

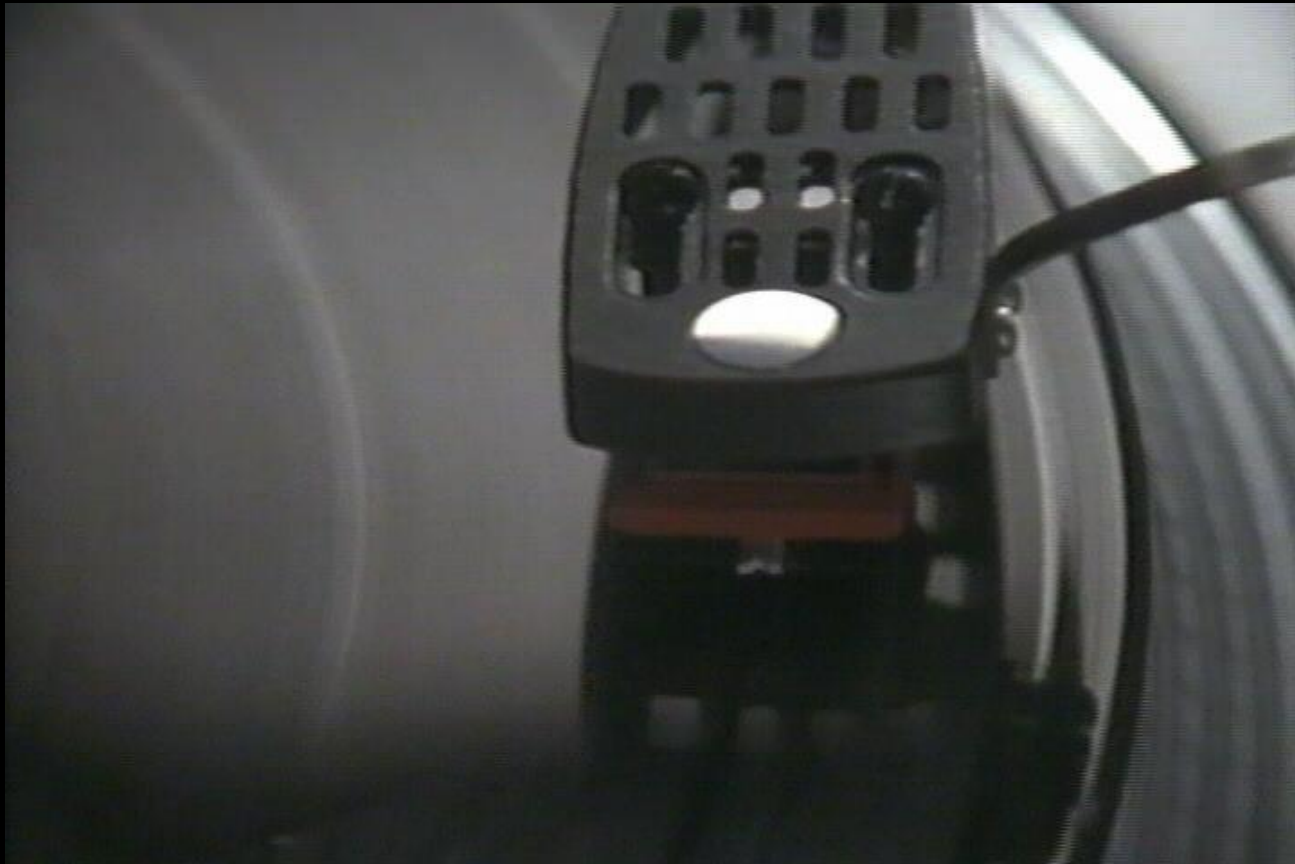


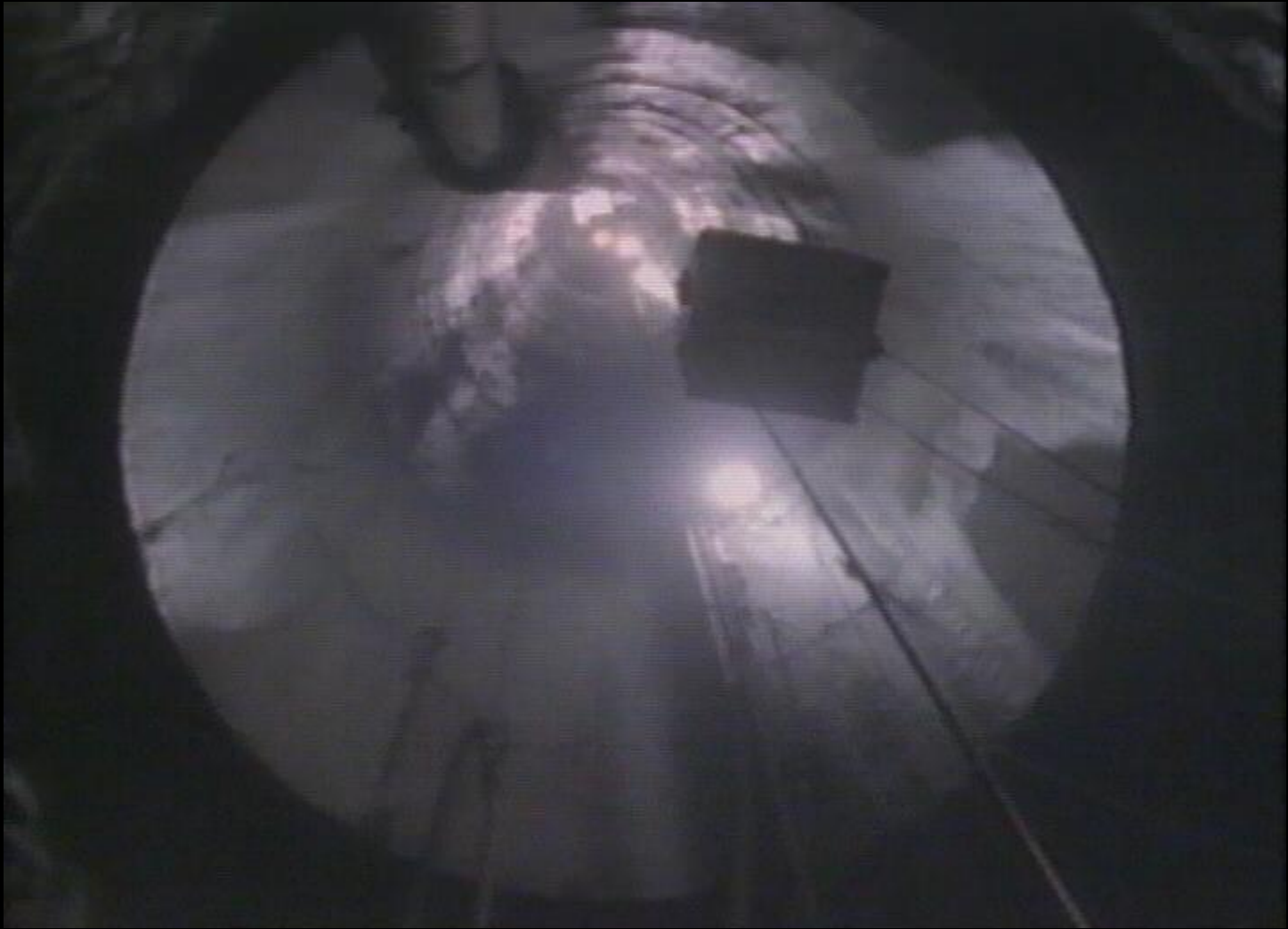
New York City Earthquakes Fact or Fiction

Charles Merguerian



New York City Earthquakes Fact or Fiction





**From: Earthquakes – The Terrible Truth
ABC World of Discovery, 1994**



A New York City Earthquake When Will it Happen Here?

1737

1783

1884

20??

EARLY MEDIAL ORDOVICIAN

(Early Chazyan)

PALEOGEOGRAPHY

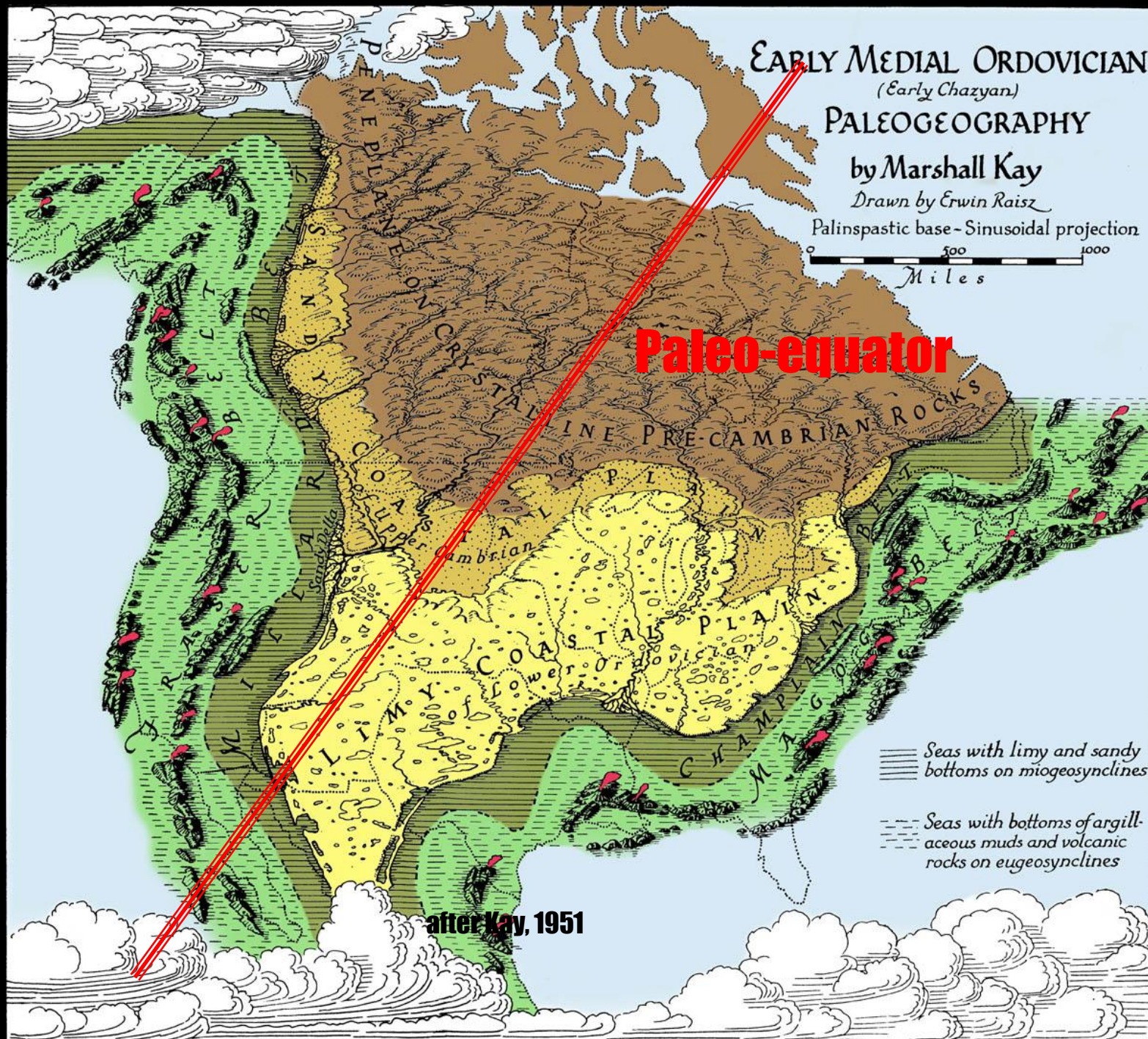
by Marshall Kay

Drawn by Erwin Raisz

Palinspastic base - Sinusoidal projection

0 500 1000
Miles

Paleo-equator



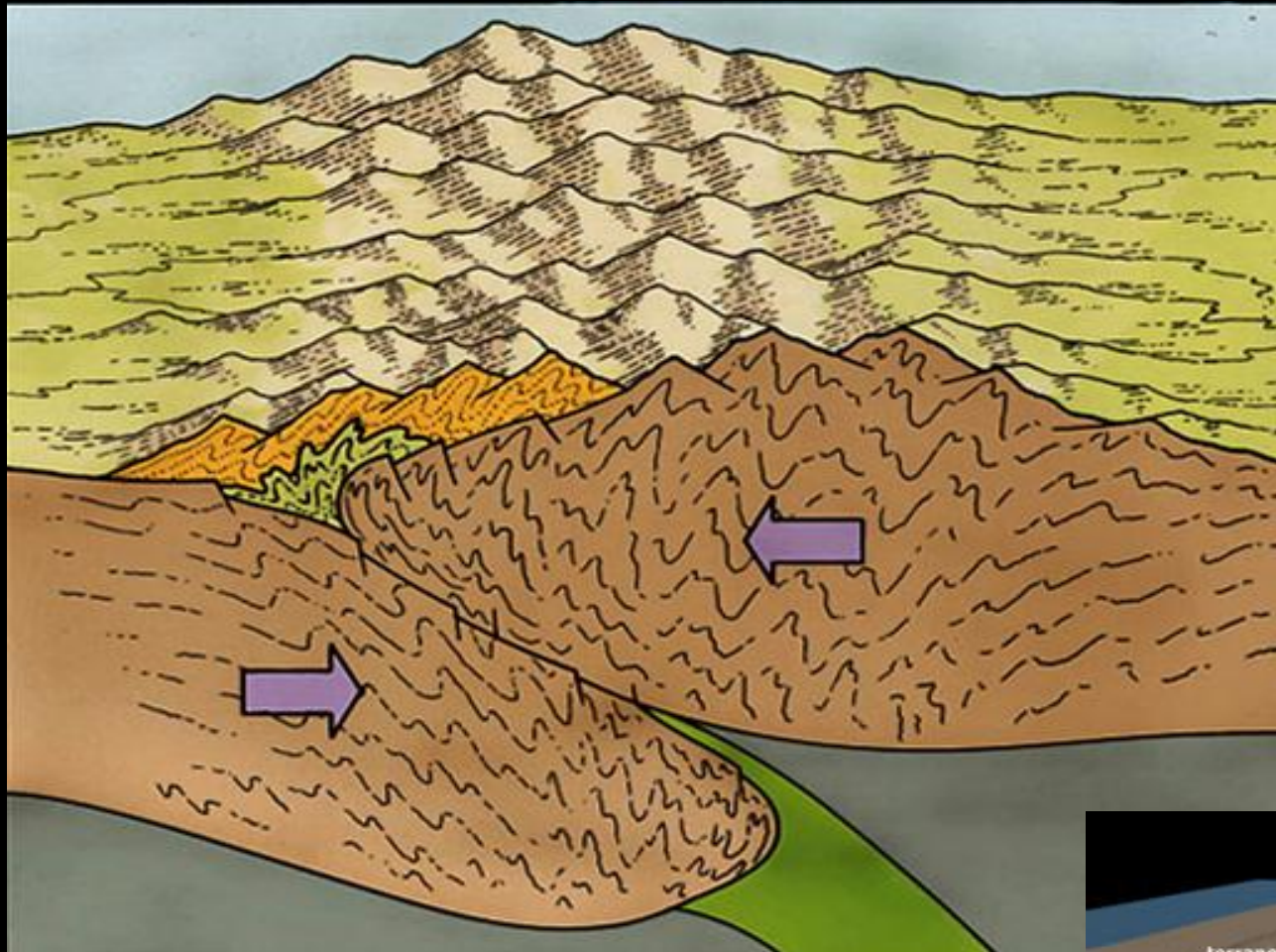
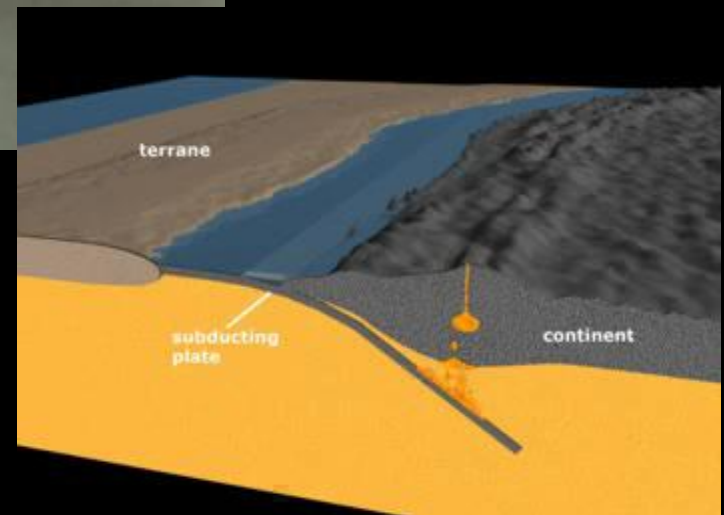
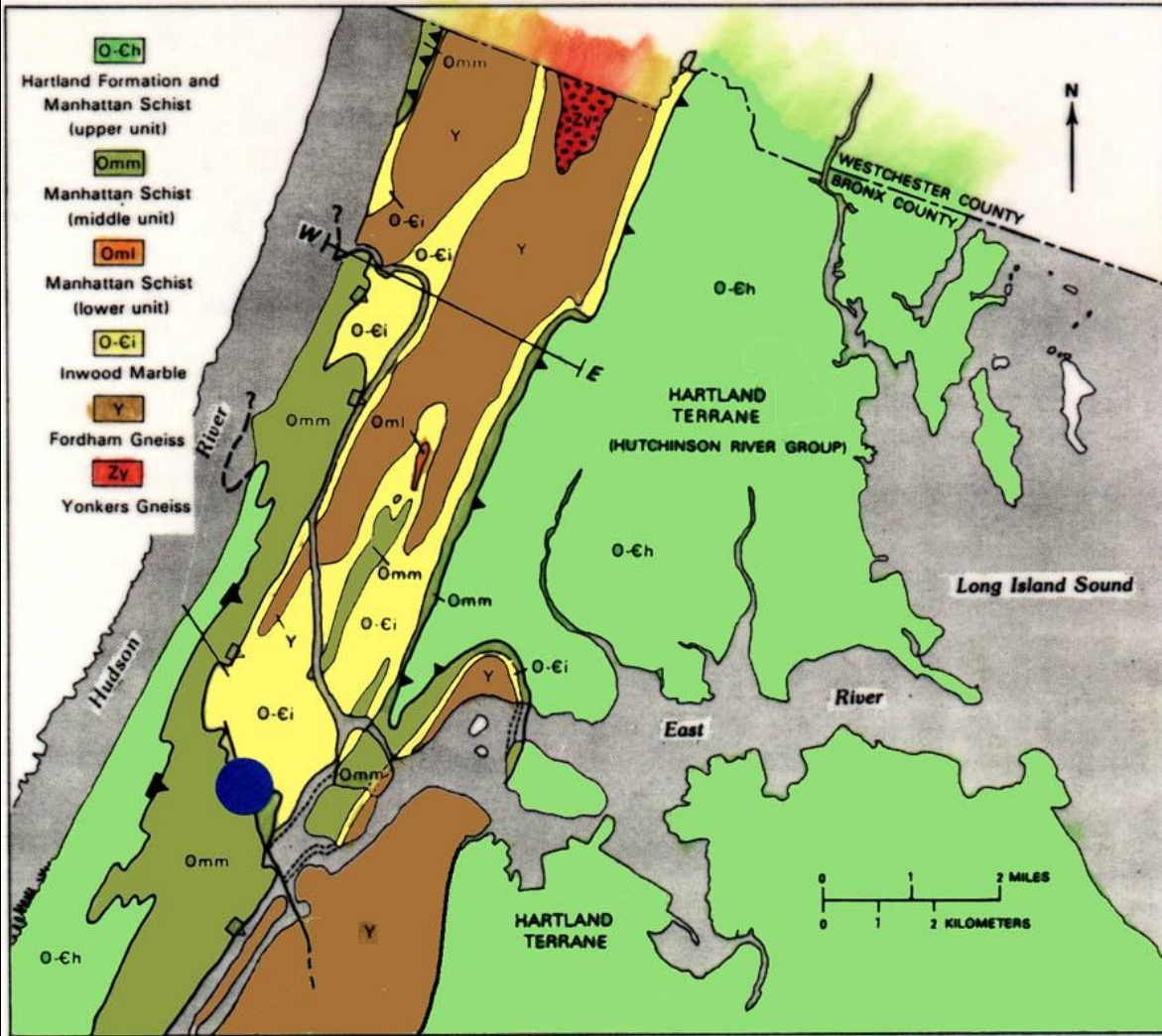
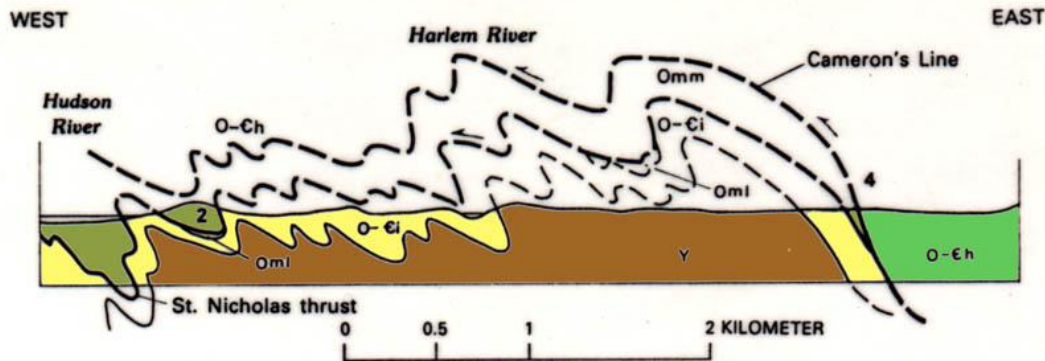
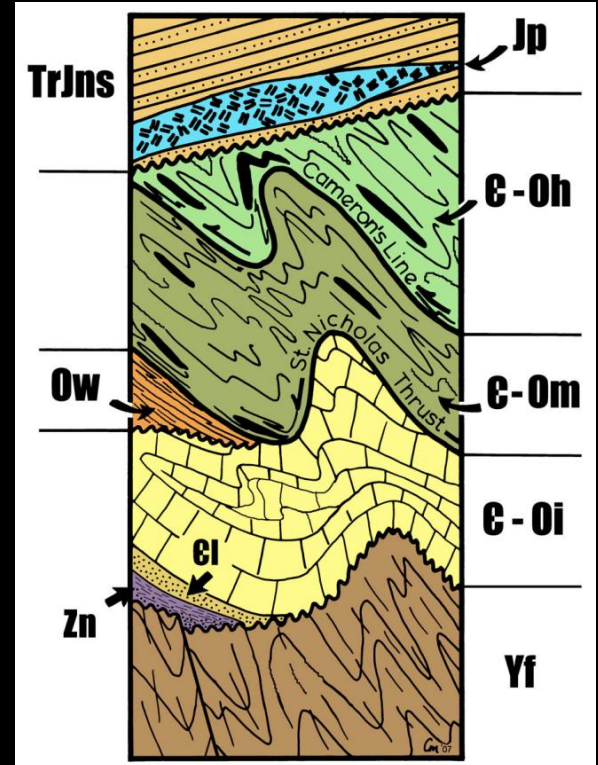


Plate Collisions

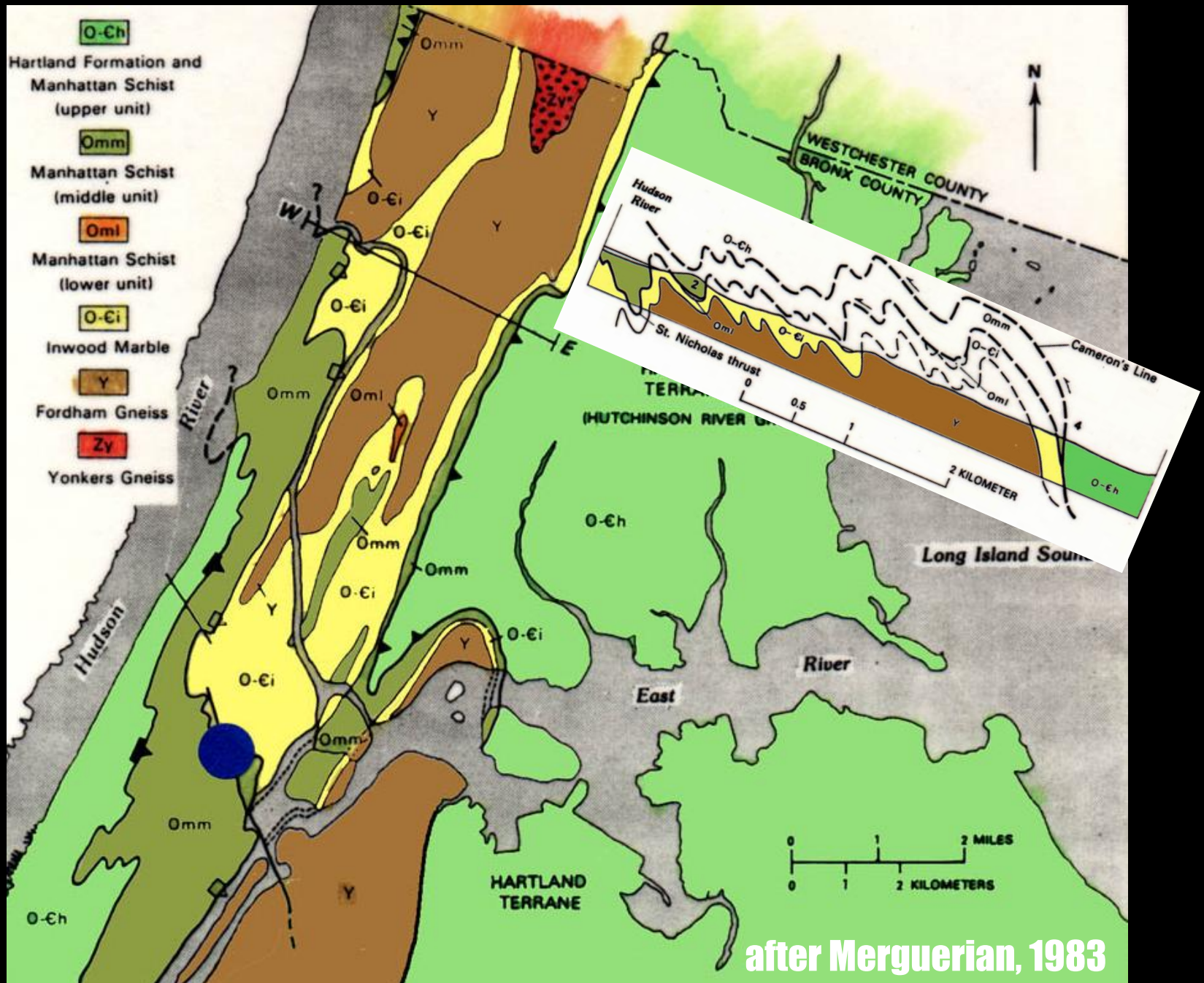




New York City

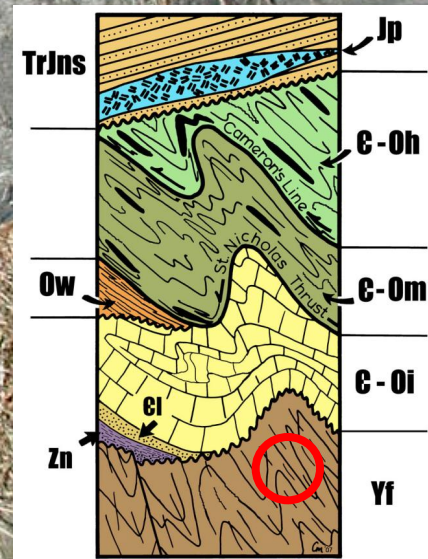


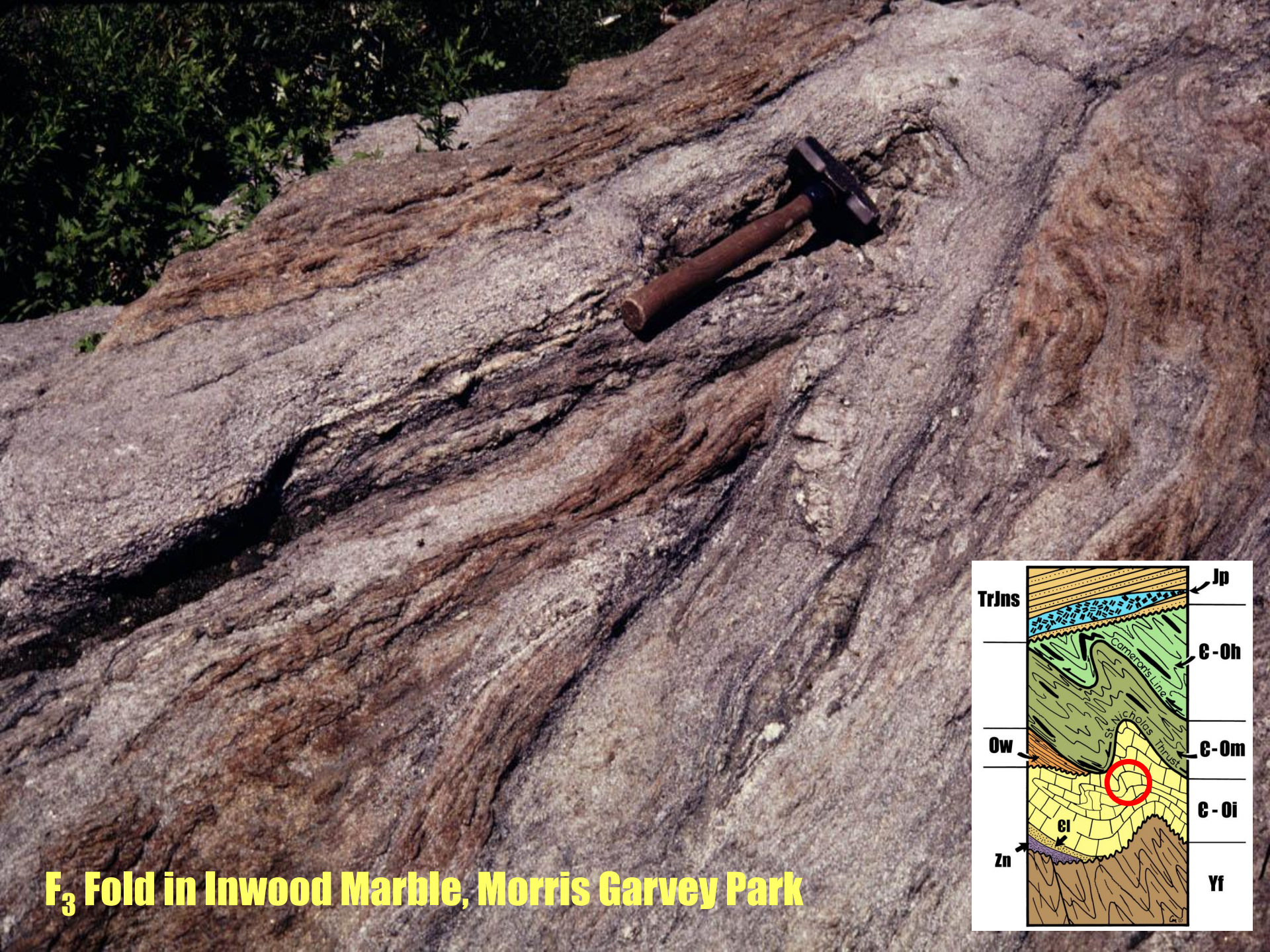
Merguerian, 2001



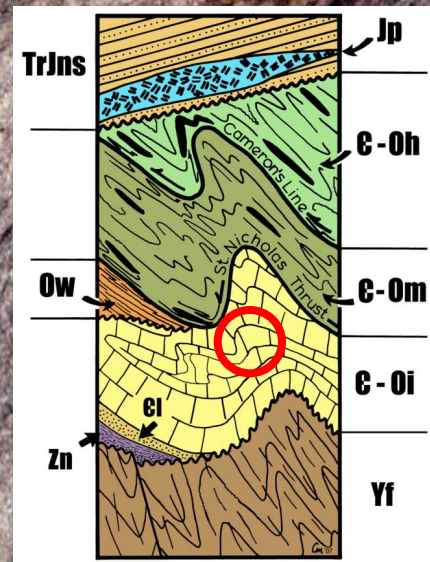


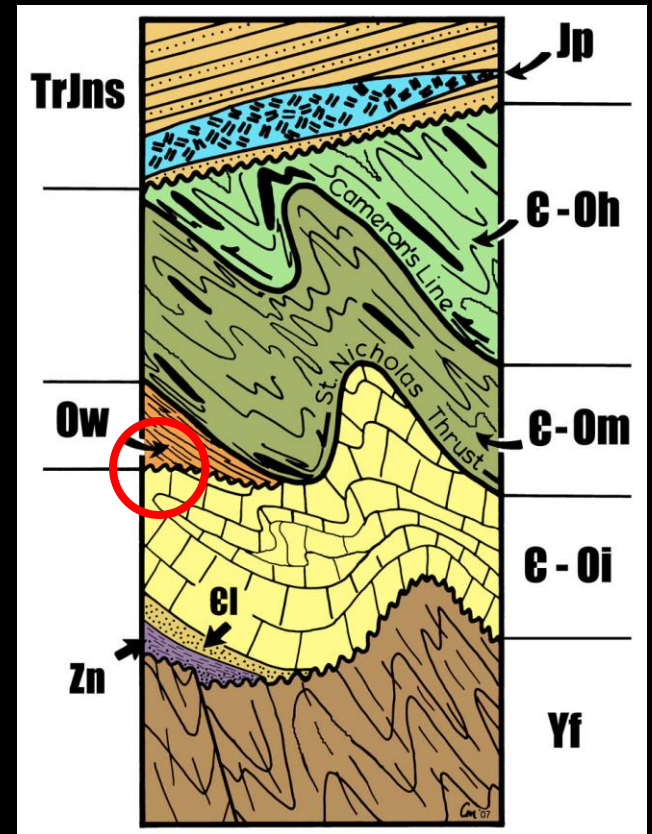
Fordham Gneiss, Echo Park





F₃ Fold in Inwood Marble, Morris Garvey Park

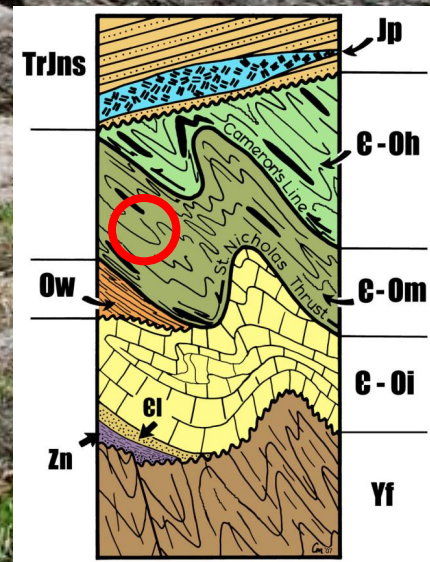




Walloomsac "Balmville" Contact, Grand Concourse, Bronx, NY

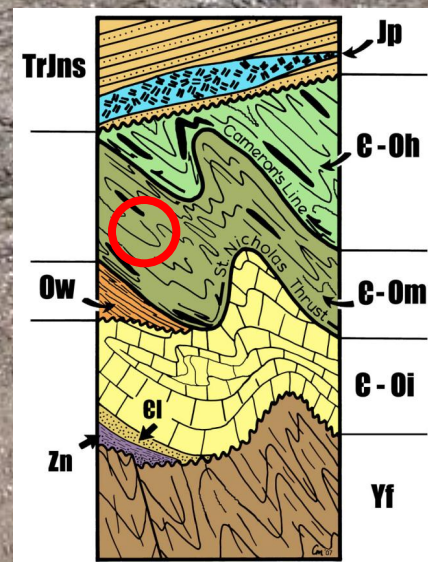


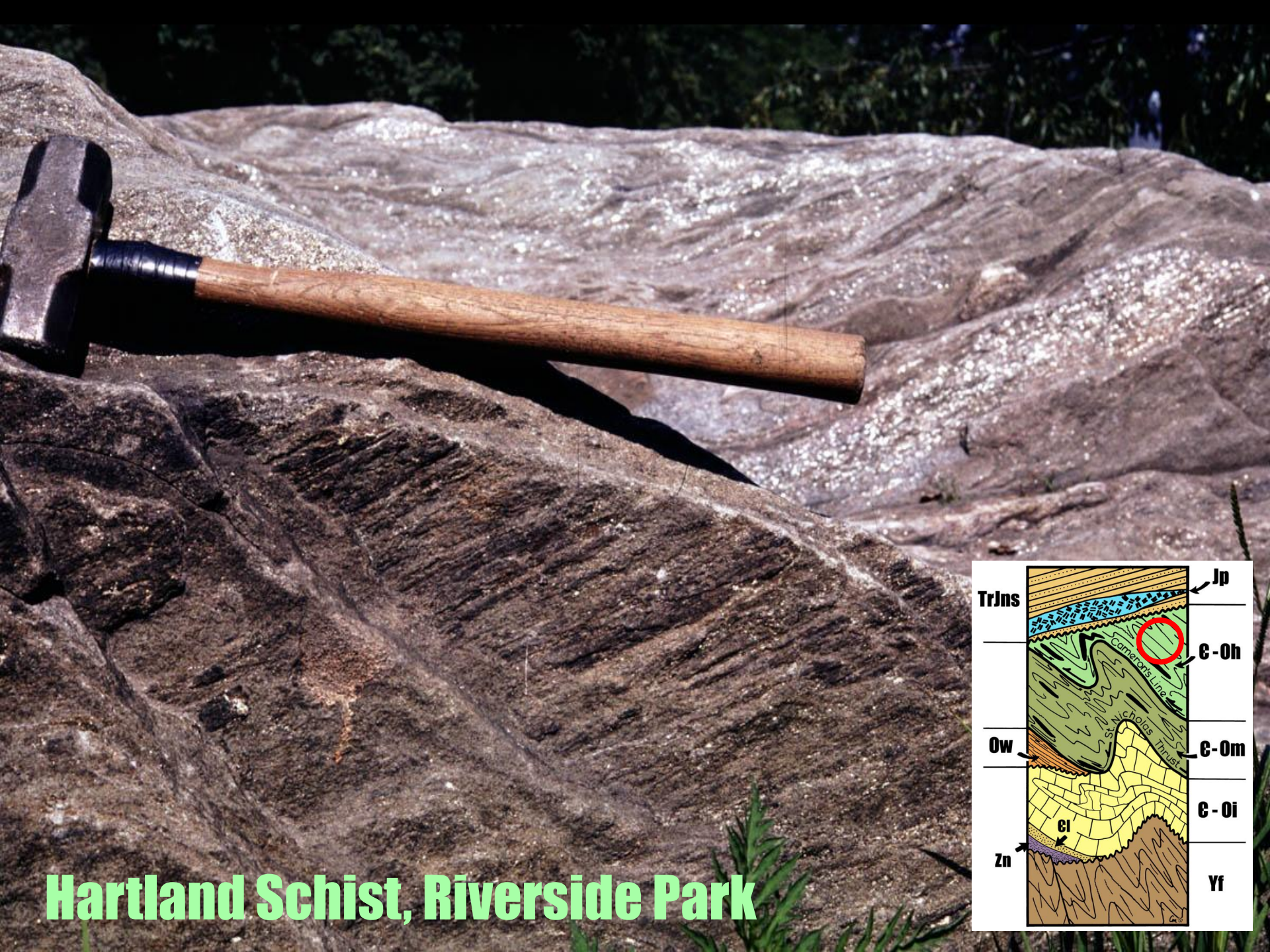
Manhattan Schist, Central Park



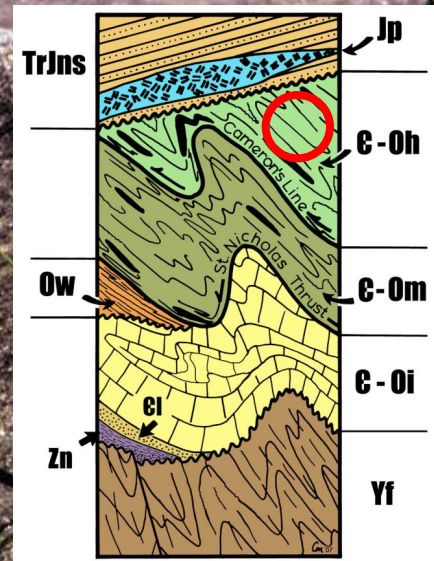


Retrograde Muscovite after Kyanite





Hartland Schist, Riverside Park





**Merguerian's Early
Field Work on
Manhattan
Island**

**In The Days
When He Was
Limber**

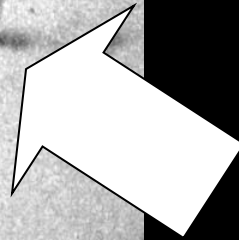






**Merguerian Has Spent
(Wasted?)**

**Most of his Career
Mapping the Surface
and Subsurface
Geology of NYC**



**Proper Field Attire
For NYC**

Long Island Sound



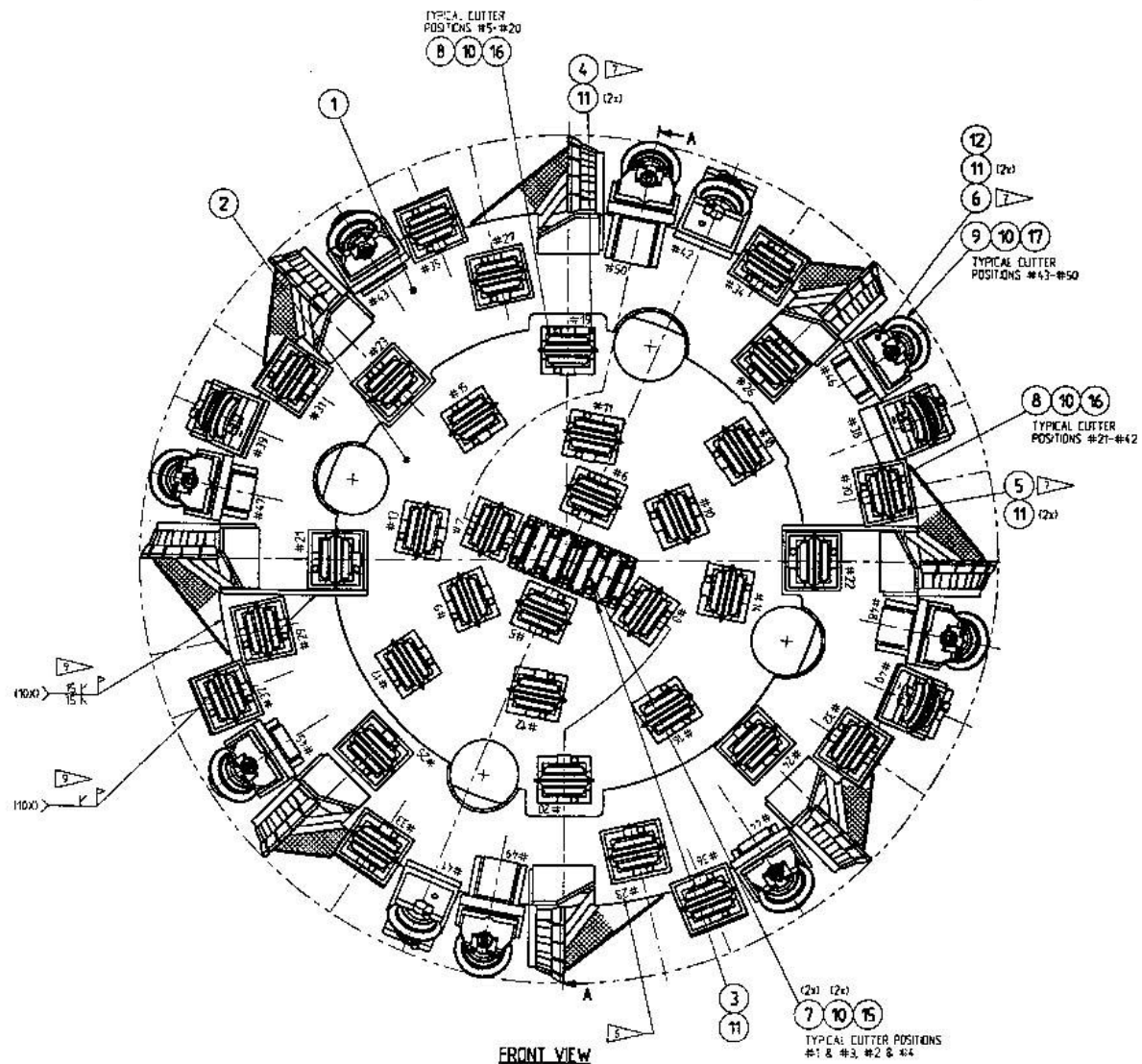
16B

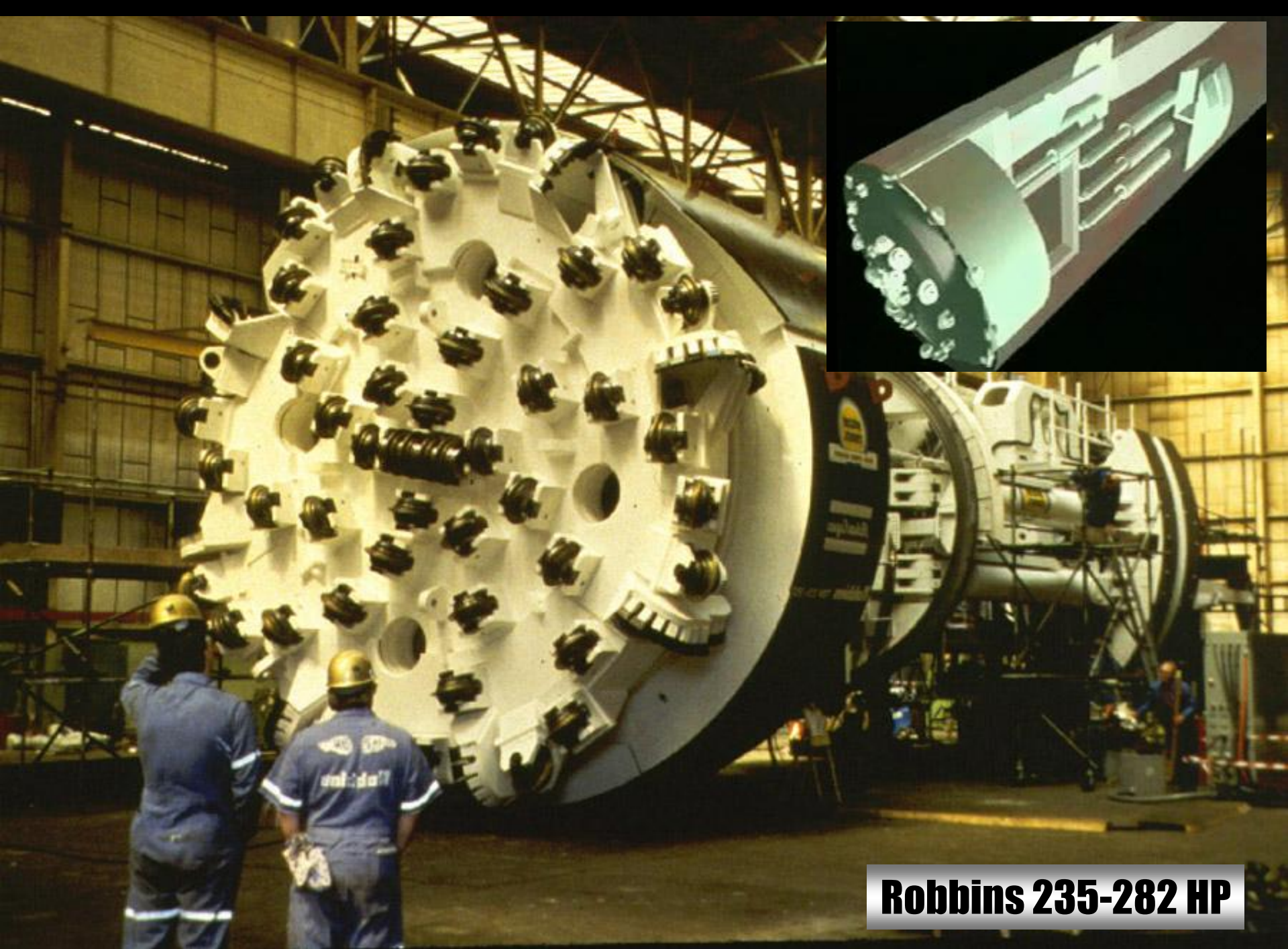
19B



Robbins 235-282 HP TBM







Robbins 235-282 HP



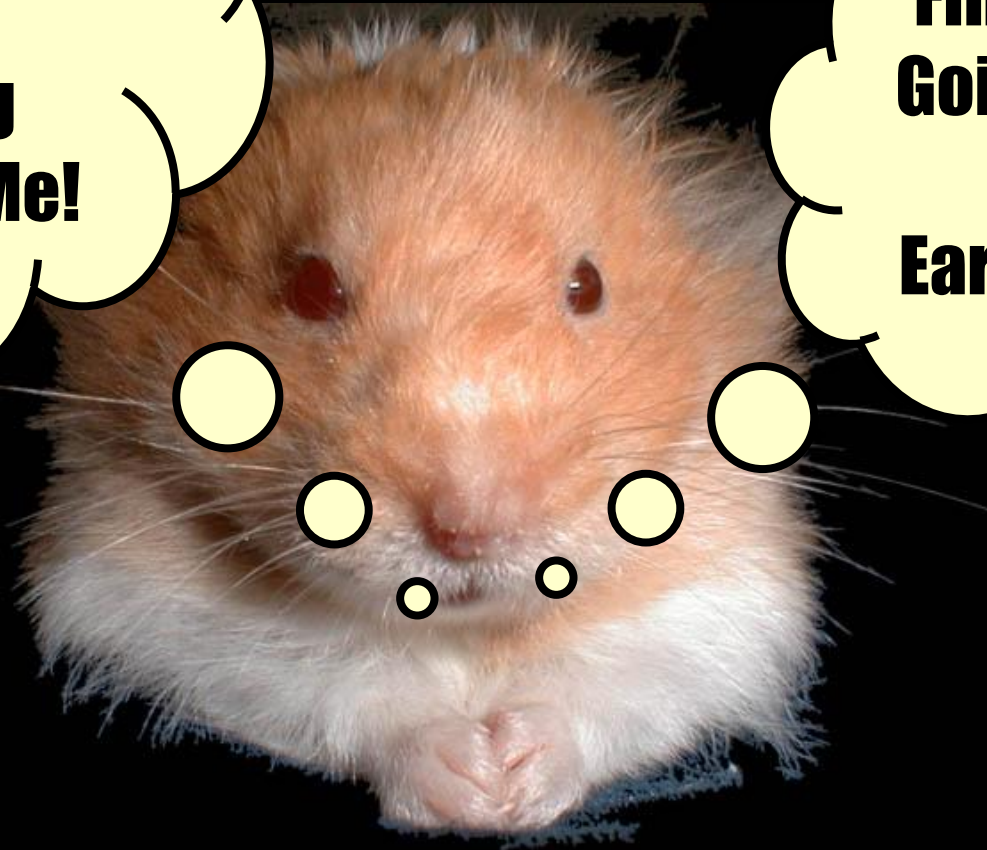
**Merguerian's Queens
Tunnel Field Office**



**Administrative
Assistant**

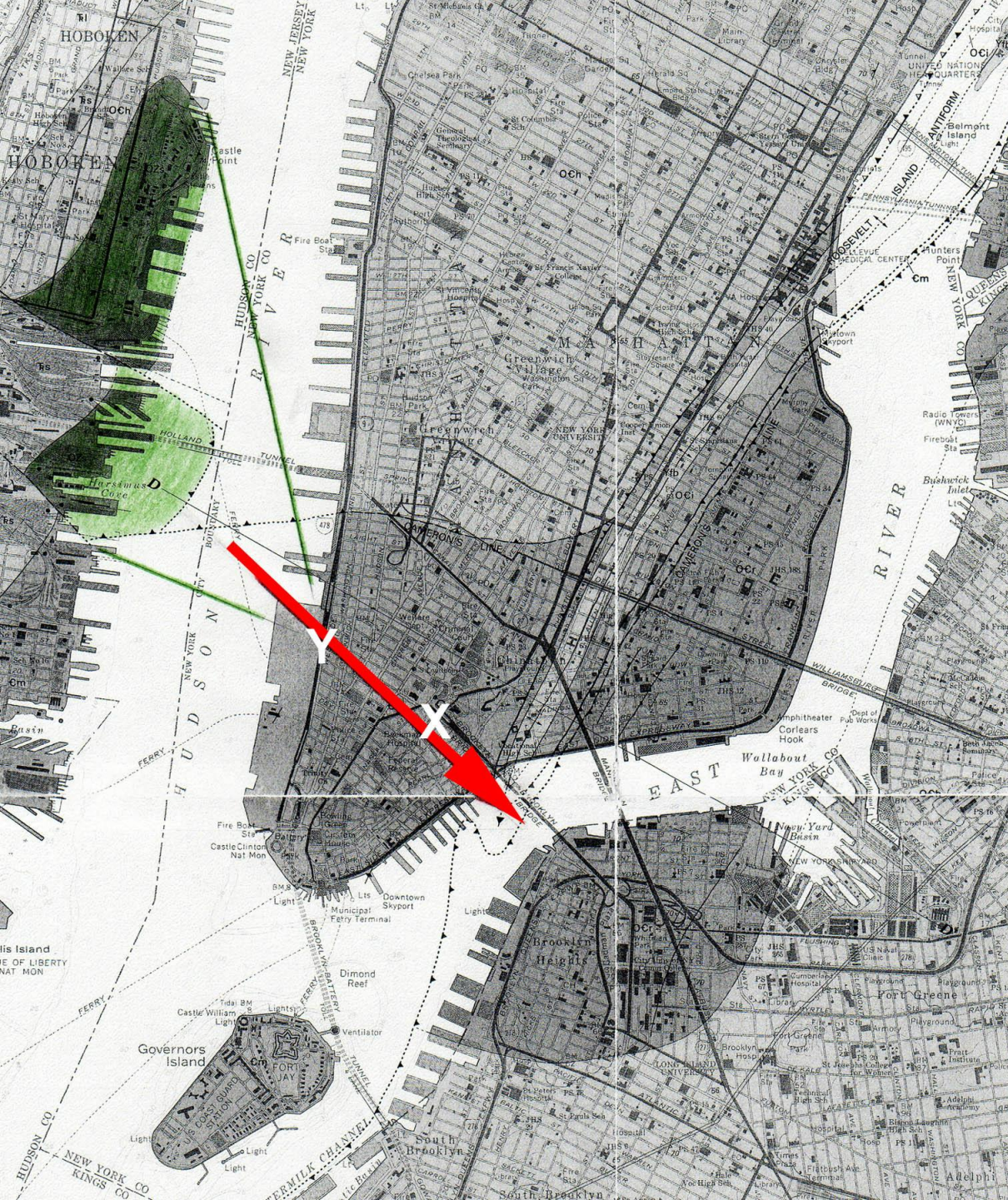
**Remember,
You're
Nothing
Without Me!**

**Finally, He's
Going to Talk
About
Earthquakes**









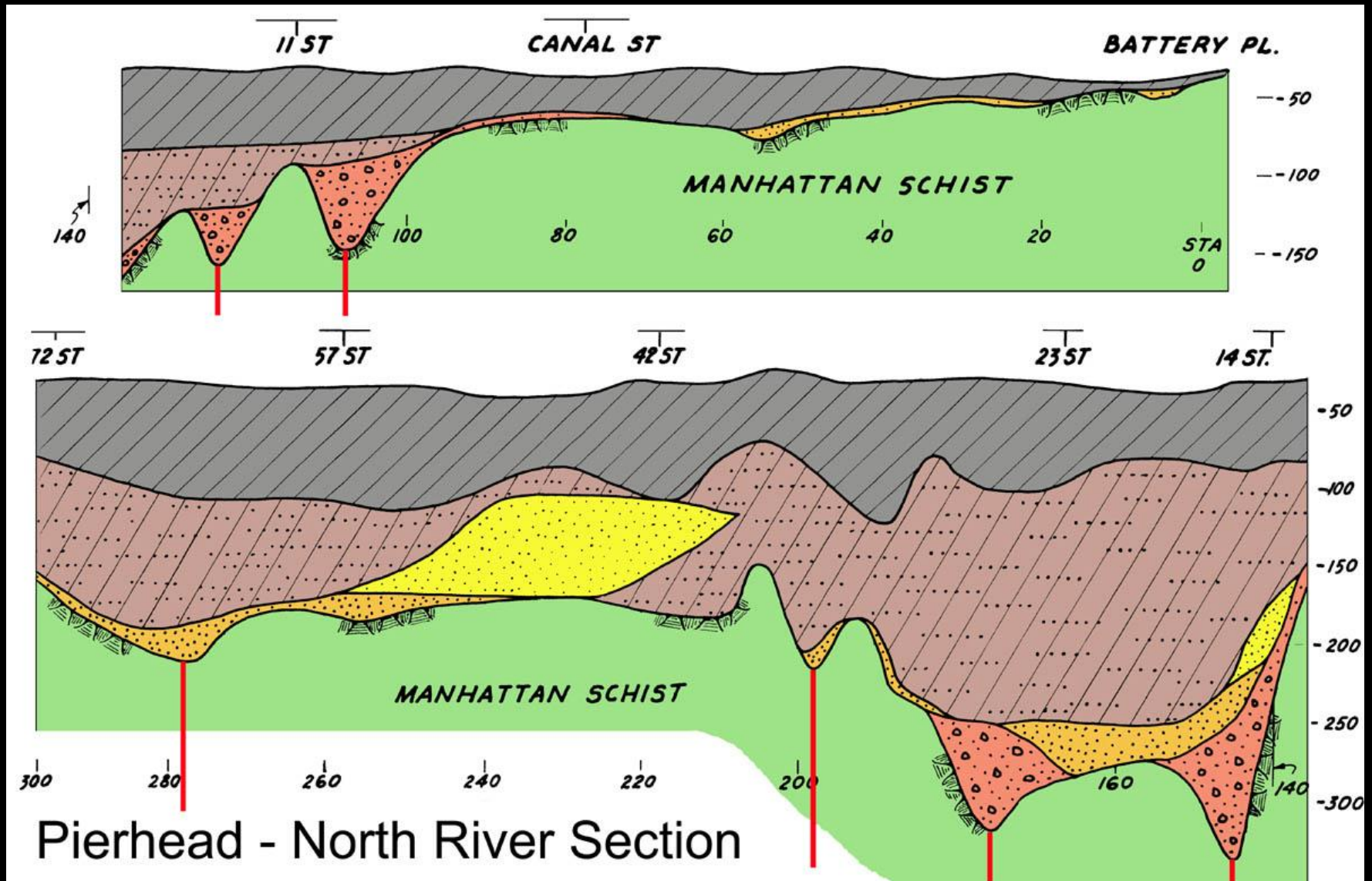
Buried Valley

**Carved By Old
Glacier**

**Backfilled by
Younger
Glaciers**

**Sites in Valley
Contain NJ
Serpentinite
In Till**

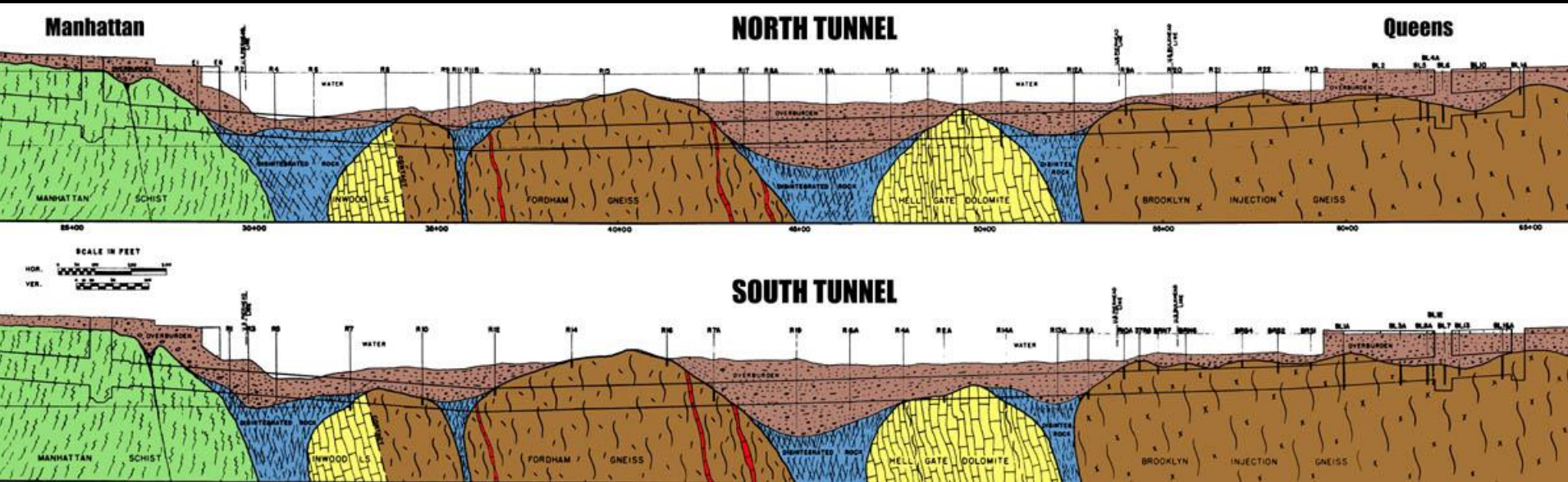
Longitudinal Profile - Manhattan



Pierhead - North River Section

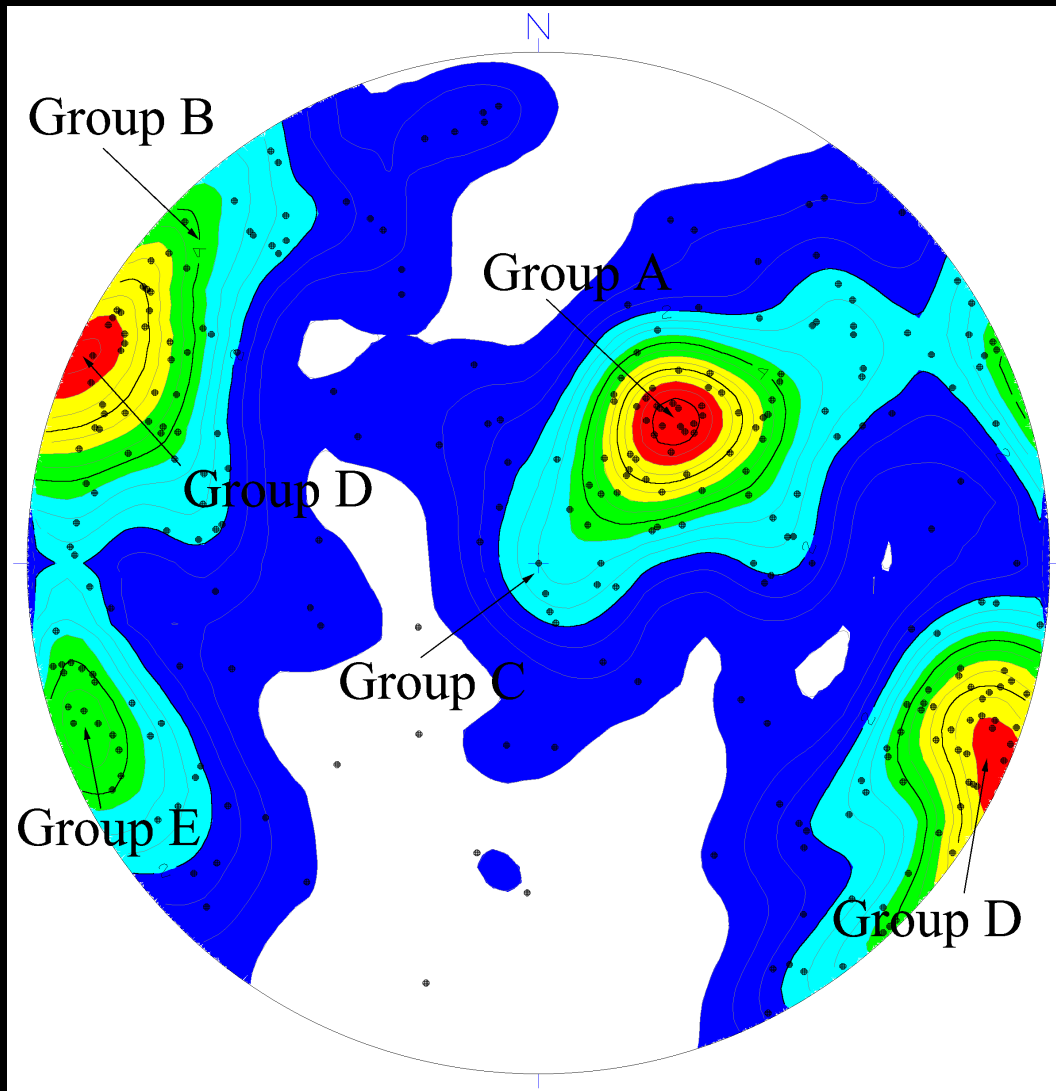
Base diagram after Mueser-Rutledge Consultants

Queens Midtown Tunnel



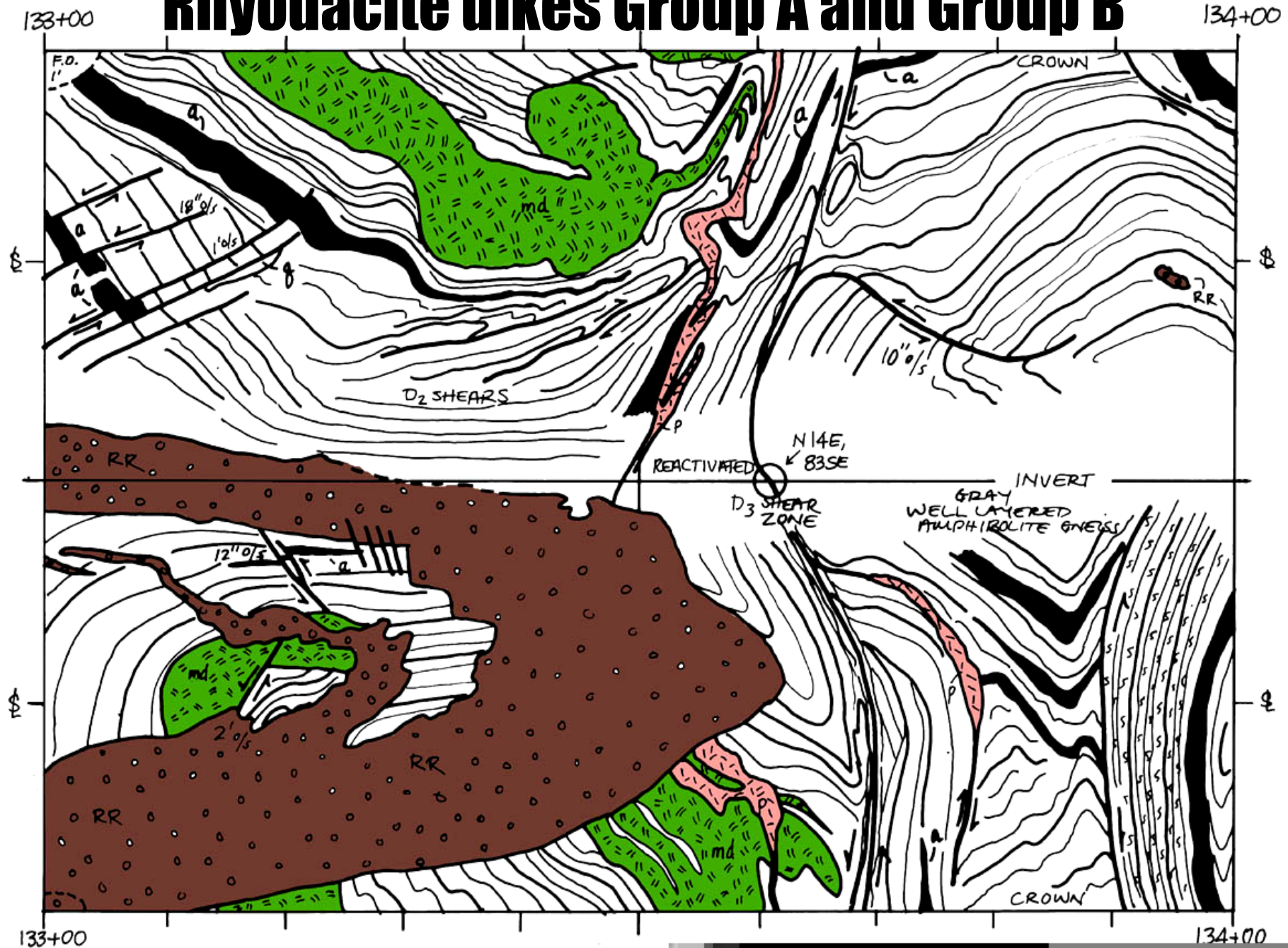
Built 1936-1940

after Berkey, 1948

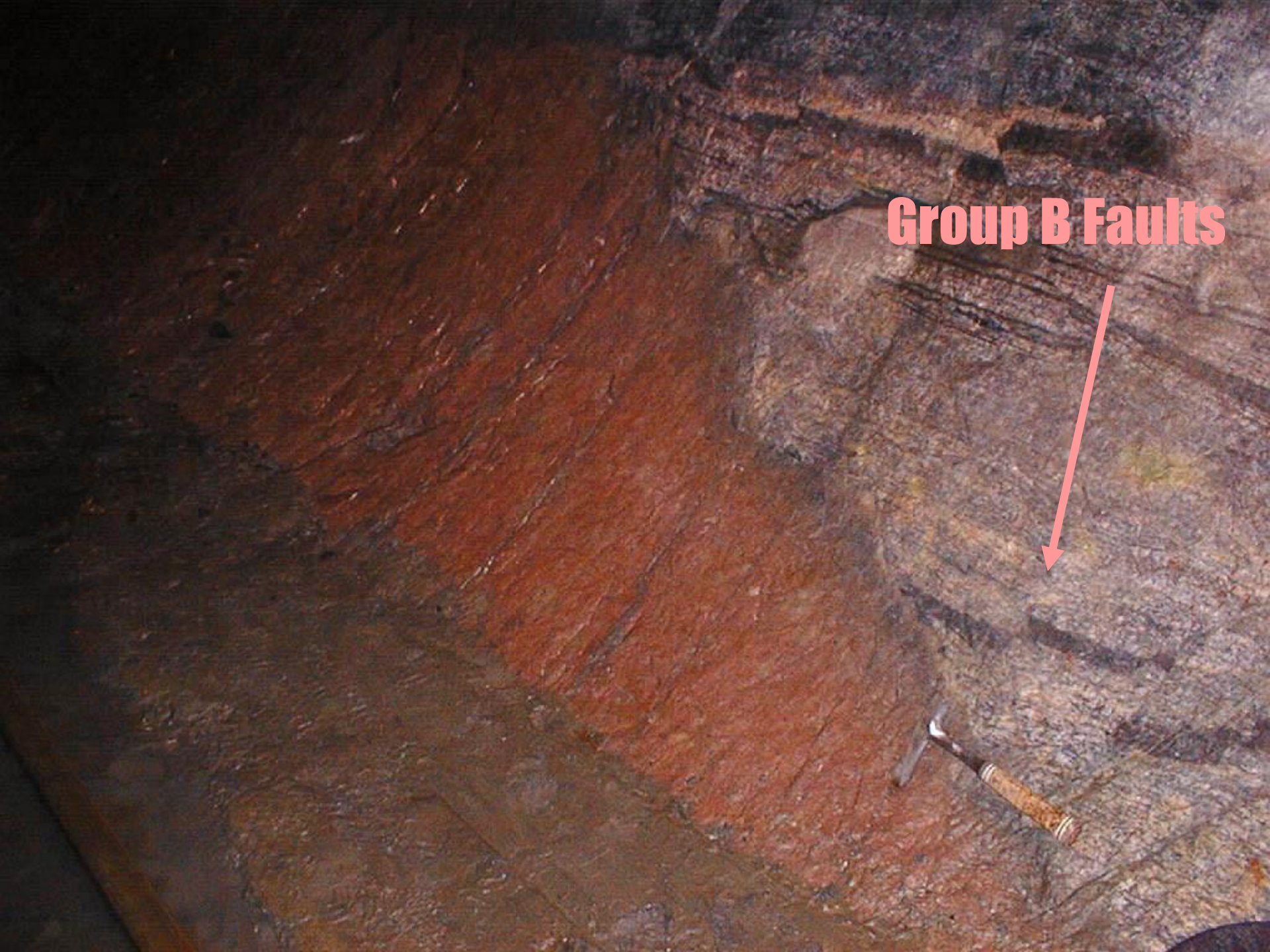


Queens Tunnel Faults

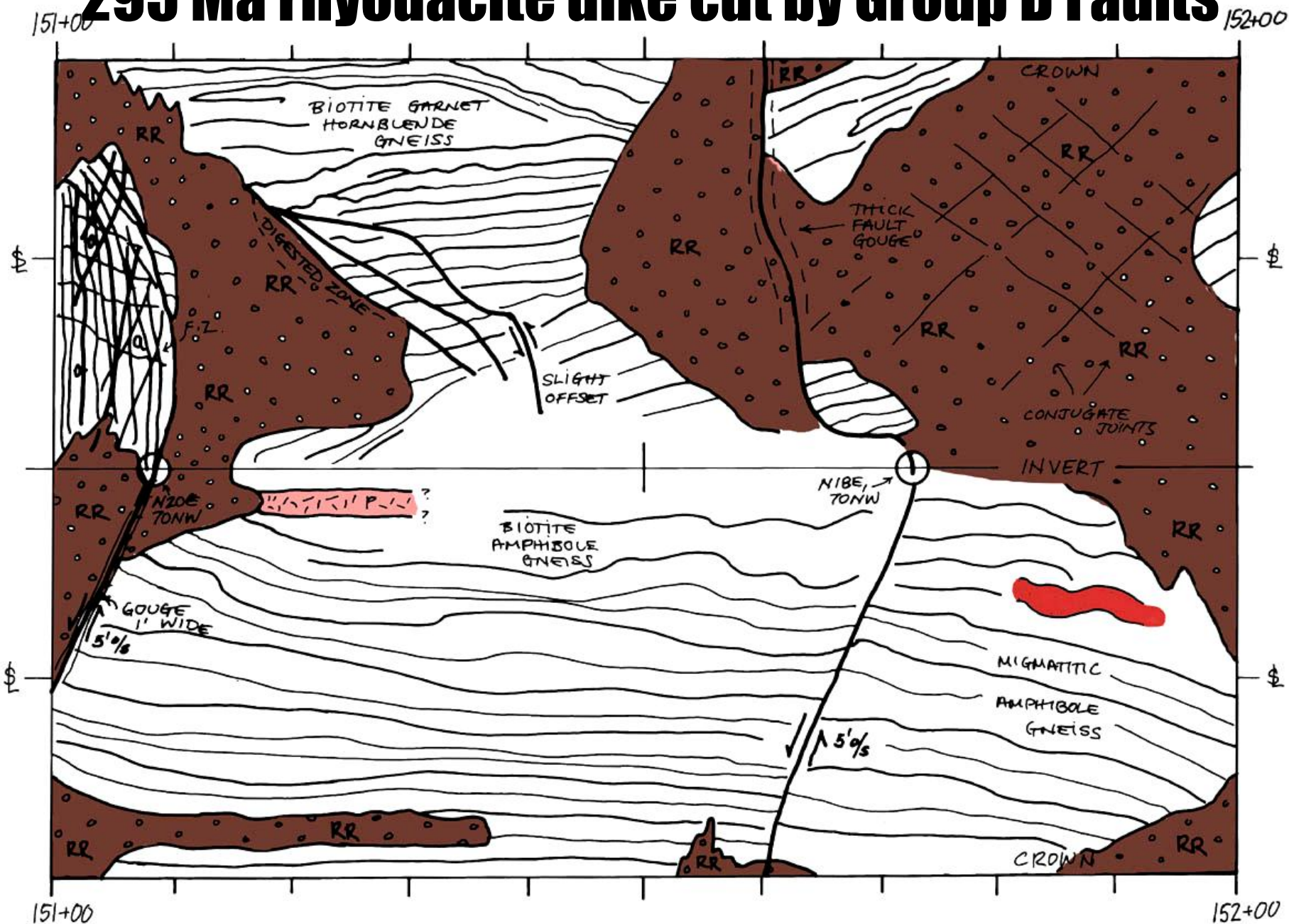
Rhyodacite dikes Group A and Group B



Group B Faults



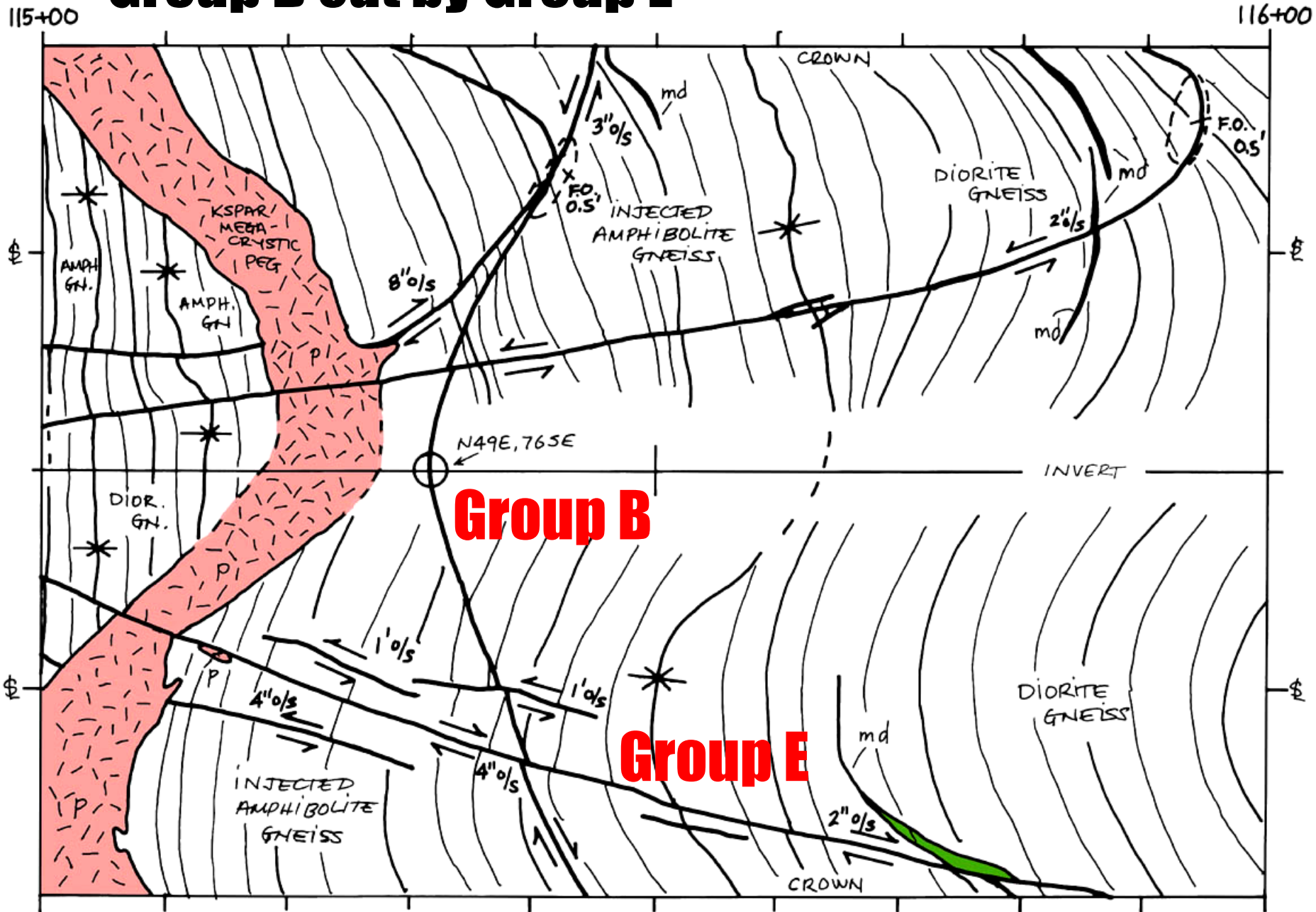
295 Ma rhyodacite dike cut by Group D Faults



NNW-Trending Fault System of Group E

- **NNW strike and steep dips**
- **R/L and L/L strike-slip offset**
- **Follow S_4 traces of open cross folds (F_4)**
- **Commonly healed with quartz +/- pyrite**
- **Youngest fault group – they cut all tunnel structures**
- **Reactivate many older faults**
- **Persistent features in NW-leg of tunnel**
- **Associated with areas of stress relief**
- **Produce wet zones in areas of fault convergence**

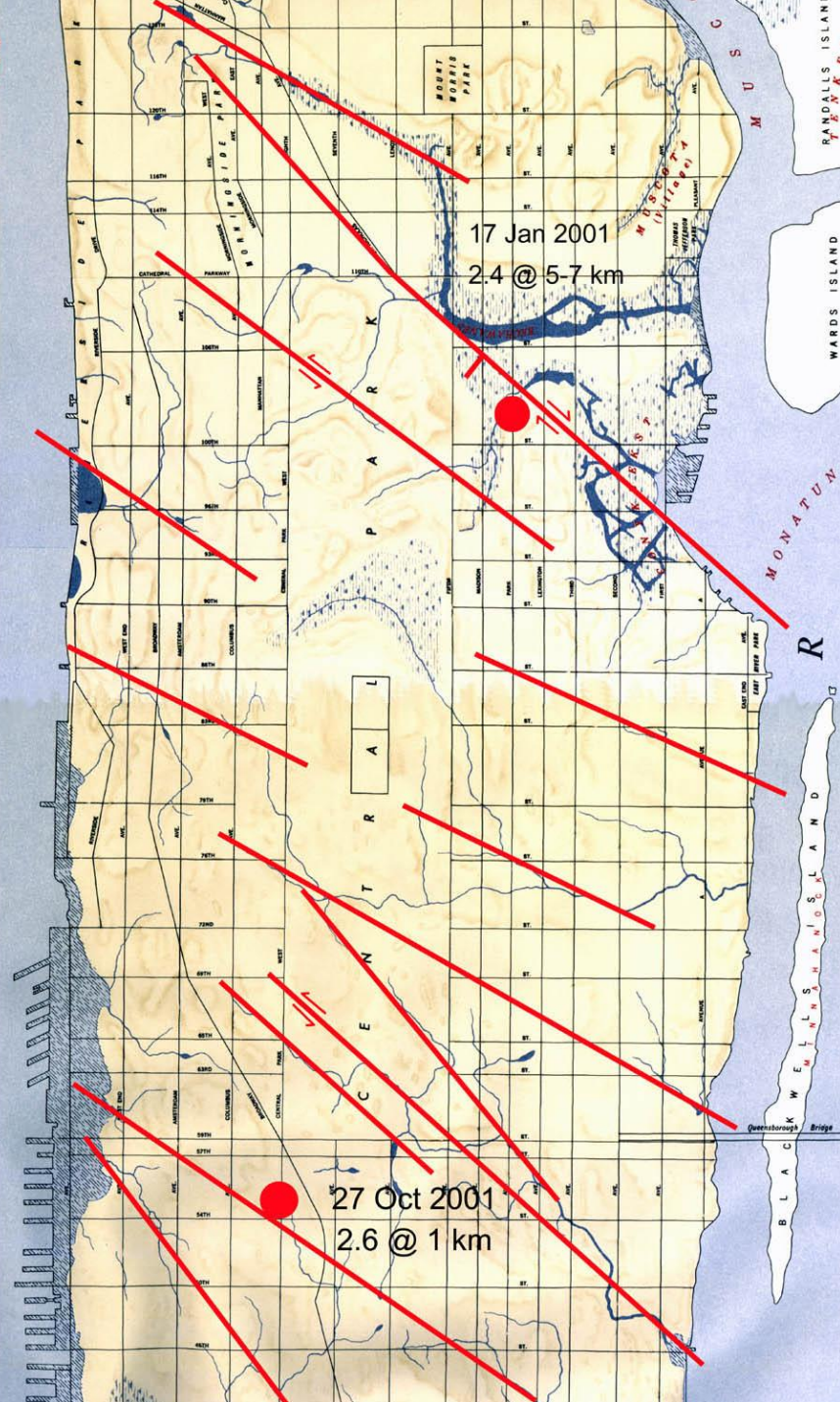
Group B cut by Group E



Crown Failure in Overstressed Rock

Queens Tunnel Sta. 253+40





**Manhattan
Schist**

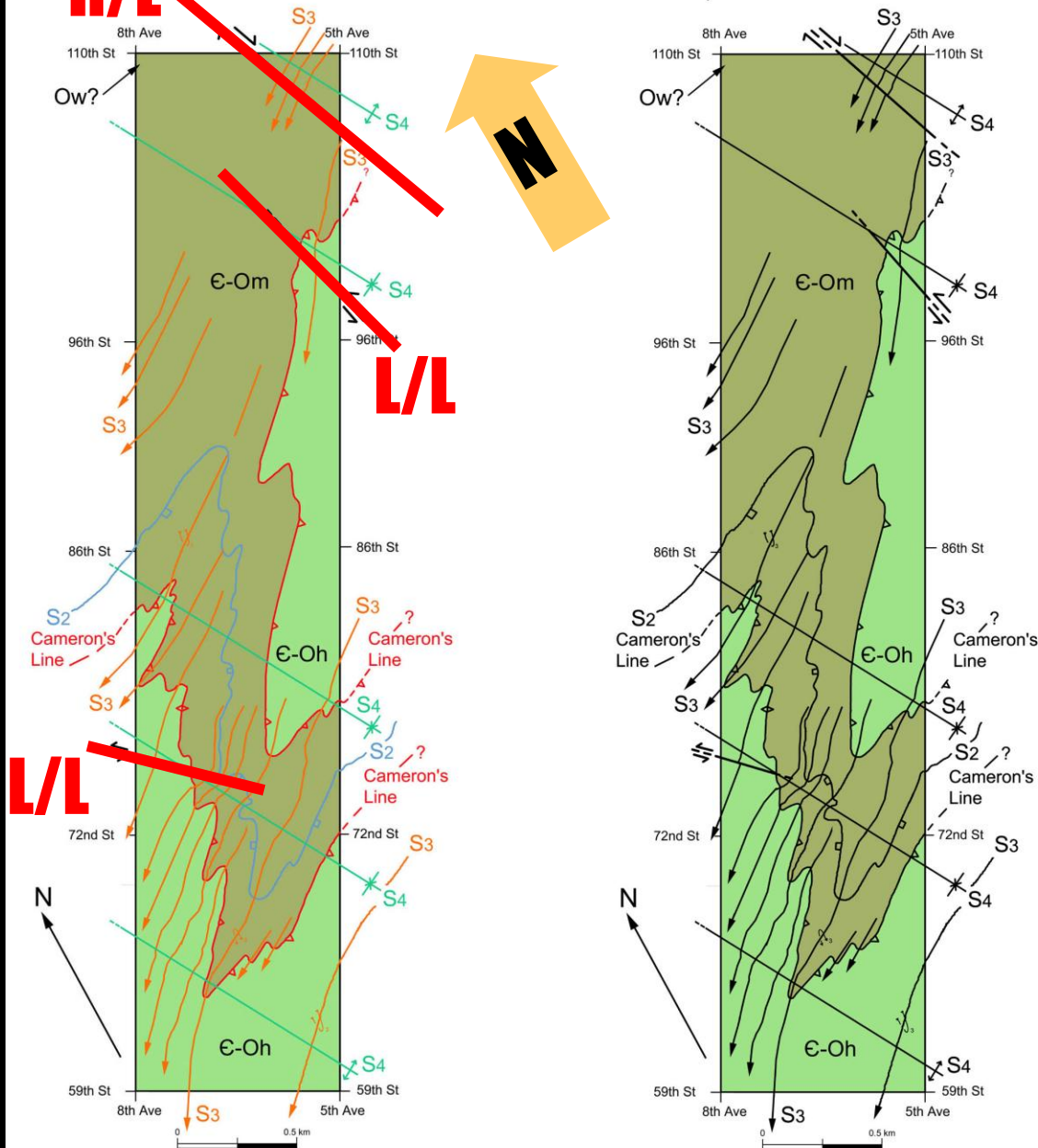
**Offsets F_3
Syncline**

N537

Group E - N12°W, L/L Fault



PRELIMINARY GEOLOGICAL MAP OF CENTRAL PARK, NYC



Group E Faults In Central Park

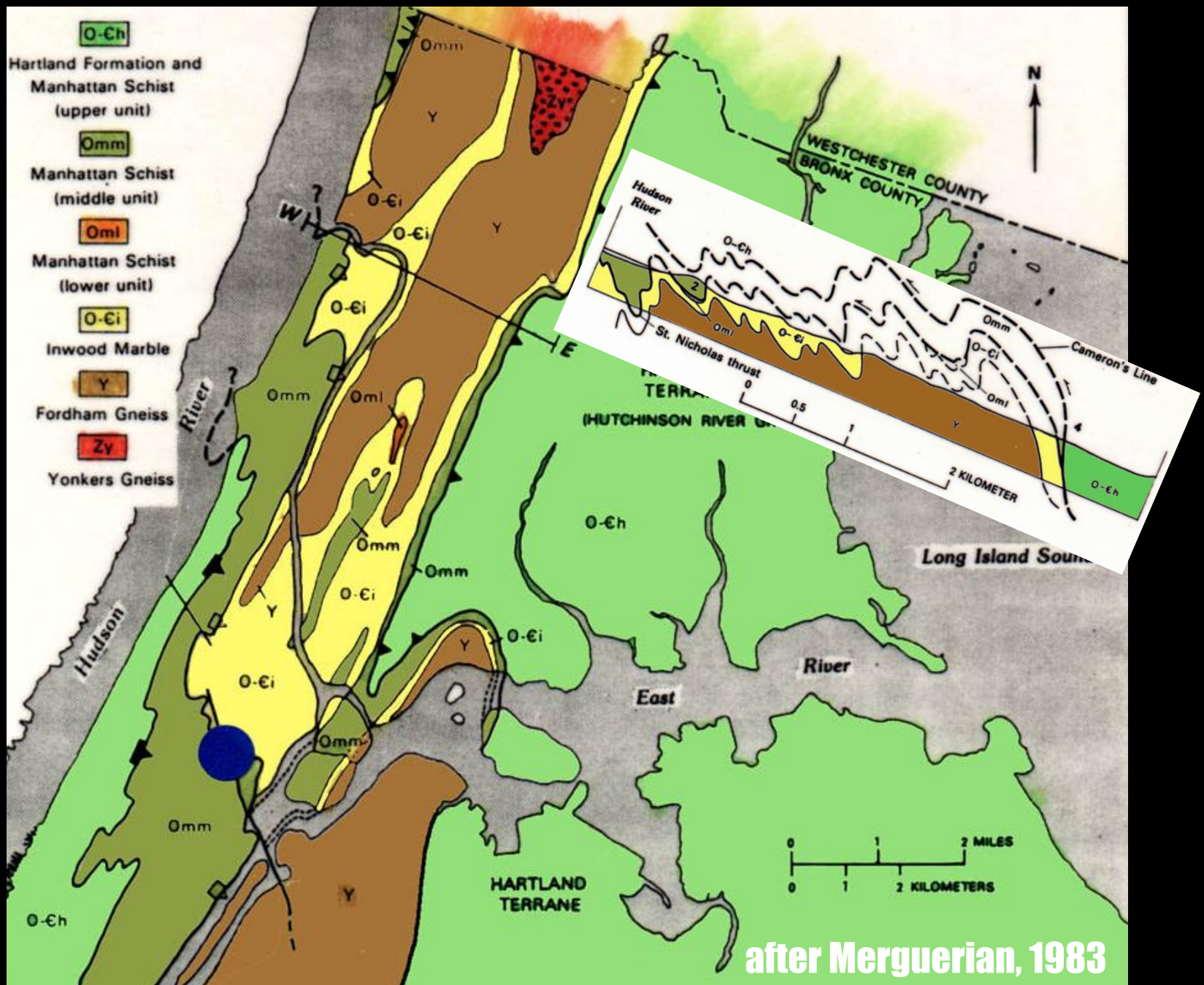
**Merguerian and
Merguerian, 2004**

Group E - N45°W, 80°S L/L Fault



N296 Hartland Fm

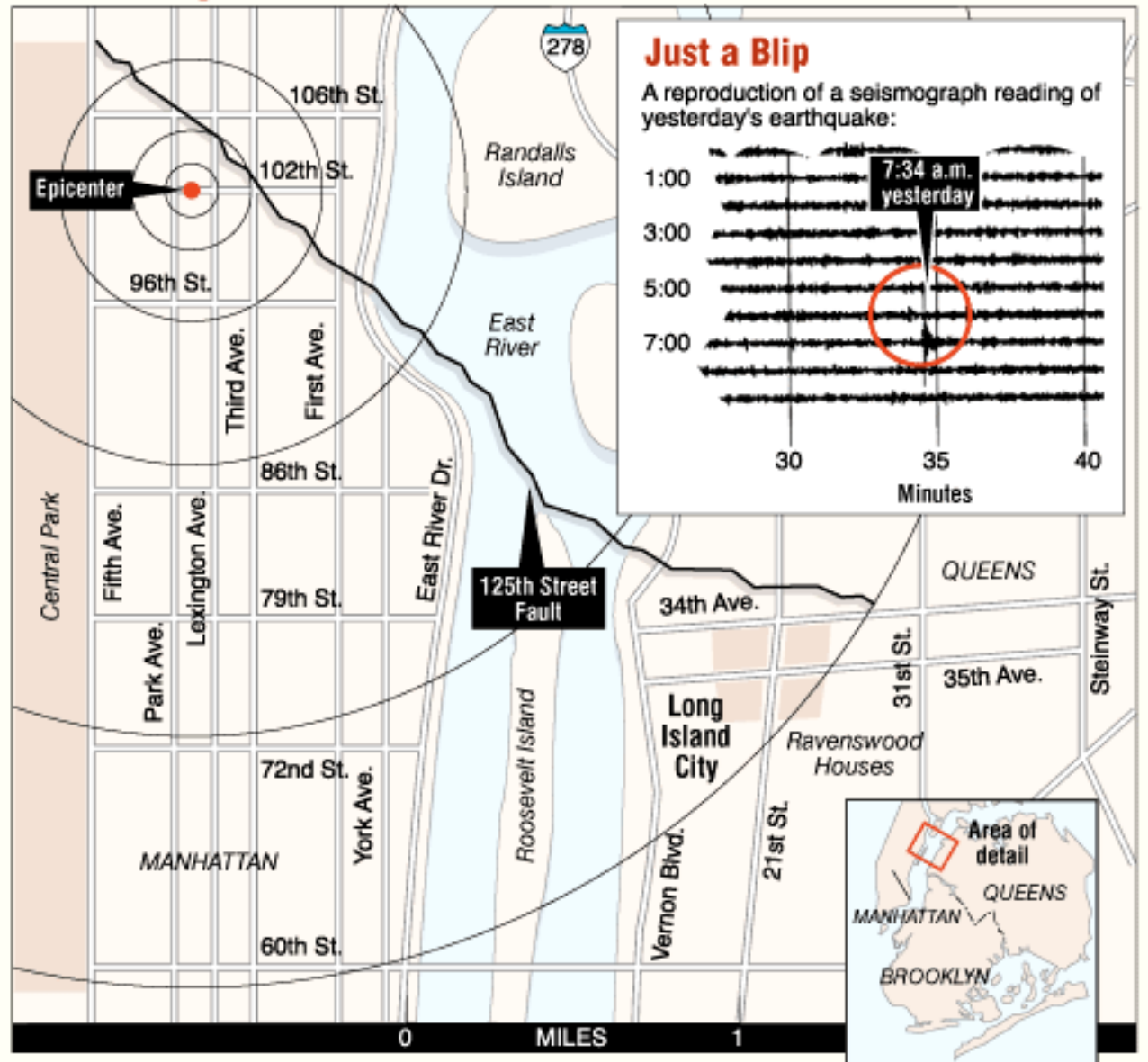




17 January 2001, M = 2.4

A Morning Jolt

The epicenter of yesterday's earthquake and a look at the 125th Street fault; believed to be where the quake occurred.



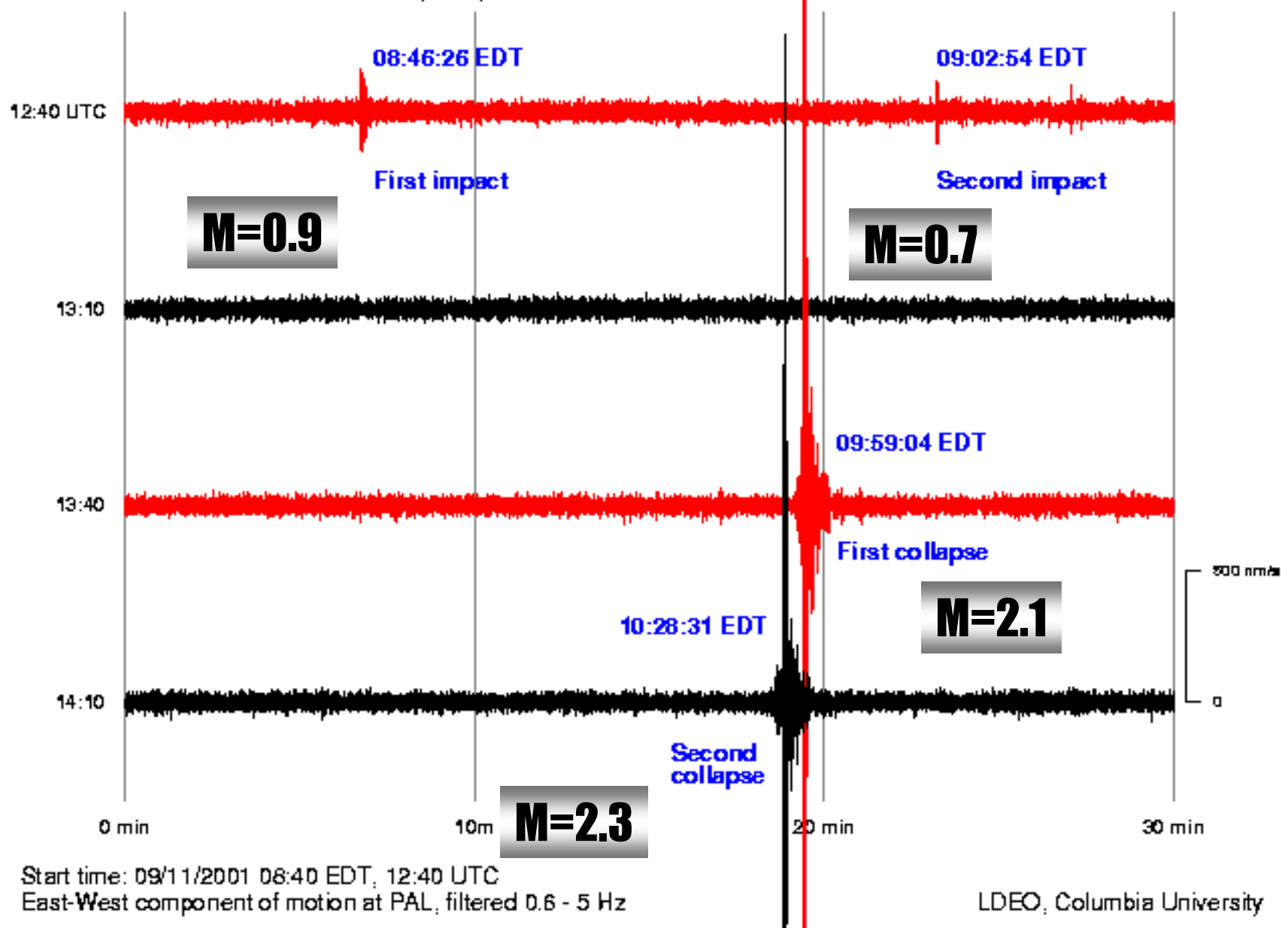
27 October 2001; M = 2.6



11 Sept 2001



Seismic Record at Palisades, NY, 34 km North of the World Trade Center Disaster





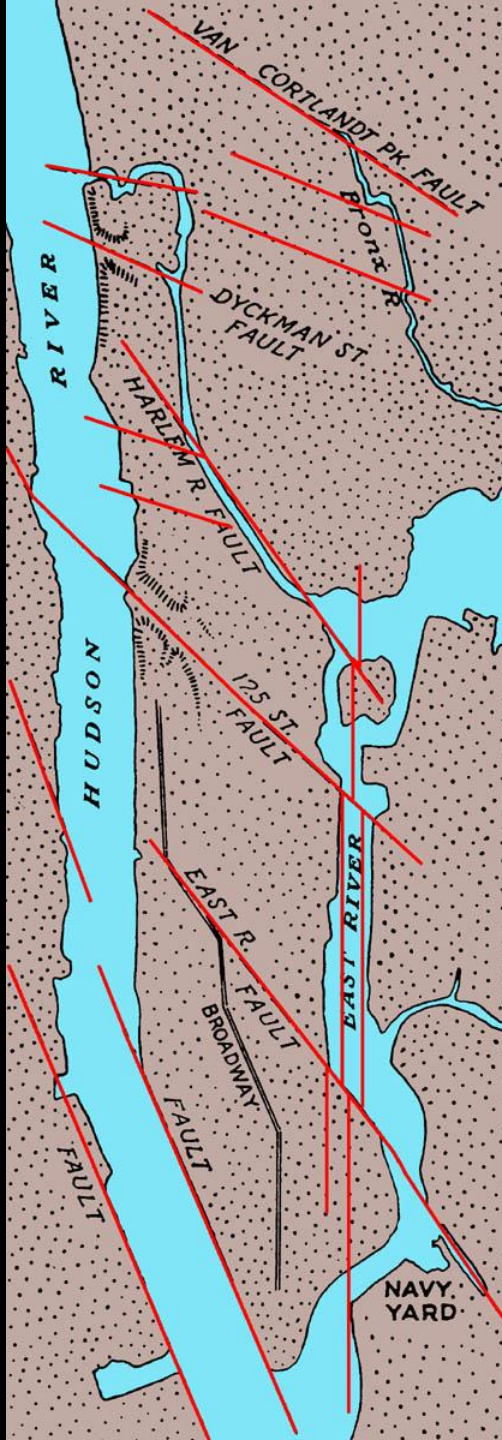
It's Not My Fault! He put me up to this!

125th Street Manhattanville Fault



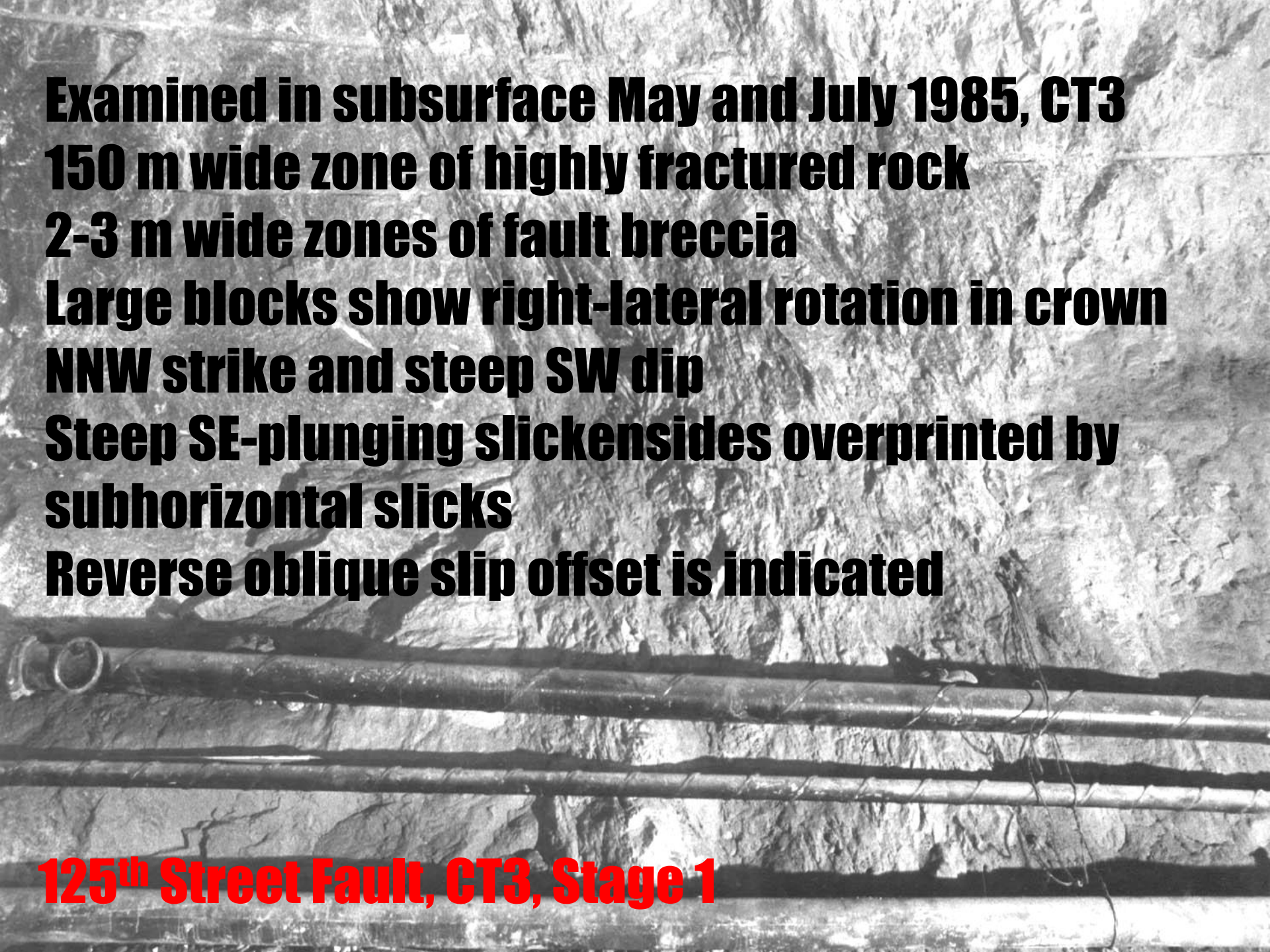
Charles Merguerian

Group E Faults





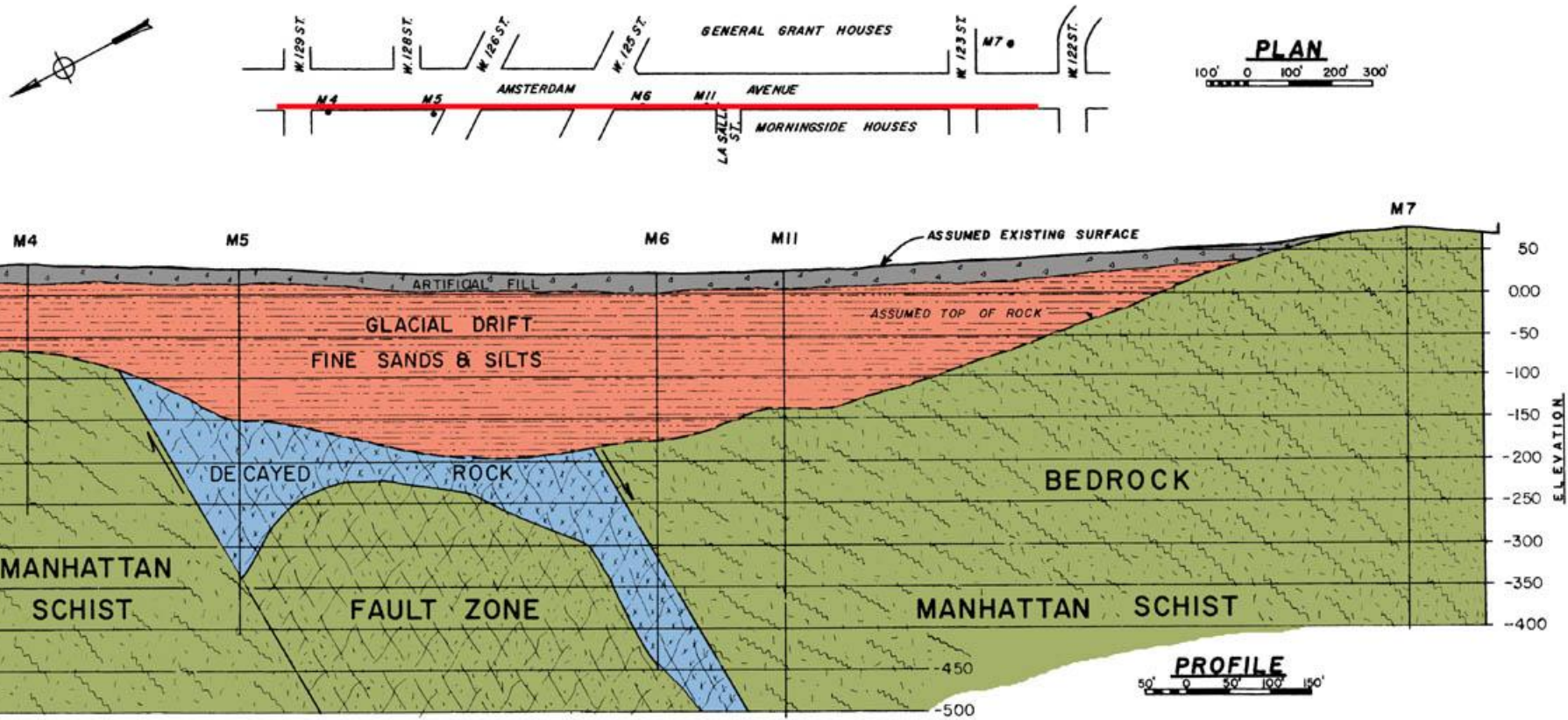
125th Street Fault, CT3, Stage 1



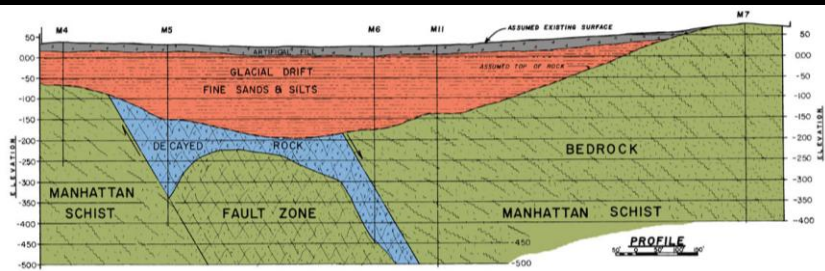
Examined in subsurface May and July 1985, CT3
150 m wide zone of highly fractured rock
2-3 m wide zones of fault breccia
Large blocks show right-lateral rotation in crown
NNW strike and steep SW dip
Steep SE-plunging slickensides overprinted by
subhorizontal slicks
Reverse oblique slip offset is indicated

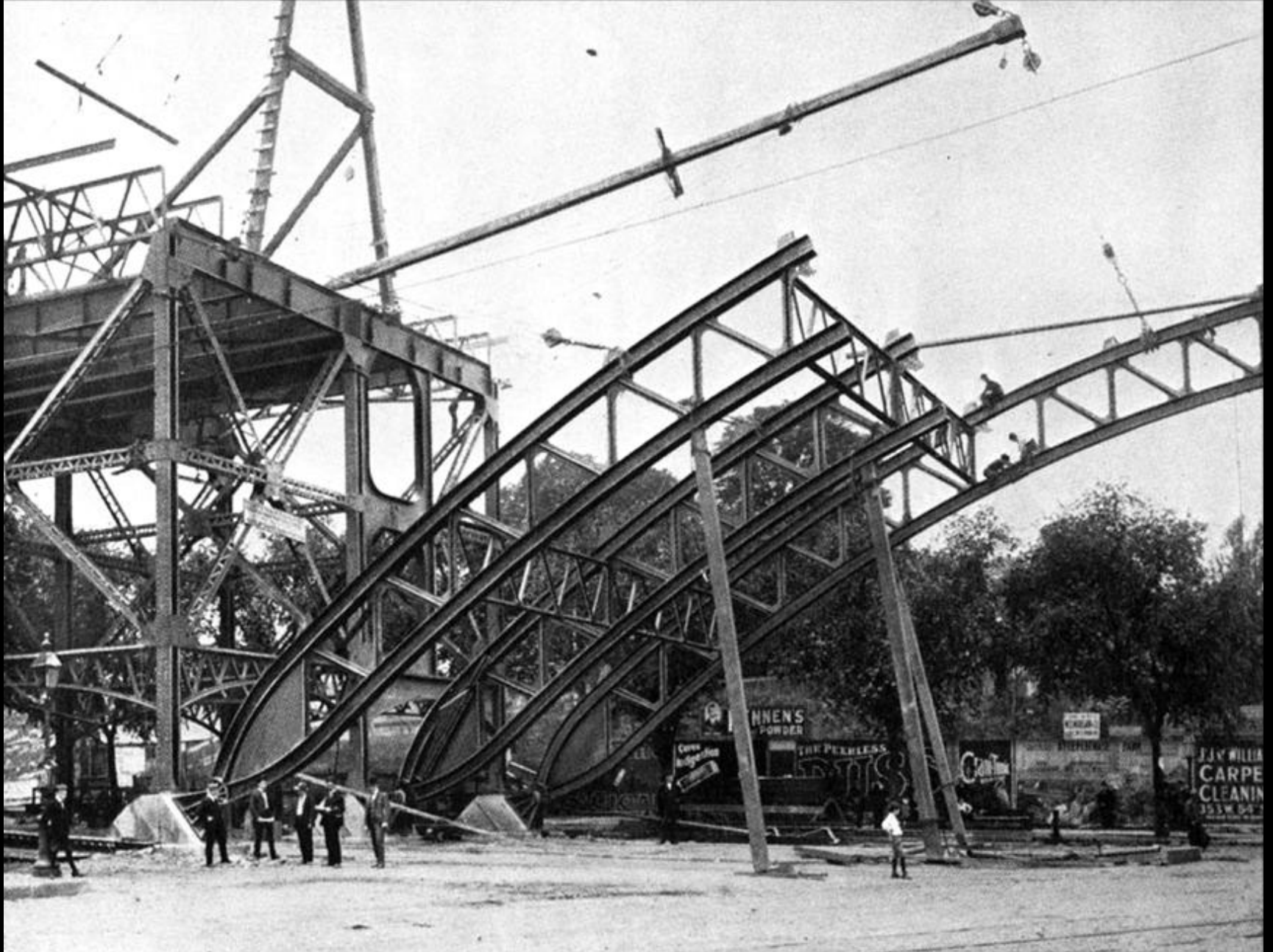
125th Street Fault, CT3, Stage 1

Manhattanville “125th Street” Fault



View North on Amsterdam Avenue into 125th Valley





Manhattanville Bridge Construction, circa 1898

Manhattanville Bridge, circa 1900













IRT 117th Street and Broadway





DESPATCH
MOVING & STORAGE
283-2800
North Avenue

FedEx

DO NOT
STOP
AT
ANY
TIME
EMERGENCY
ONLY

WALK

Jeep





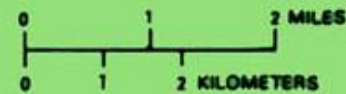
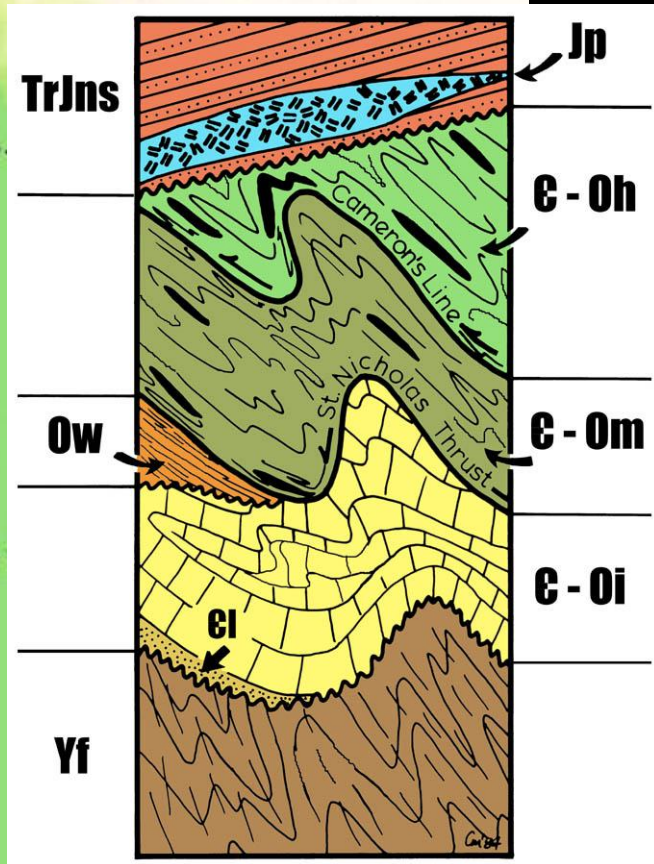
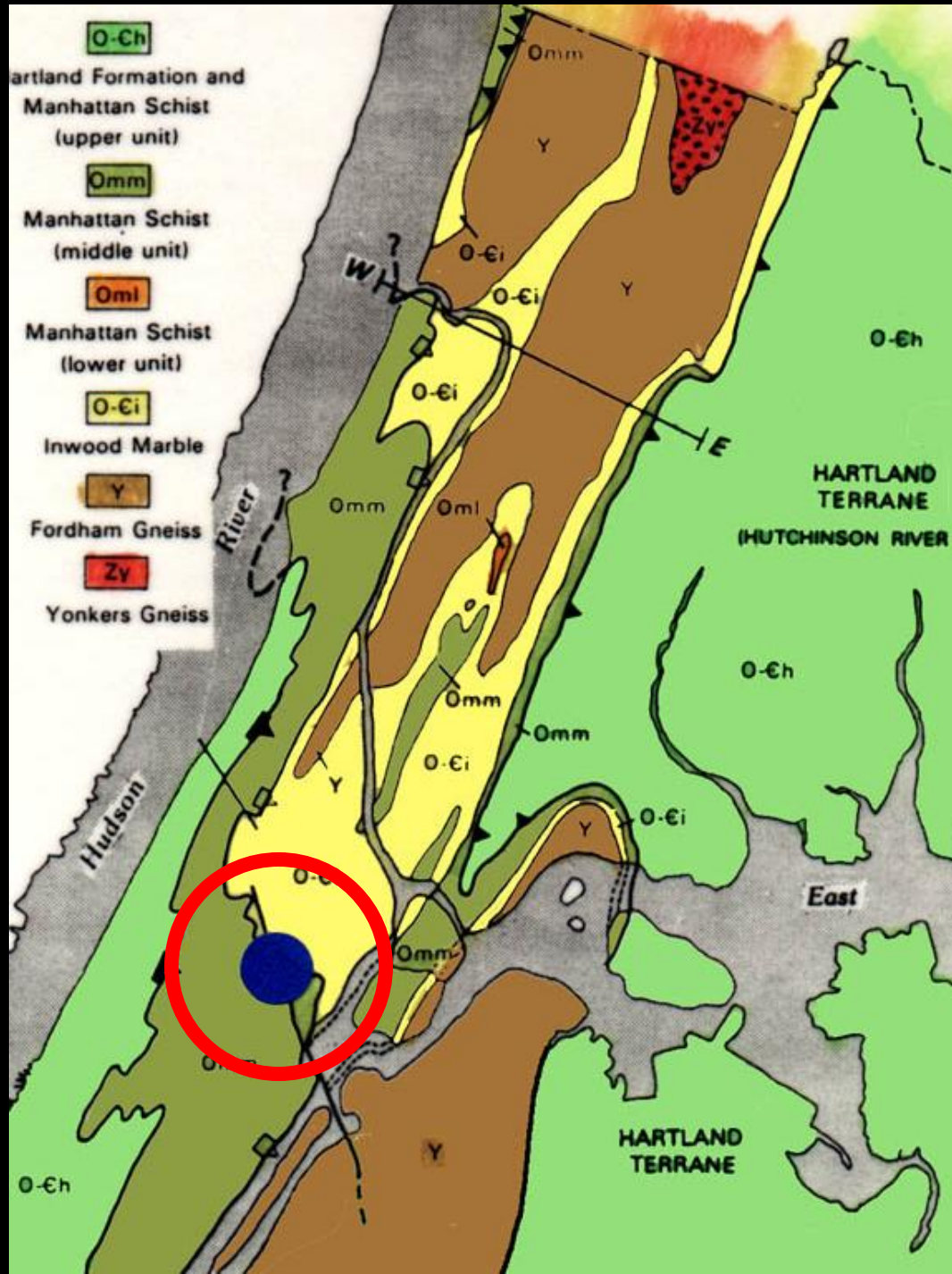


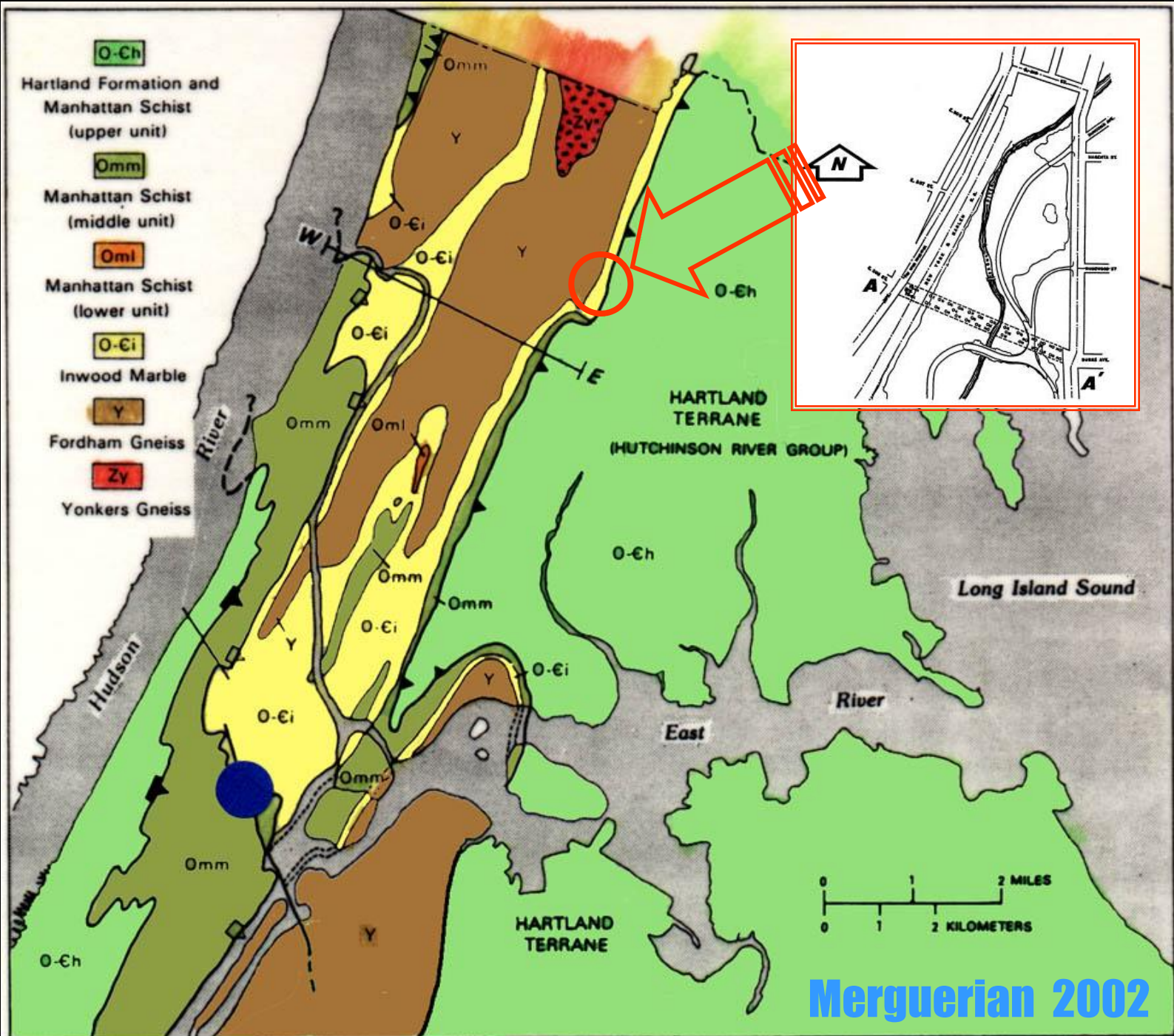
H&R BLOCK

3200 BROADWAY

Expect Fair

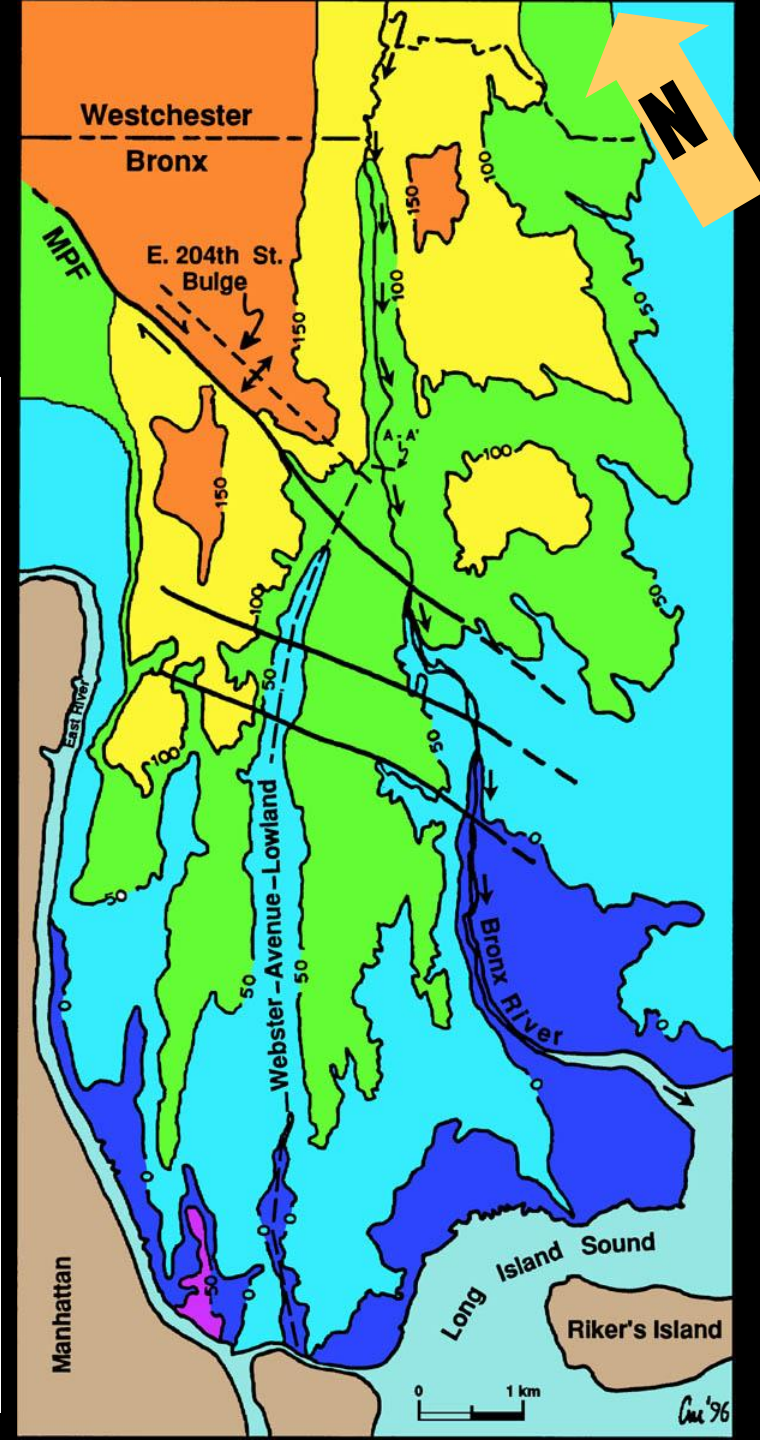
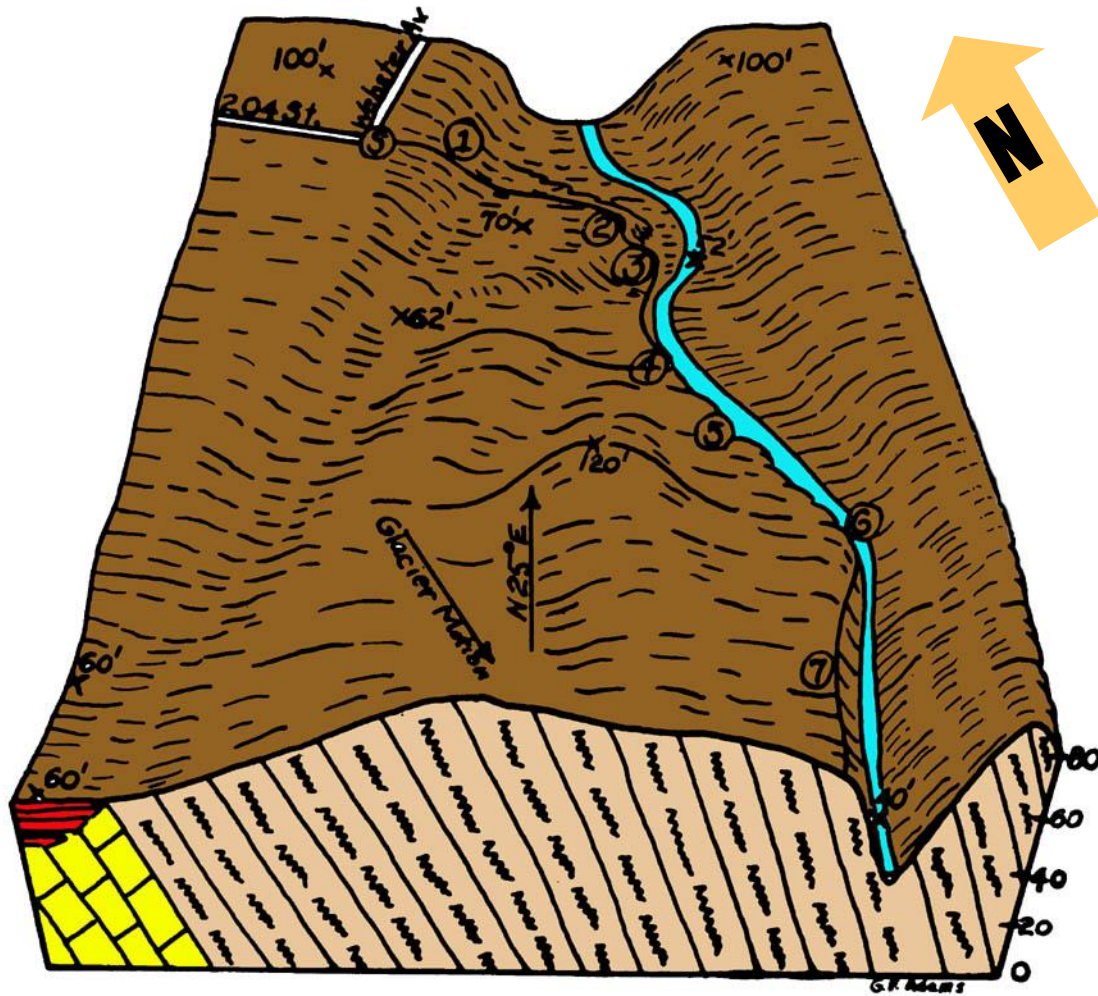




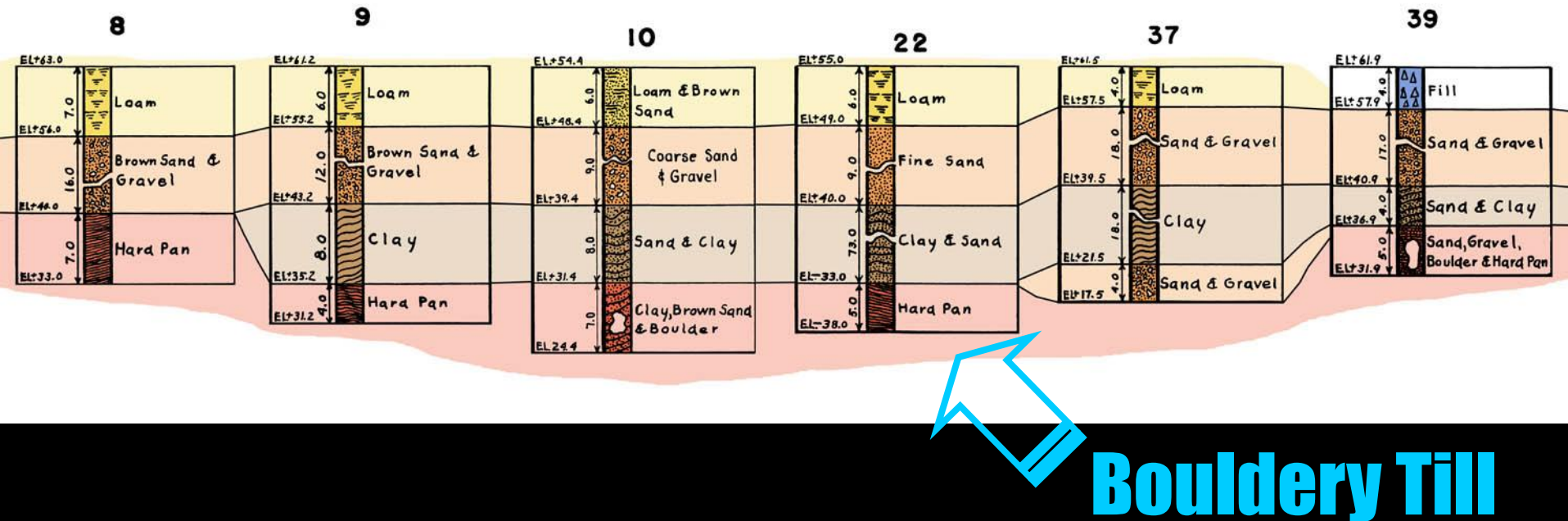


Merguerian 2002

Bronx River Drainage Anomaly



Burke Avenue Profile – Bronx WPA

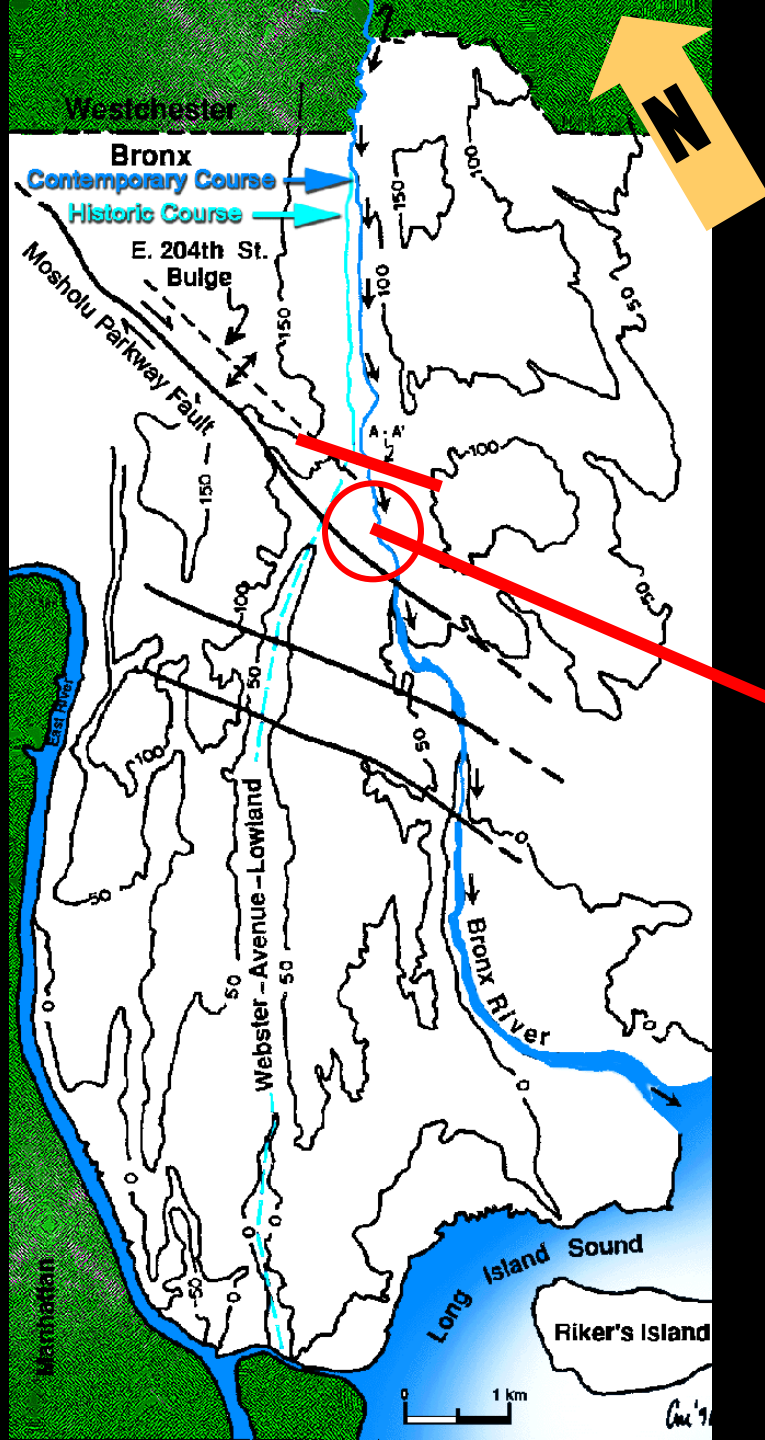


Stratified Lake Sediment Overlie Glacial Drift
Supports Hypothesis that Damming of Bronx River
was Post-Glacial

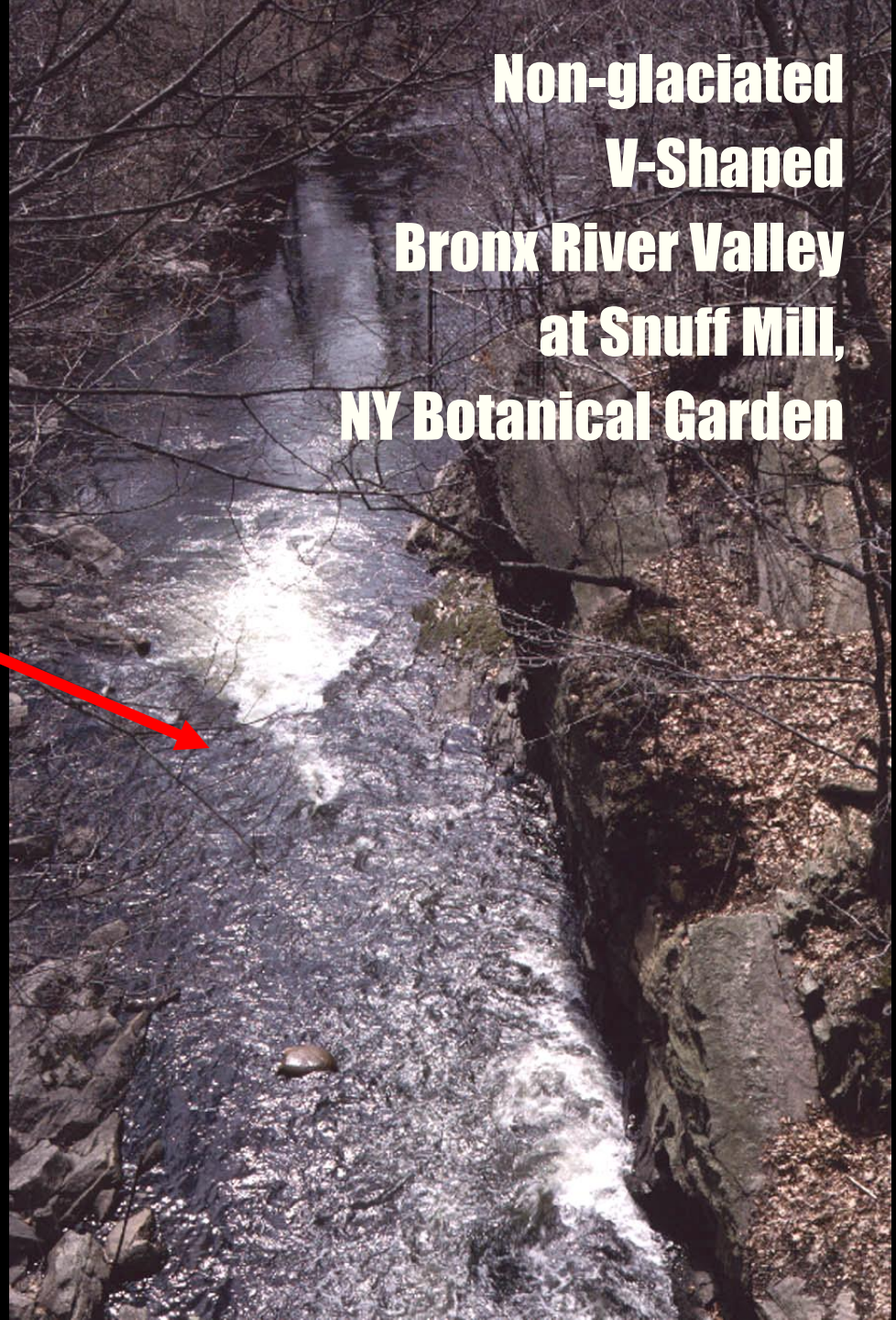


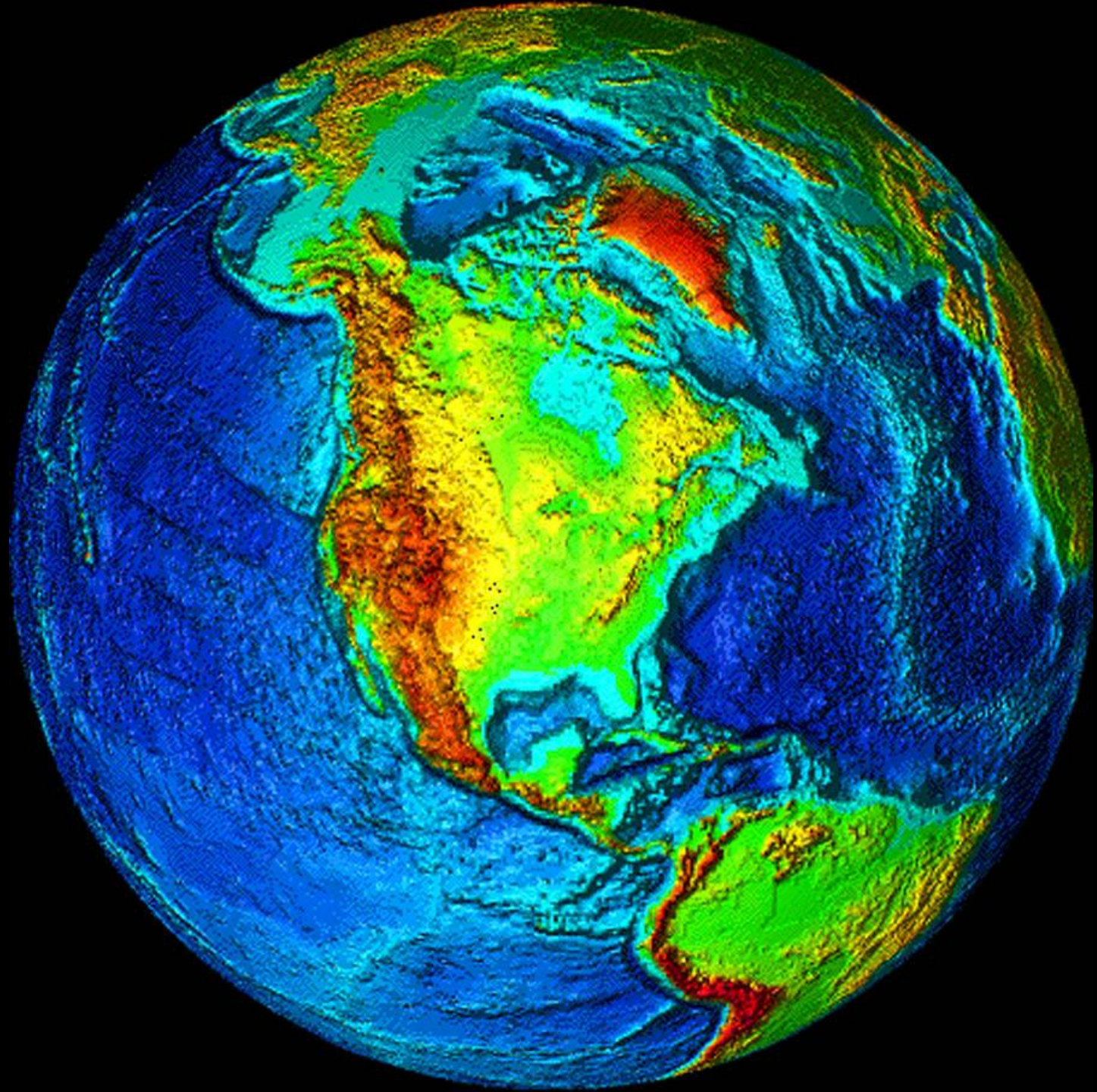
**NW-Trending
Joints**

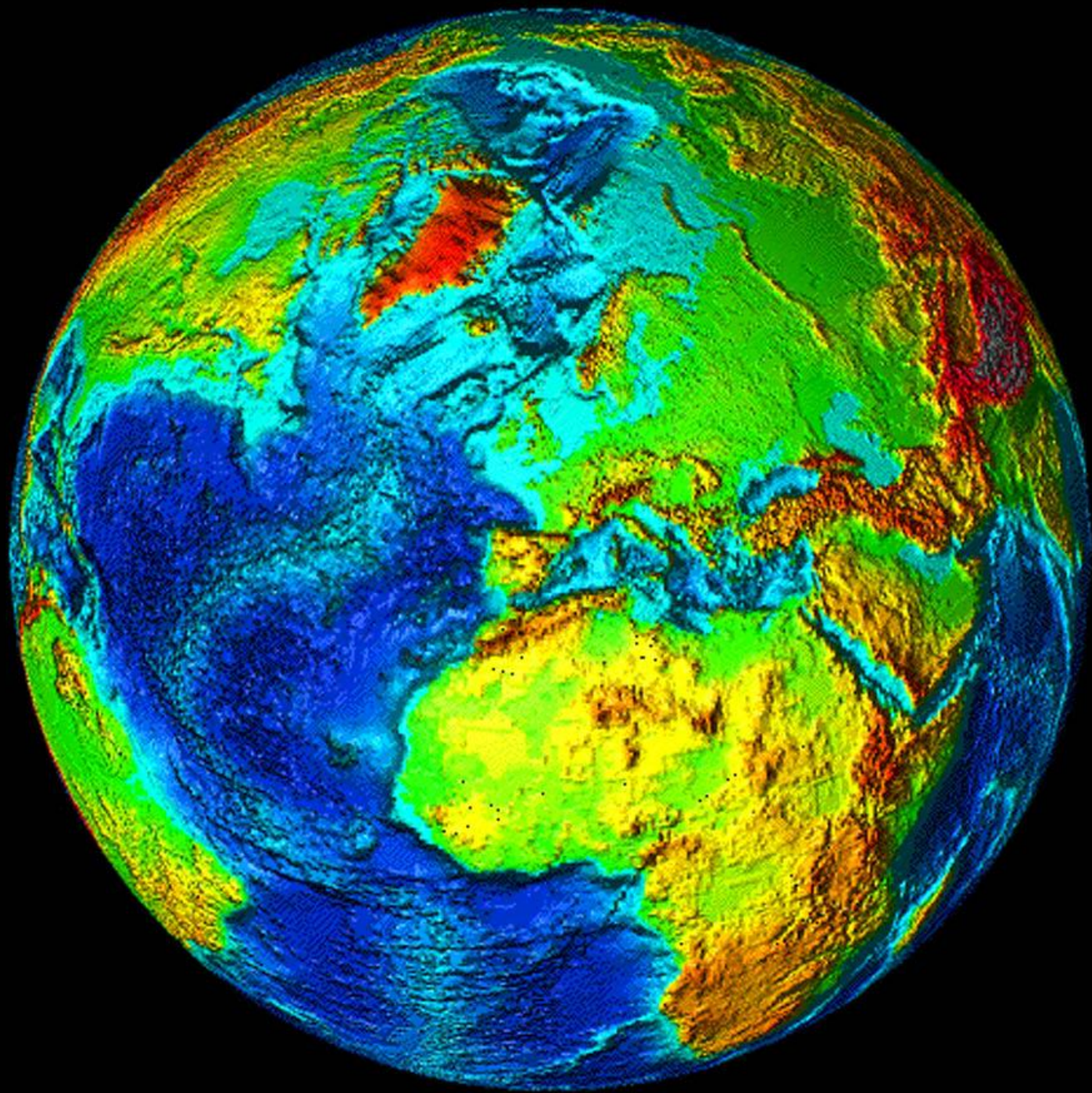
NW Joints, Moshulu Fault, Bronx, NY



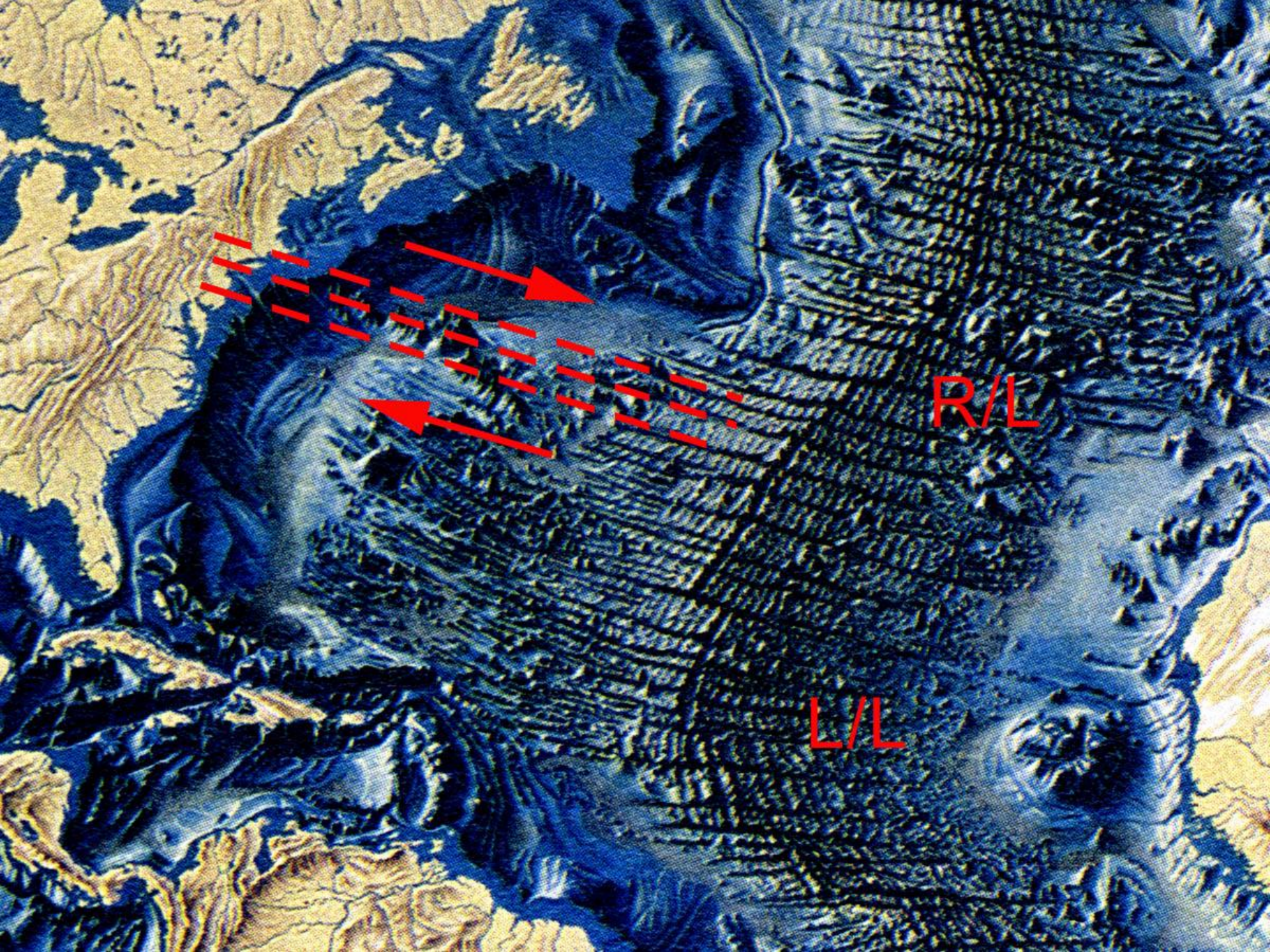
**Non-glaciated
V-Shaped
Bronx River Valley
at Snuff Mill,
NY Botanical Garden**











R/L

L/L



New York City Earthquake Can it Happen Here?

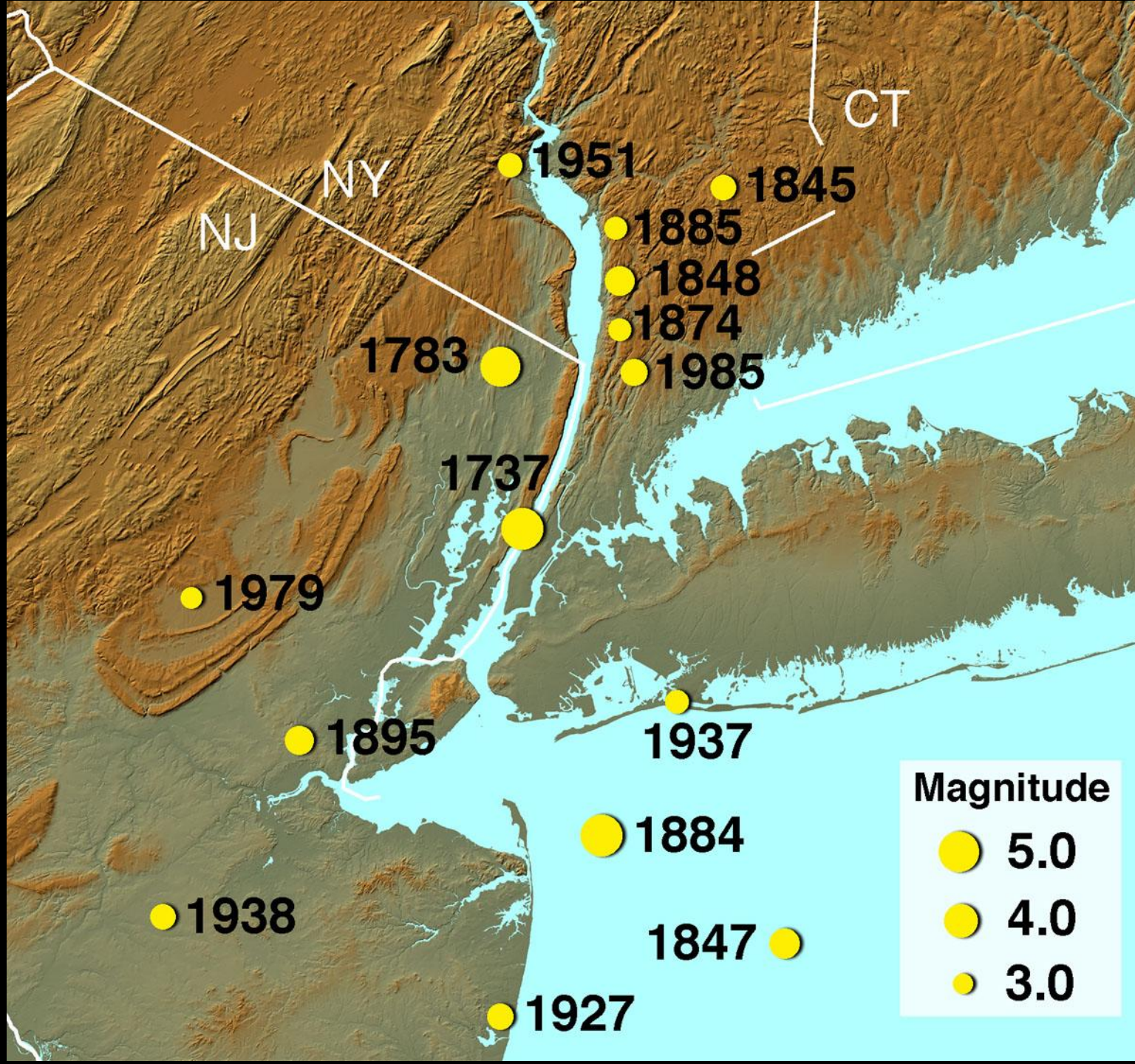
1737 **5.2**

1783 **4.9**

1884 **5.2**

20?? **?**







**How Well Will
NYC Withstand
A Moderate
Earthquake?**

How is NYC Built?



Download Geology Publications:
www.hofstra.edu
www.dukelabs.com

**What's That
Shaking?**



EXTRA SLIDES

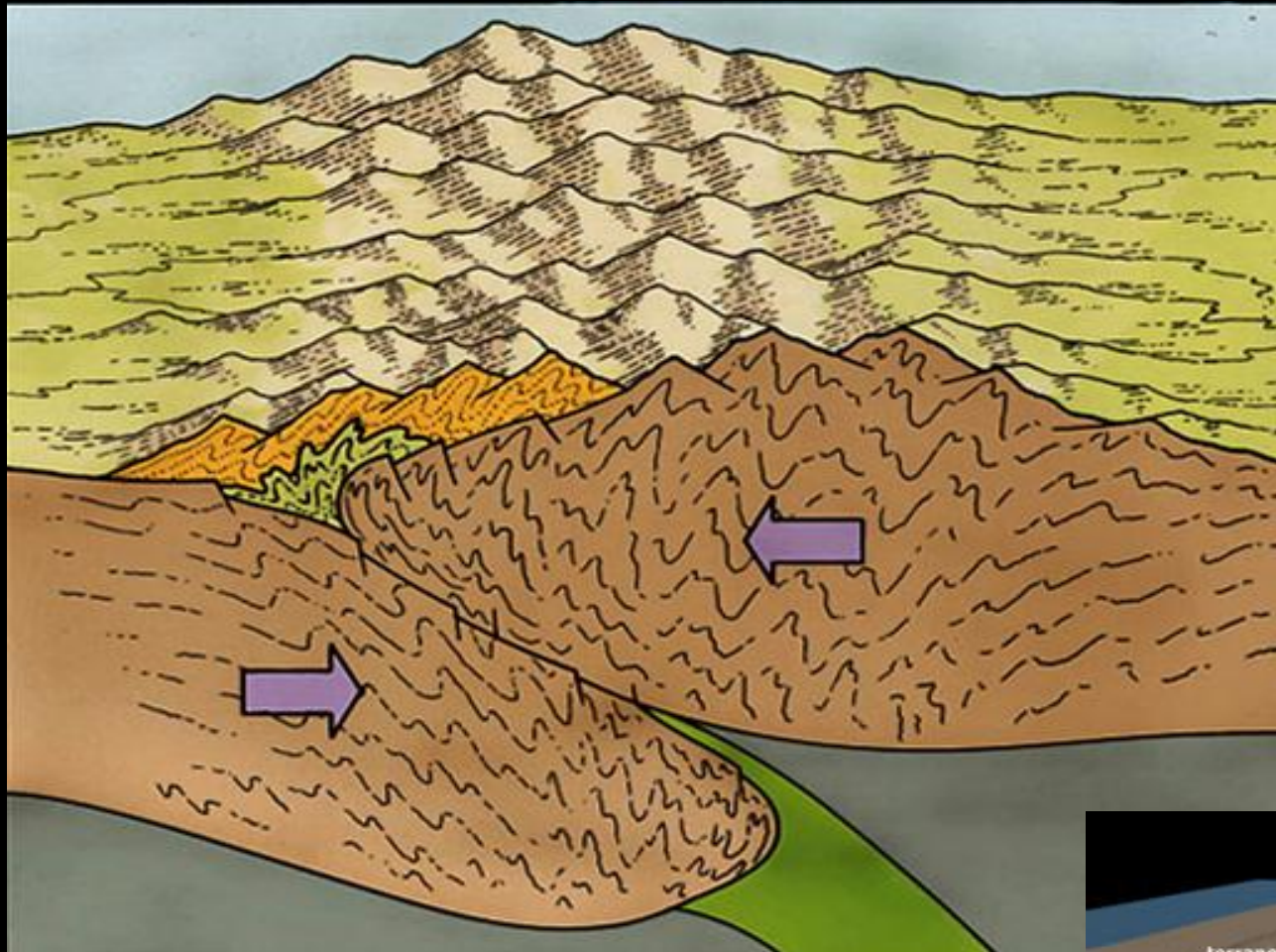
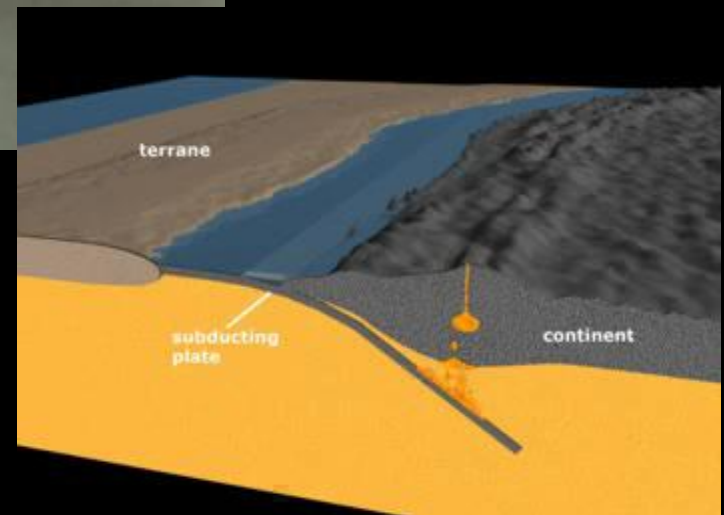


Plate Collisions





Late Paleozoic Bedrock Features

NW Joints, Mosholu Fault, Bronx, NY

NW-Trending
Joints



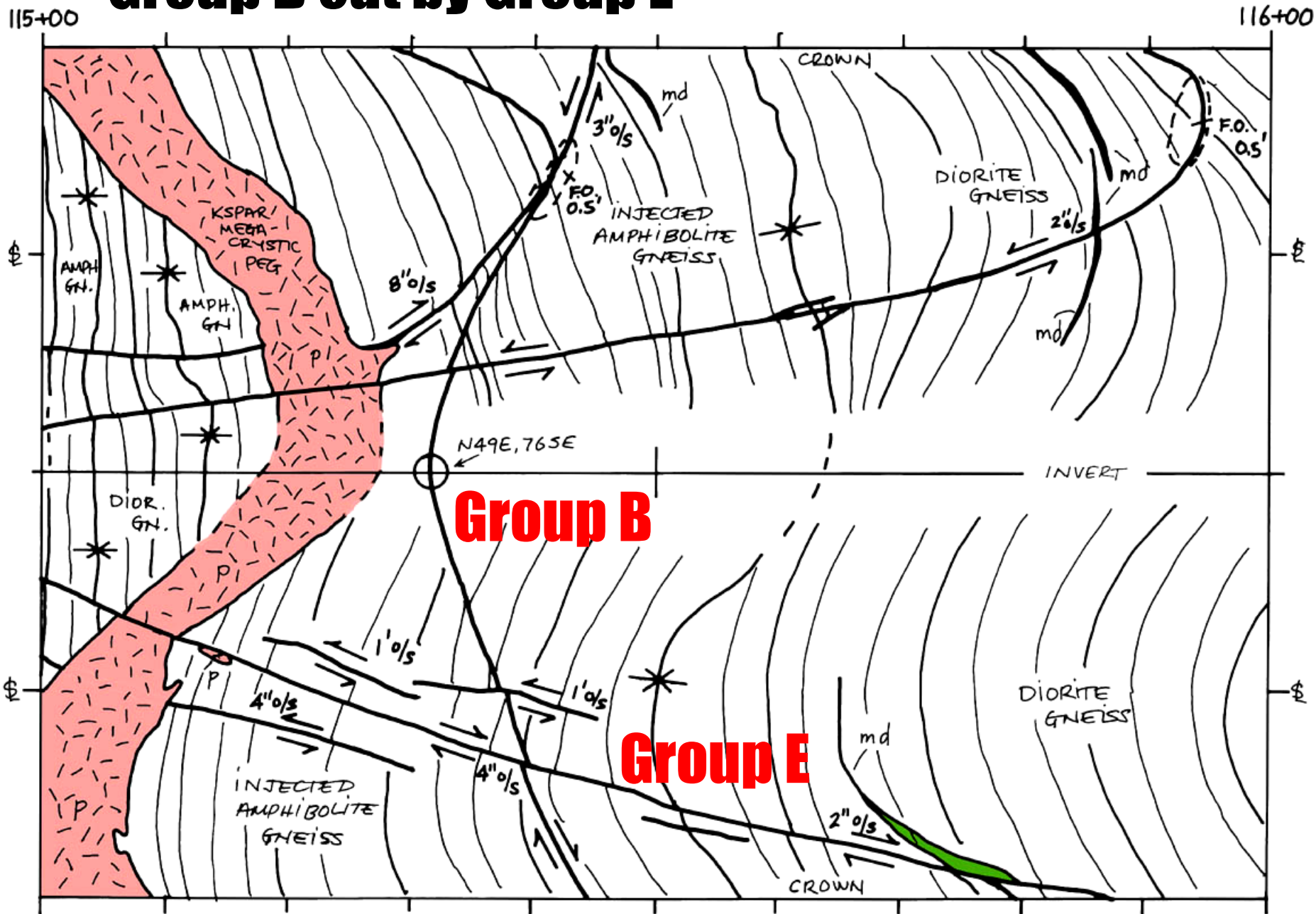
NNW-Trending “Manhattanville” Strike-Slip Faults

**Splays and Conjugate
Joints**

Queens Tunnel Sta. 75+85



Group B cut by Group E



Crown Failure in Overstressed Rock

Queens Tunnel Sta. 253+40





N569 Mylonitic C0m



Retrograde Muscovite after Kyanite



N42°E-Trending Left-Lateral Fault, South Twin Is., NY





N66°W R/L Fault, So. Twin Is., NY