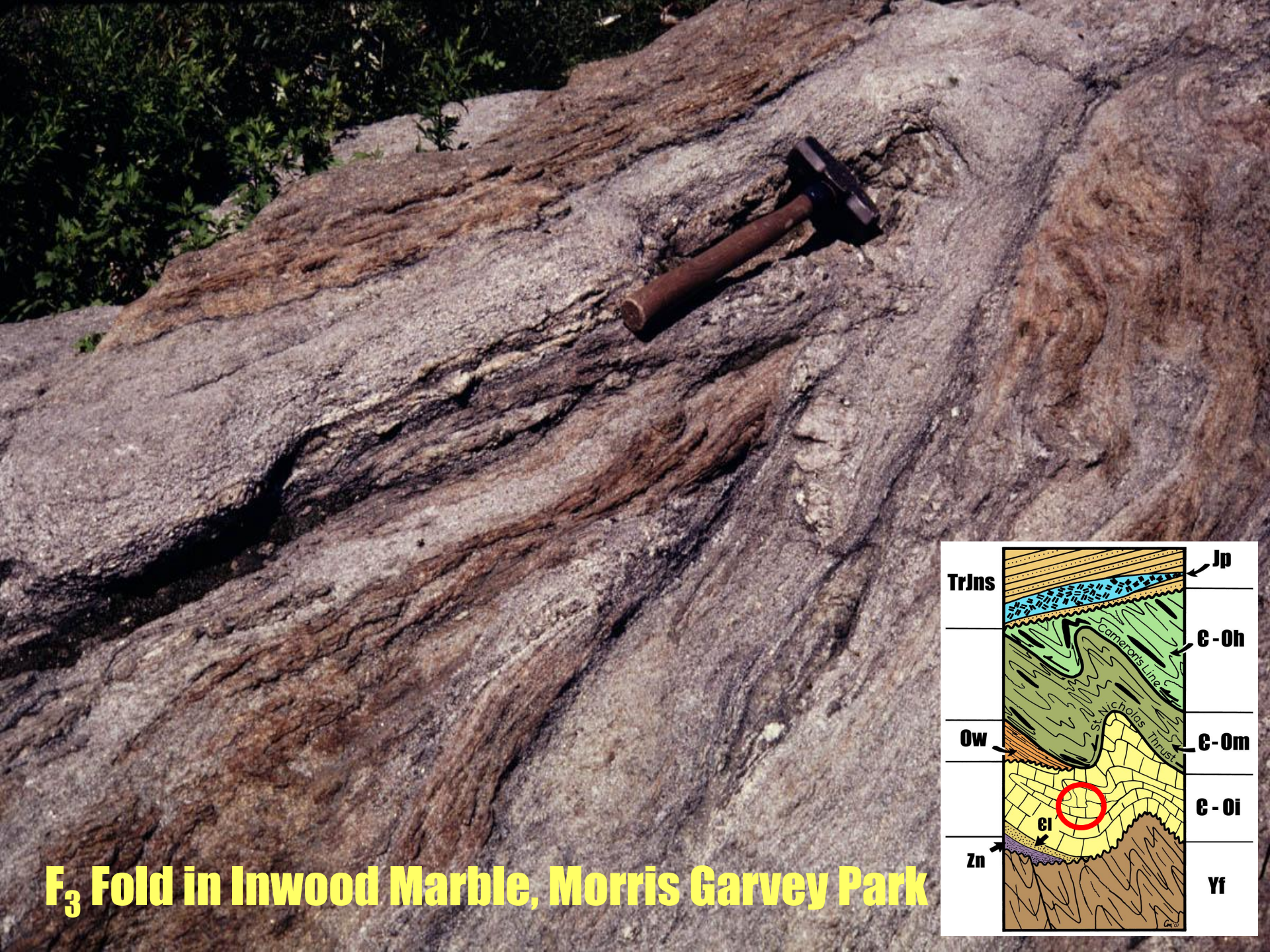
Walloomsac "Balmville" Contact, Grand Concourse, Bronx, NY



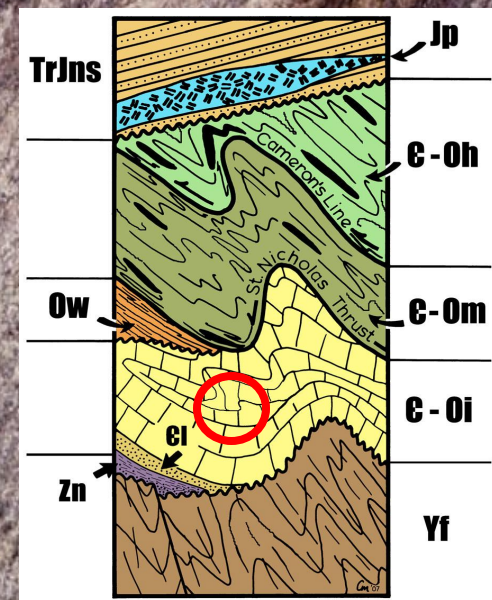


**N113-3L – Walloomsac, Inwood Hill Park**





**F<sub>3</sub> Fold in Inwood Marble, Morris Garvey Park**



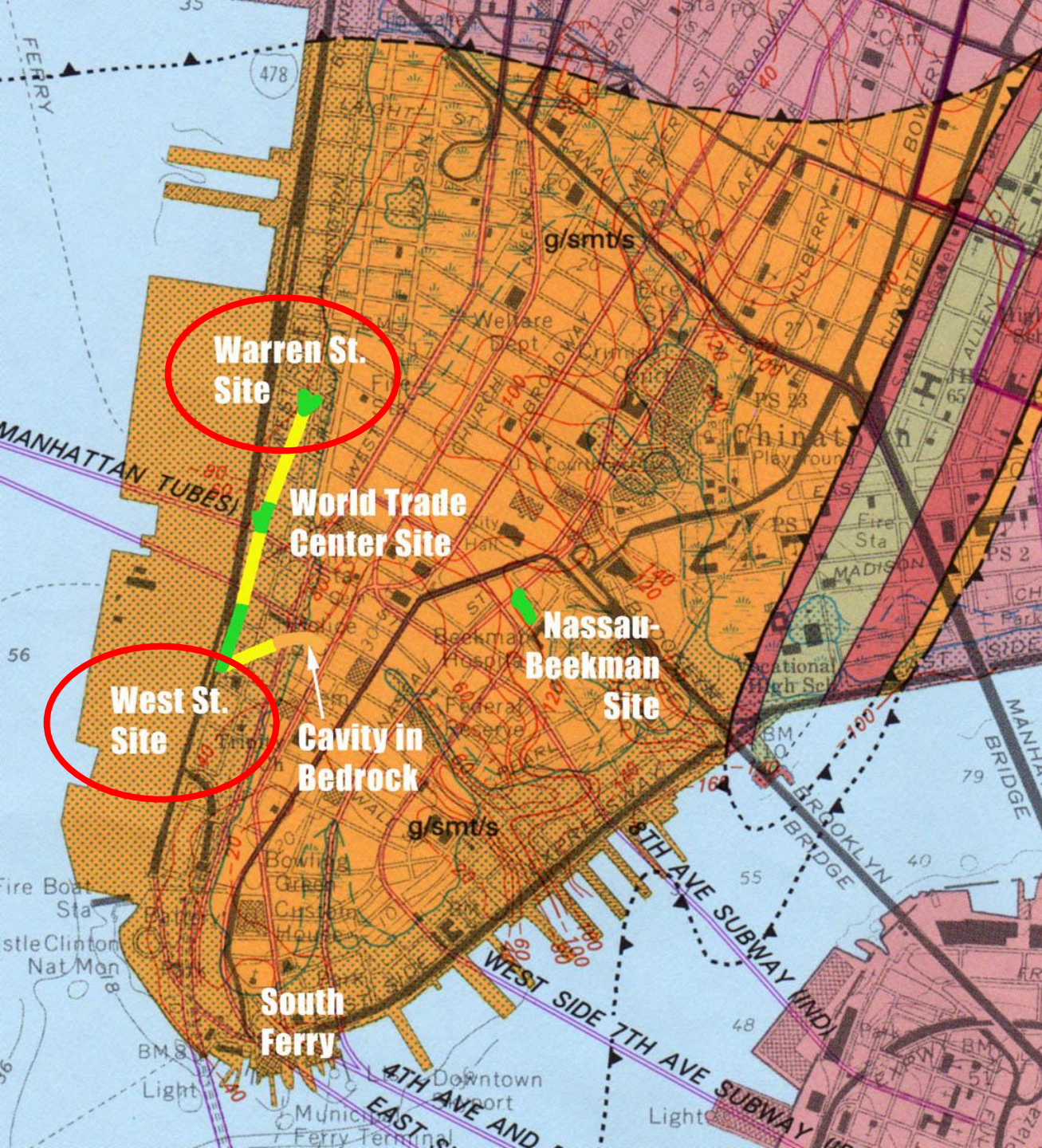


**Four Main  
Localities  
South of  
Canal Street**

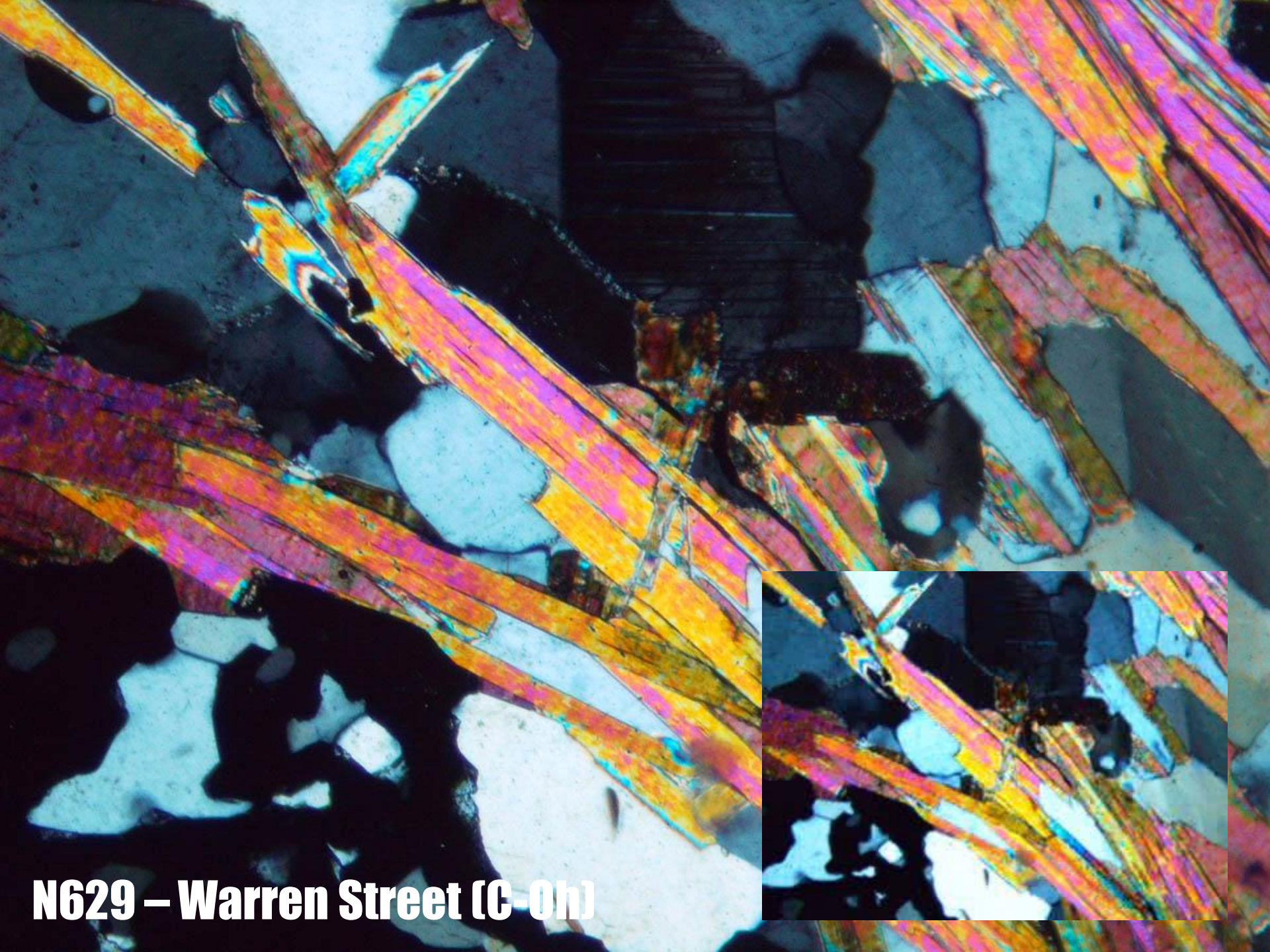
**Mapped as  
Manhattan!**

**All Display  
Sheared  
Walloomsac  
Rocks!**

**after Baskerville 1994**







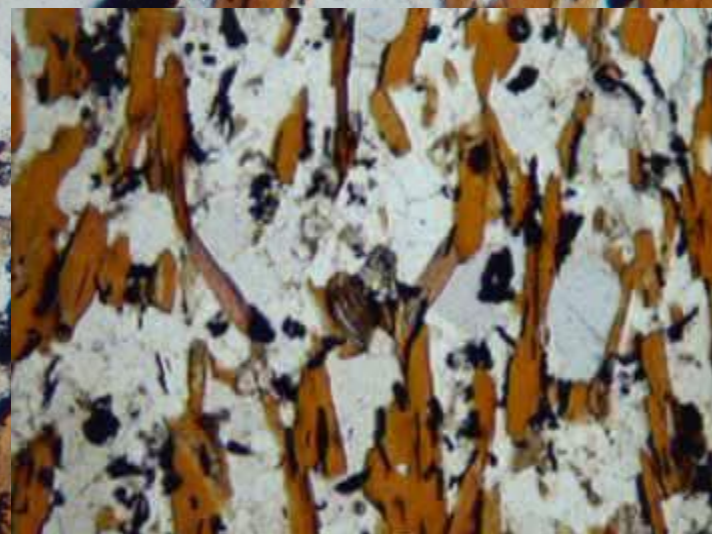
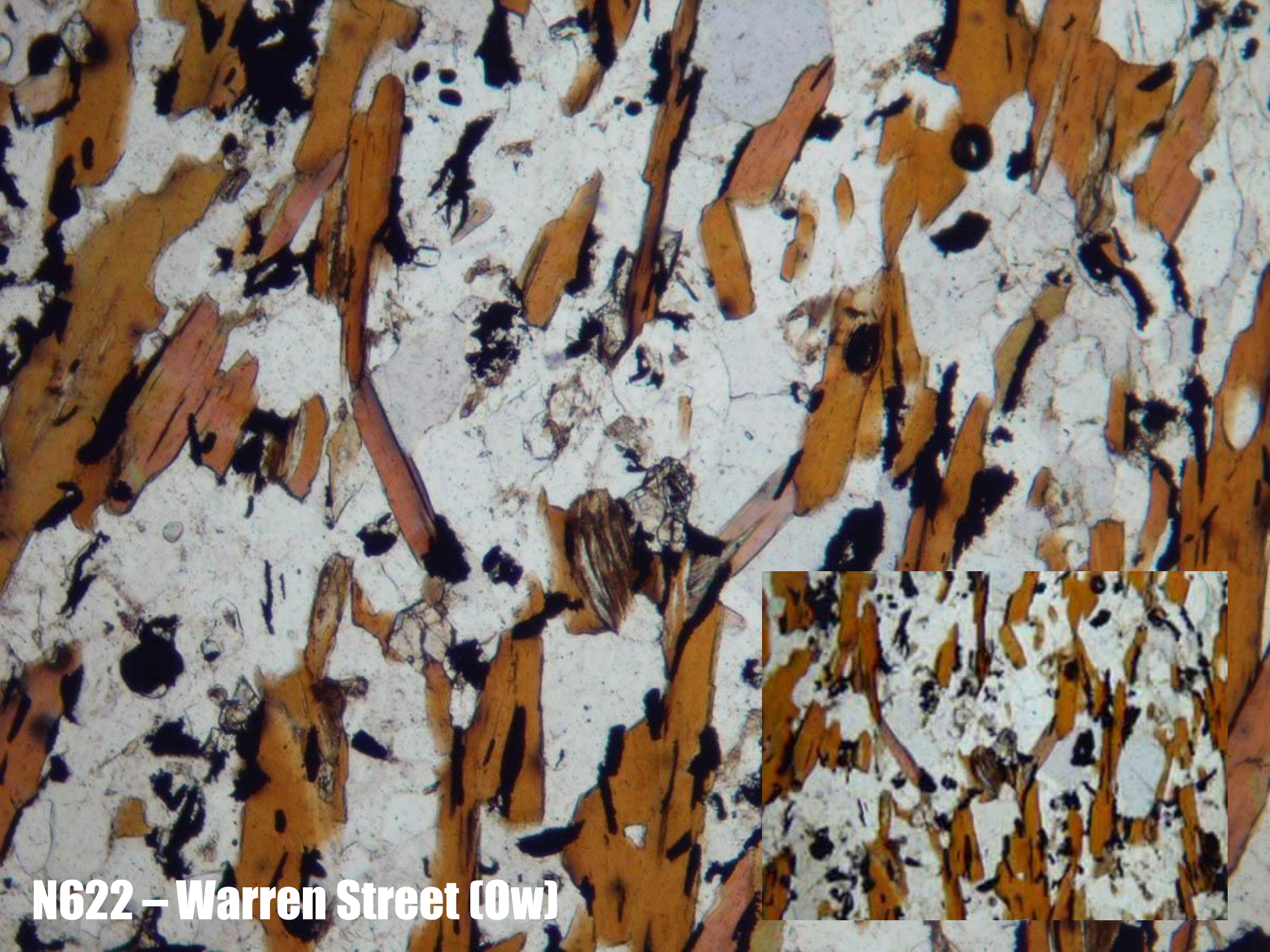
**N629 – Warren Street (C-0h)**





**N631 – Warren Street (0w)**





**N622 – Warren Street (Ow)**



The map displays Lower Manhattan with various streets and landmarks. Four sites are highlighted with red circles and labels:

- Warren St. Site**: Located near the top left, near the Hudson River and the Manhattan Tubes.
- World Trade Center Site**: Located in the center, near the Hudson River and the Manhattan Tubes.
- Nassau-Beekman Site**: Located to the right of the World Trade Center Site, near the Hudson River and the Manhattan Tubes.
- West St. Site**: Located to the left of the World Trade Center Site, near the Hudson River and the Manhattan Tubes.

A yellow line connects the Warren St. Site and the World Trade Center Site. A green dot is marked near the World Trade Center Site, labeled "Cavity in Bedrock". The map also shows the Hudson River, the Manhattan Tubes, the Hudson River Bridge, the Brooklyn Bridge, the West Side Highway, the 4th Ave Subway, and the 7th Ave Subway. Other landmarks include the Statue of Liberty, the South Ferry, and the World Trade Center.

The map shows Lower Manhattan with several sites highlighted in red circles: Warren St. Site, World Trade Center Site, Nassau-Beekman Site, and West St. Site. A yellow line connects the Warren St. and World Trade Center sites, with a green dot labeled 'Cavity in Bedrock' on it. The map includes street names, subway lines, and landmarks like the Statue of Liberty and South Ferry.

The map shows Lower Manhattan with four proposed sites for the World Trade Center highlighted in red circles:

- Warren St. Site**: Located near the top left, near the Hudson River and the Manhattan Ferry.
- World Trade Center Site**: Located in the center, near the Hudson River and the Manhattan Ferry.
- Nassau-Beekman Site**: Located in the center-right, near the Hudson River and the Manhattan Ferry.
- West St. Site**: Located in the bottom left, near the Hudson River and the Manhattan Ferry.

A yellow line connects the West St. Site to the World Trade Center Site. A green dot near the Nassau-Beekman Site is labeled "Cavity in Bedrock". The map also shows the Hudson River, the Manhattan Ferry, the Statue of Liberty, the Empire State Building, and various streets and landmarks.



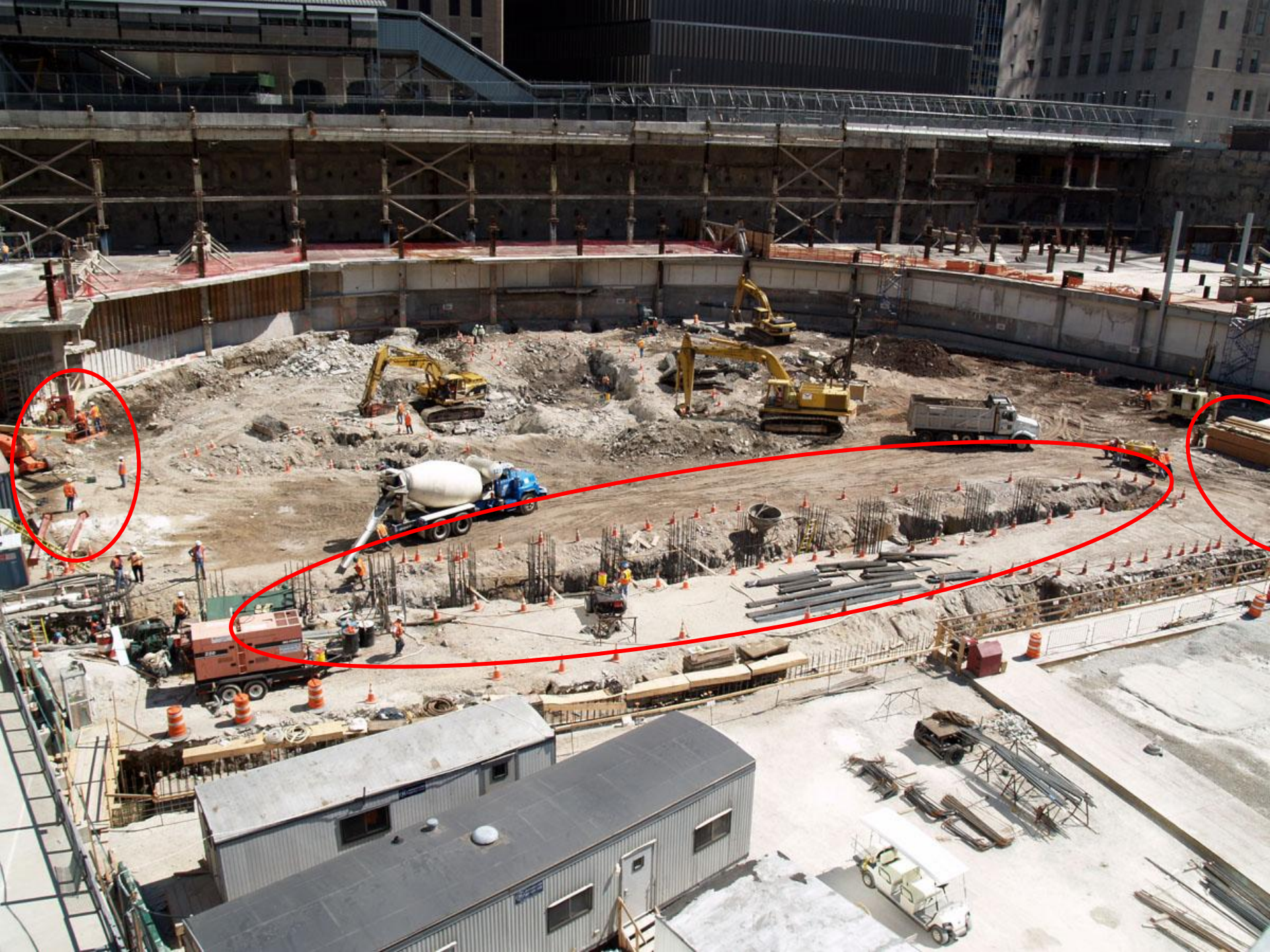






**July 2007**









**Mostly Hartland Schist  
and Granofels  
WITH  
Walloomsac Schist  
and calc-silicate  
rocks**









**WTC East Wall  
Sheared Walloomsac  
Calc-silicate rock  
and Graphitic Schist**

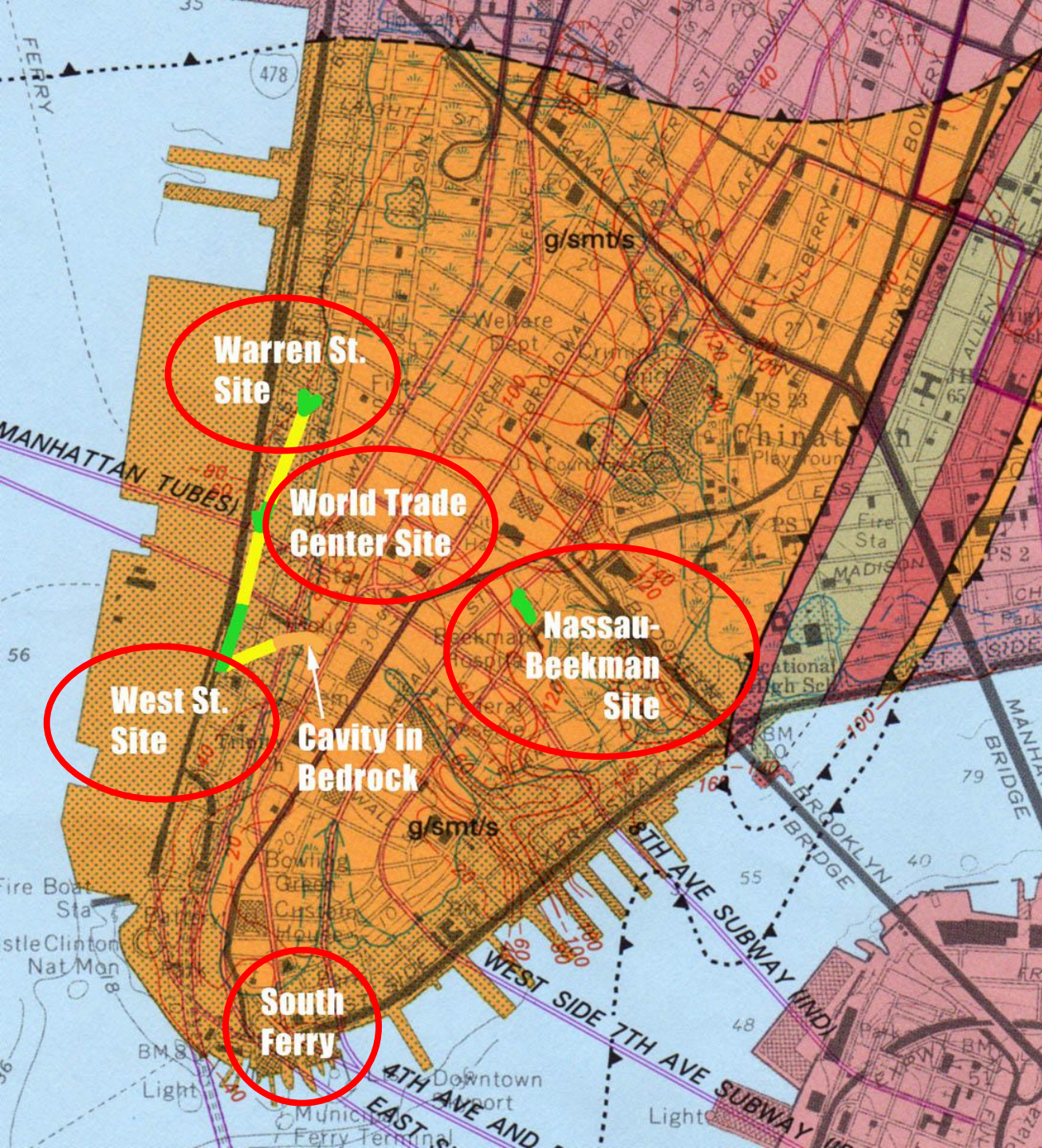




# Four Main Localities South of Canal Street

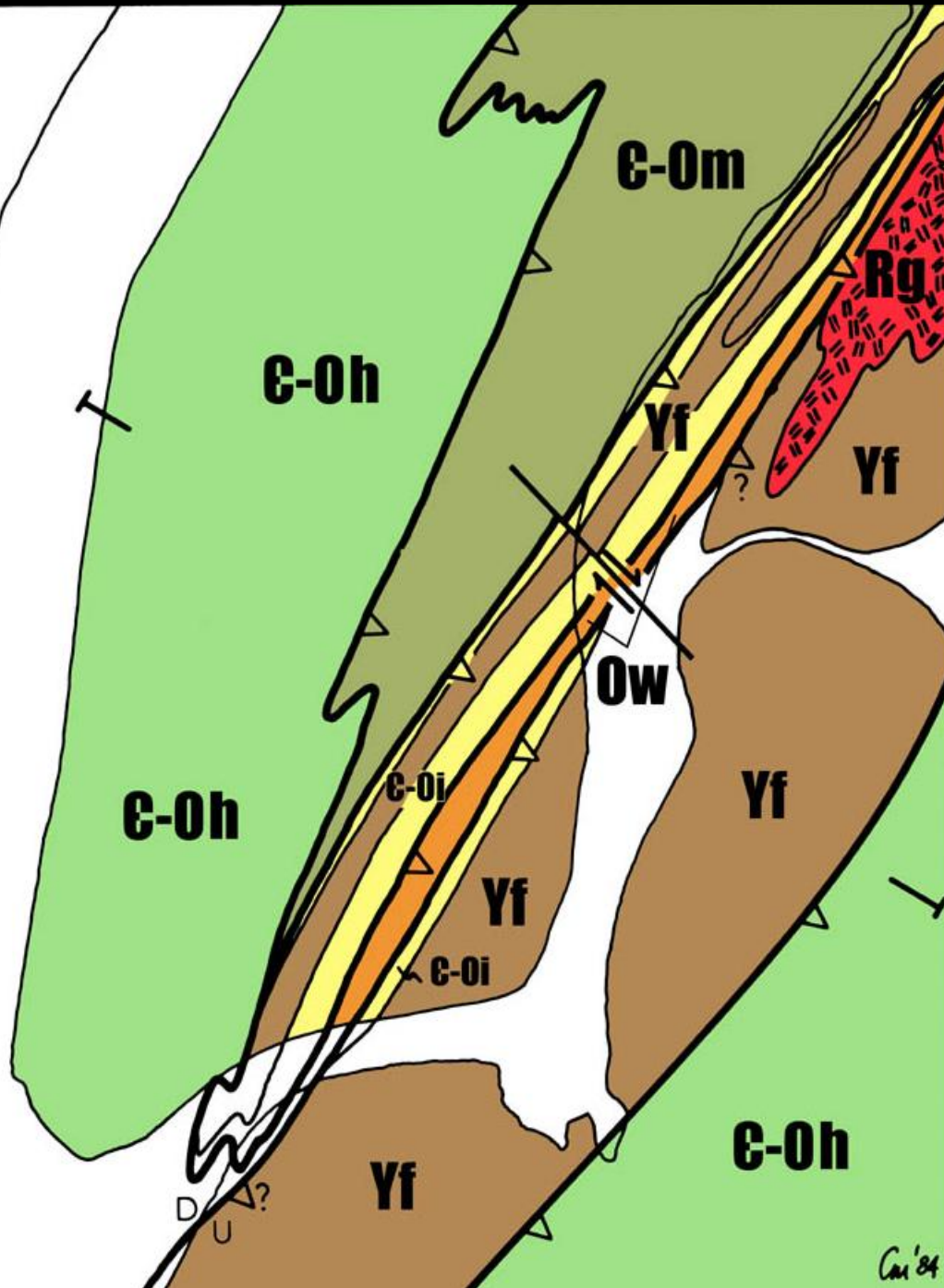
**All Display Sheared Walloomsac Rocks!**

**after Baskerville 1994**



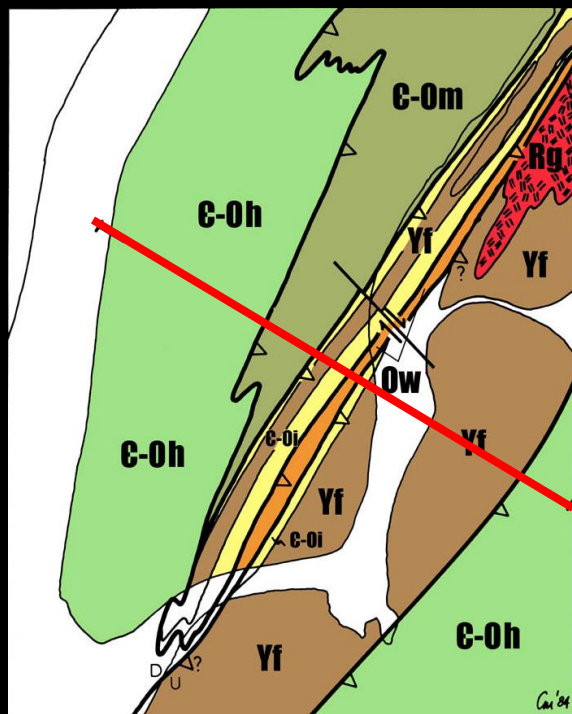
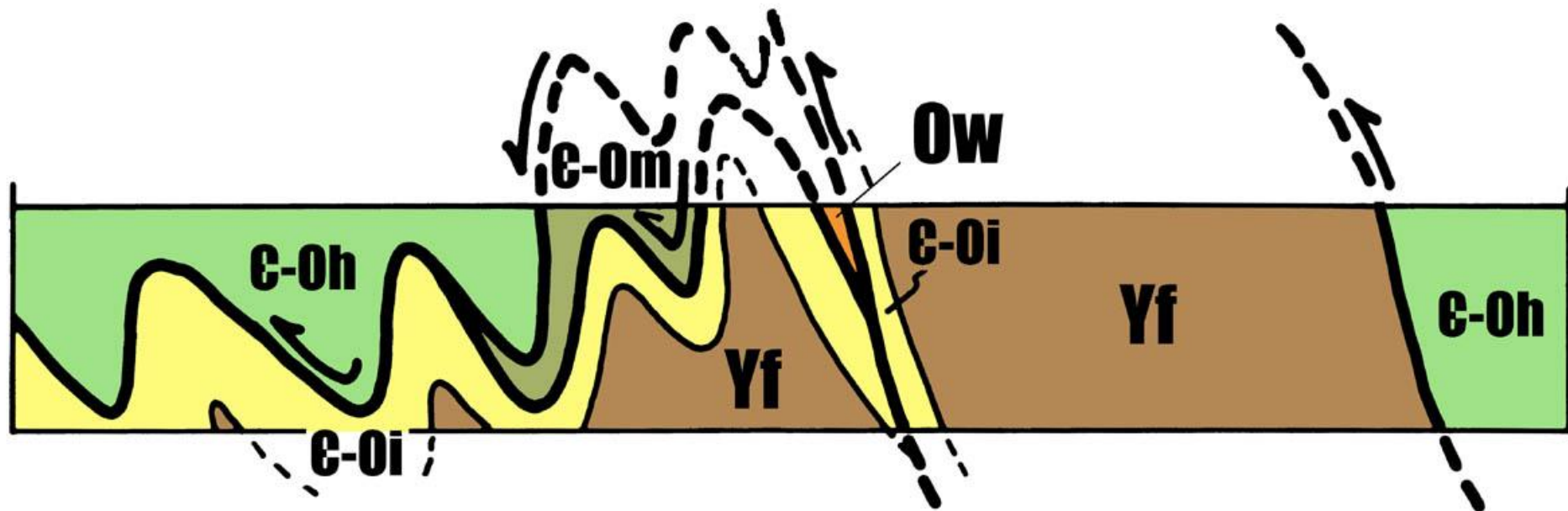


# Interpretive Geologic Map of SE Manhattan, Brooklyn, and Queens Based on Borings of Berkey (1910)



Merguerian, 1984



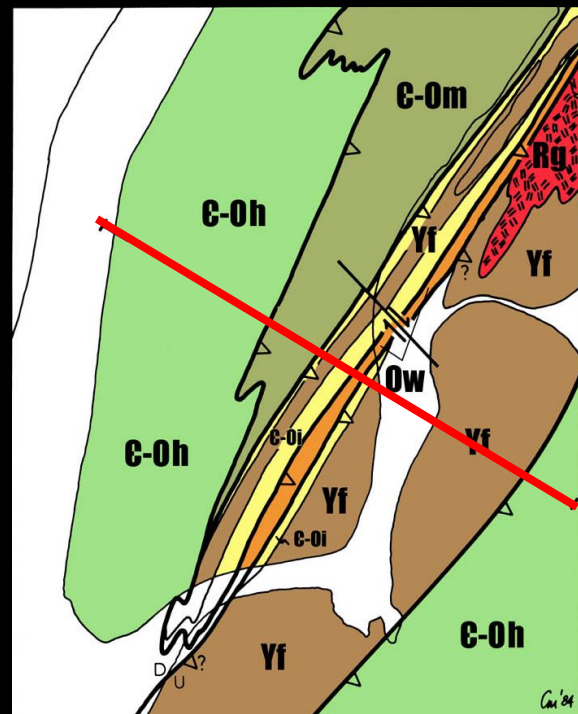
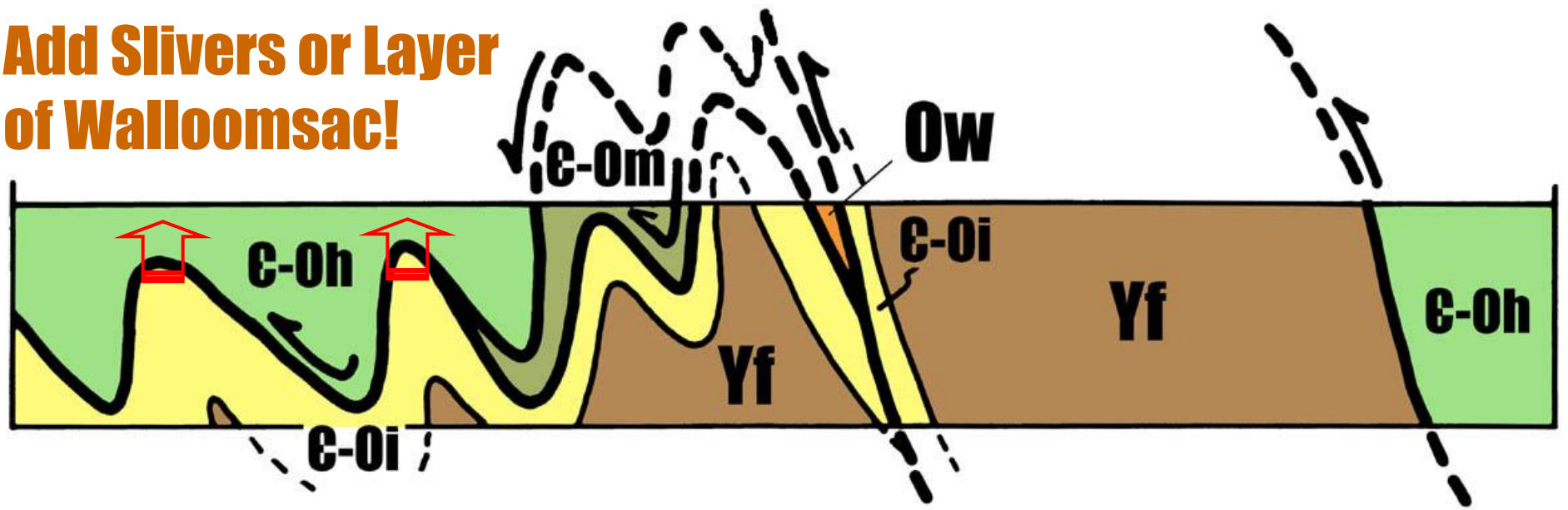


# Interpretive NW-SE Geologic Section Based on Berkey 1910 Boring Data

Merguerian, 1984



**Add Slivers or Layer of Walloomsac!**



**Interpretive NW-SE  
Geologic Section Based  
on Berkey 1910 Boring Data**

**Merguerian, ~~1984~~ (2007)**





**Thanks For Coming**





