

The Narrows Flood - Post-Woodfordian Meltwater Breach of the Narrows Channel

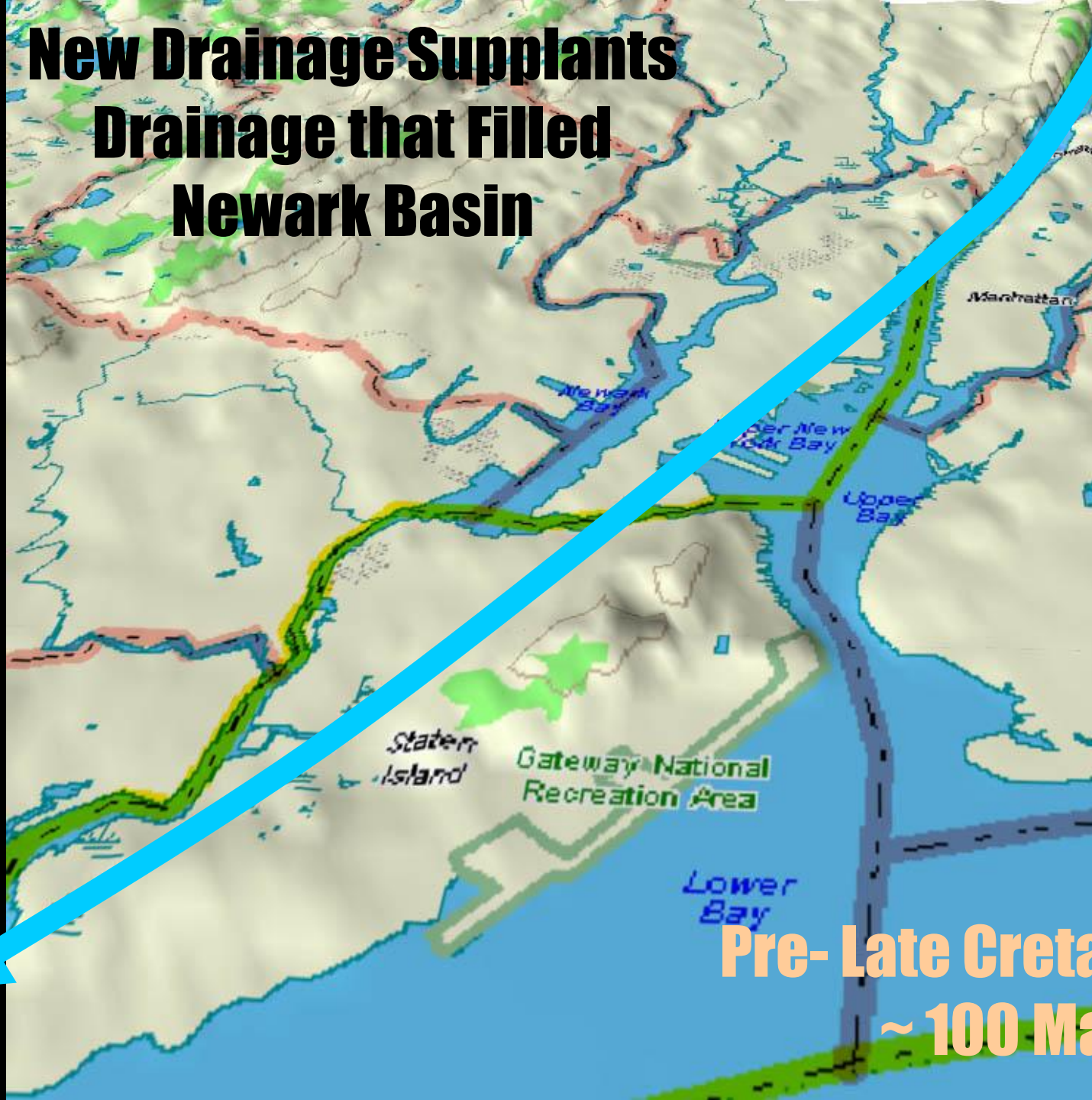
Charles Merguerian



HOFSTRA UNIVERSITY



New Drainage Supplants Drainage that Filled Newark Basin

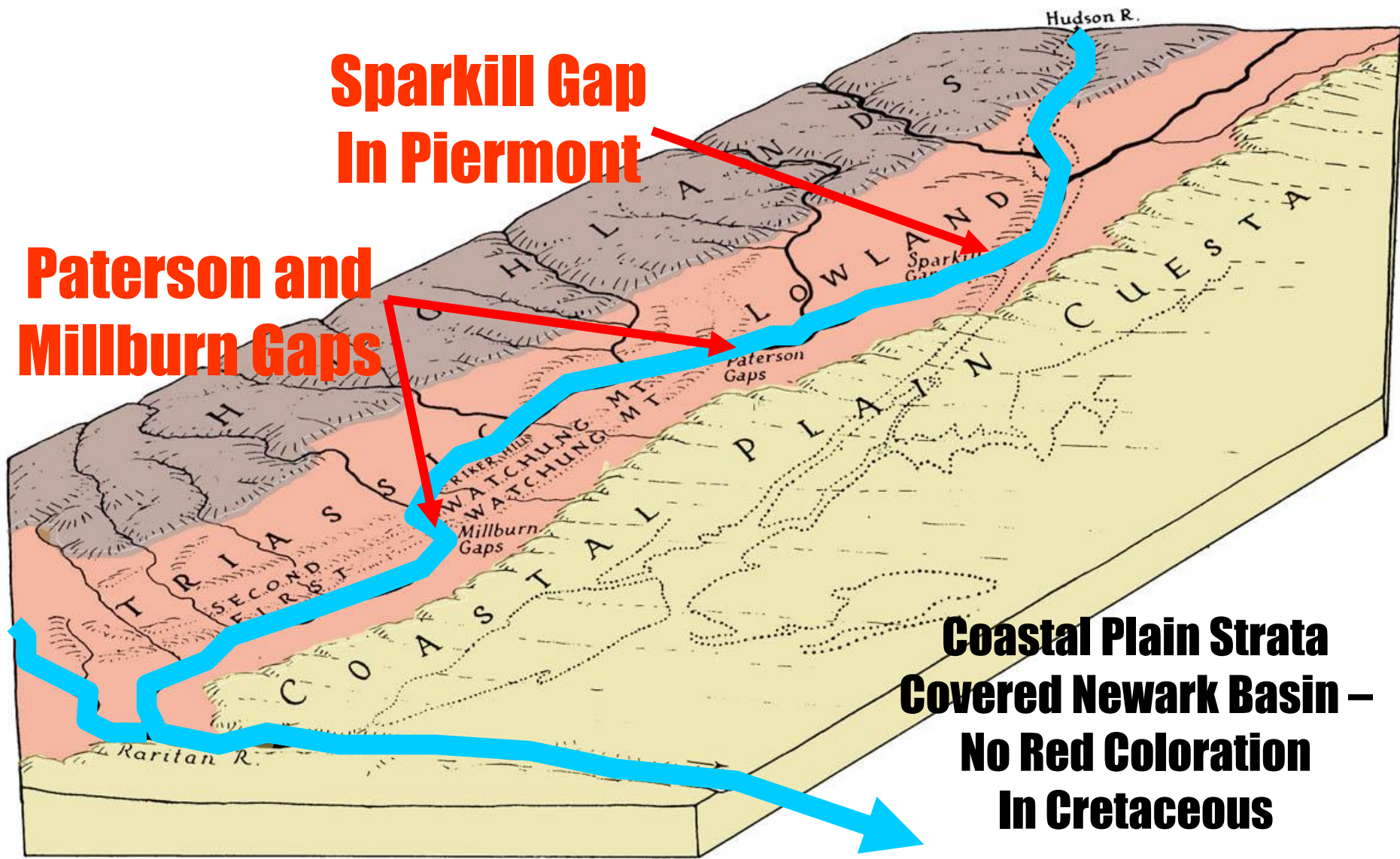


**Pre- Late Cretaceous
~ 100 Ma**

**Coastal Plain Strata
Covers Region
Cretaceous to Miocene
~ 80 – 15 Ma**



**Stream Systems Cut
Coastal Plain
Beginning in
Miocene**



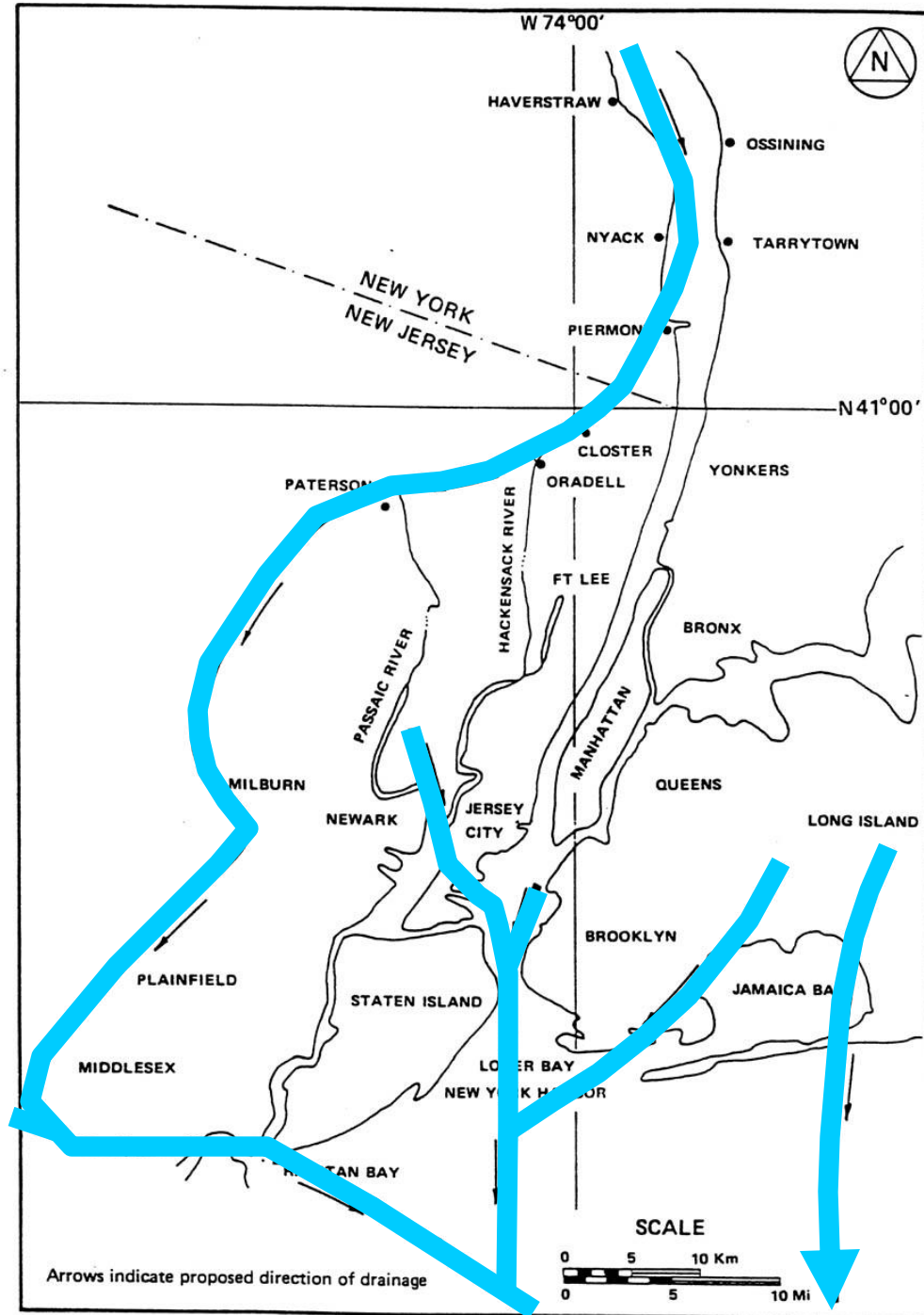
**Sparkill Gap
In Piermont**

**Paterson and
Millburn Gaps**

**Coastal Plain Strata
Covered Newark Basin –
No Red Coloration
In Cretaceous**

Mio/Pliocene

Johnson (1931)

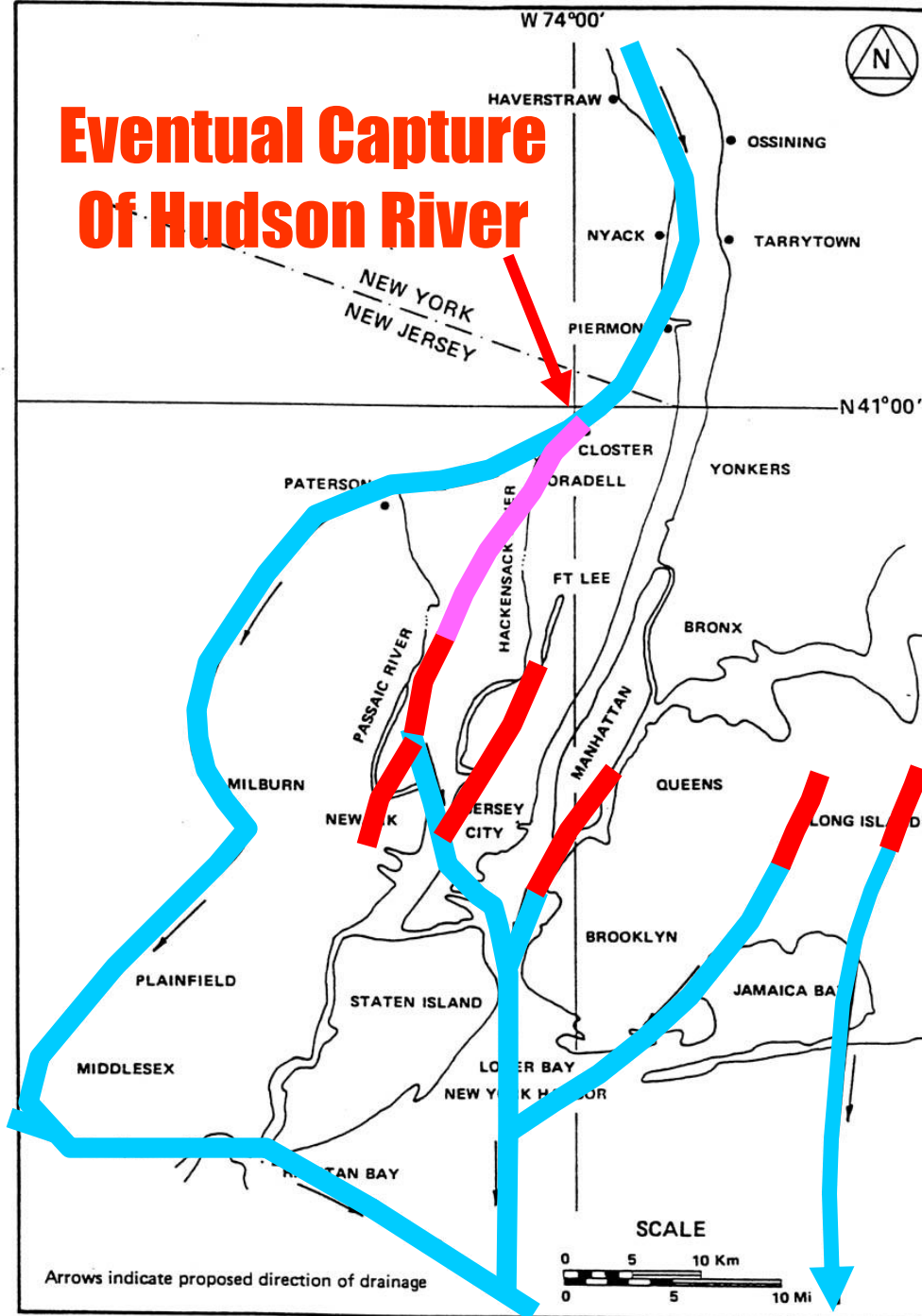


Meandering Course of The Ancient Hudson River atop Coastal Plain Strata

Miocene
15-12 Ma

Lovegreen (1974)

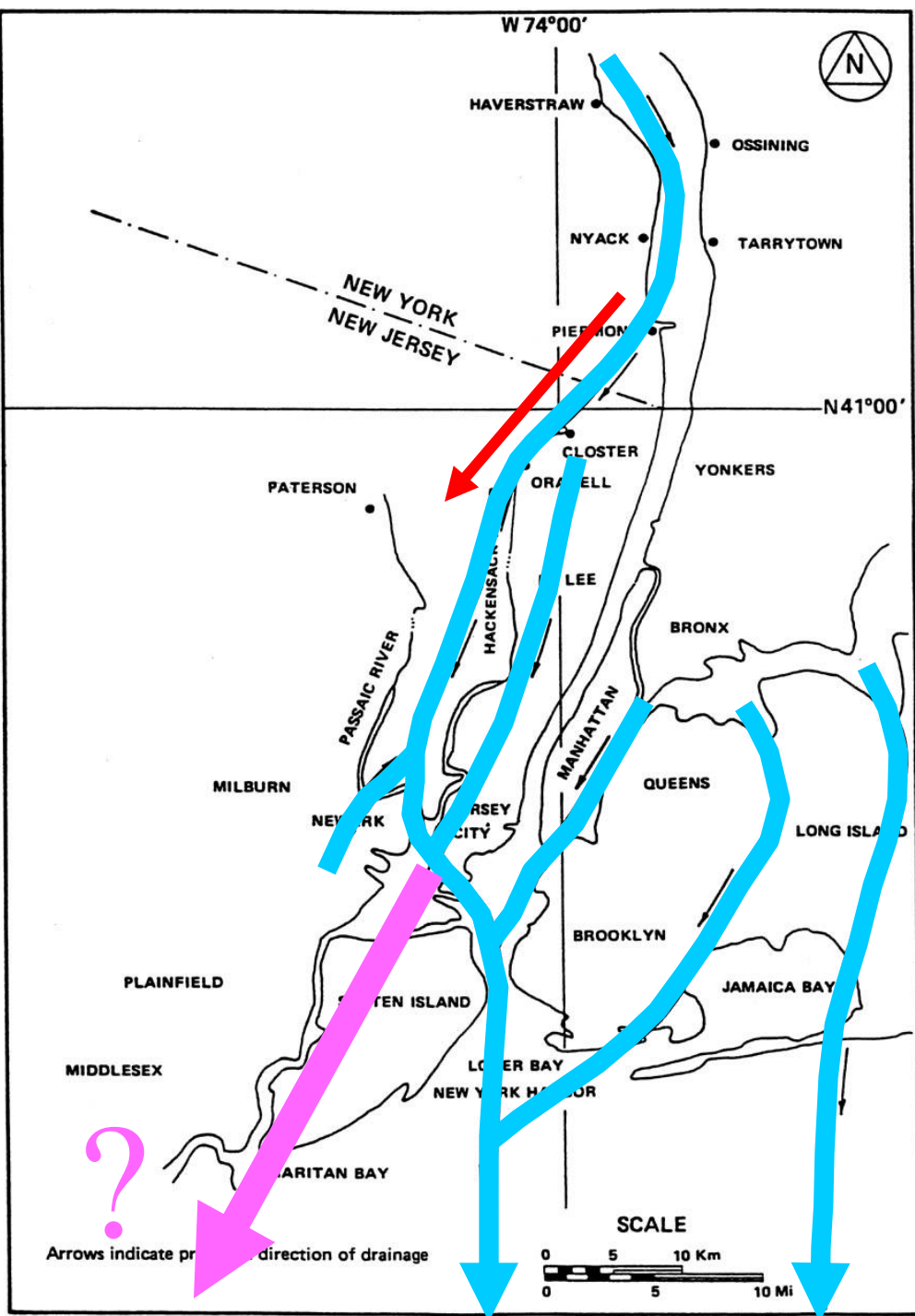
Eventual Capture Of Hudson River



**Pliocene Uplift
Downcutting
as Coastal
Plain Cuesta
Erodes and
Migrates
Southeastward**

**Pliocene
12-10 Ma**

Lovegreen (1974)

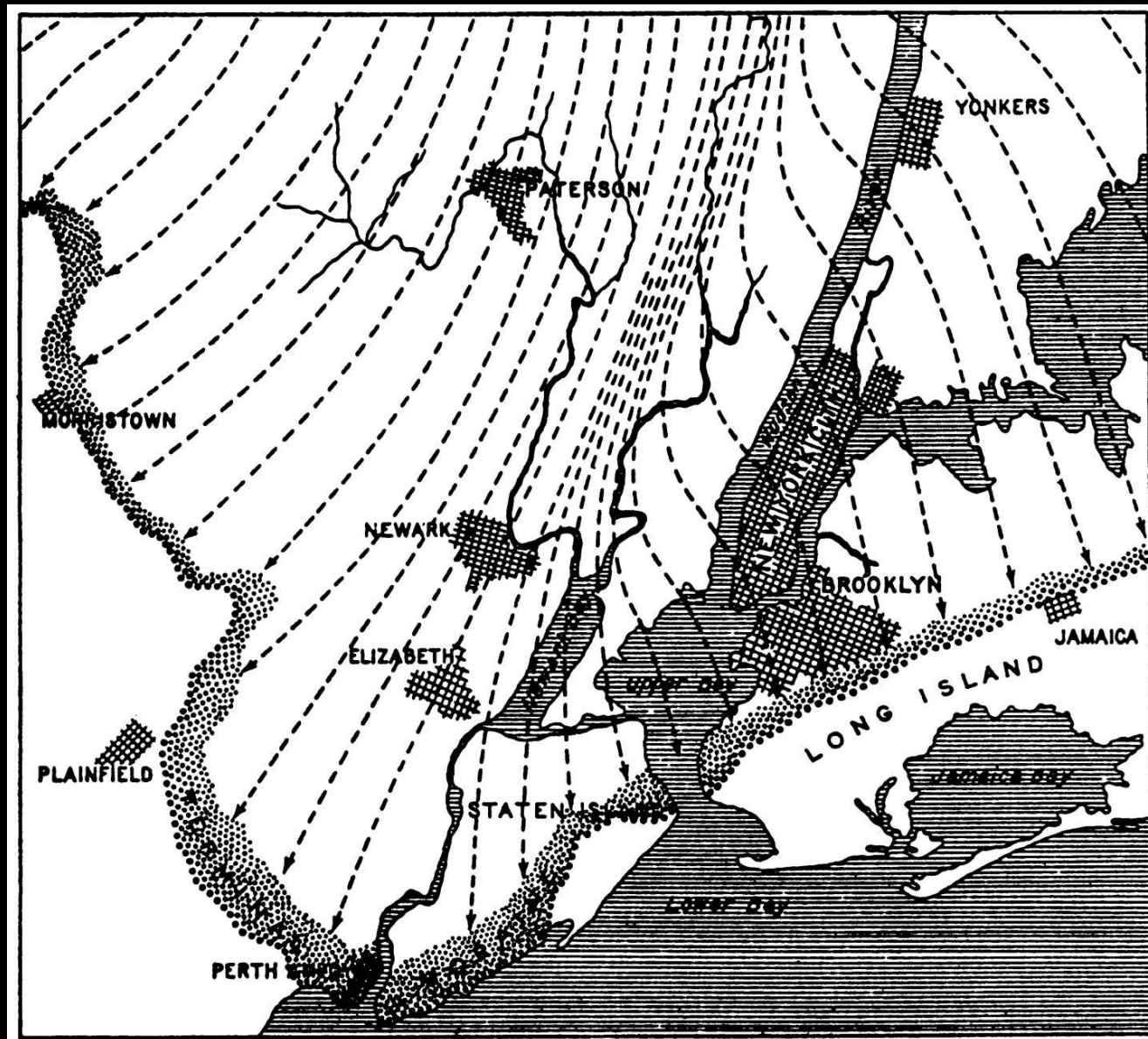


Headward Erosion and Capture of the Hudson by Stream in Hackensack Meadow

Late Pliocene
~3 Ma

Lovegreen (1974)

A Tale of Two Tills



Darton et al
(1902)

Age	Till No.	Ice-flow Direction	Description; remarks
Late Wisconsinan ("Woodfordian"?)	I	NNE to SSW	Gray-brown till in Westchester Co., Staten Is., Brooklyn, & Queens (but not present on rest of Long Island); Hamden Till in CT with terminal moraine lying along the S coast of CT; gray lake sediments at Croton Point Park, Westchester Co.
<i>Mid-Wisconsinan (?)</i>			Paleosol on Till II, SW Staten Island.
Early Wisconsinan(?)	II	NW to SE	Harbor Hill Terminal Moraine and associated outwash (Bellmore Fm. in Jones Beach subsurface); Lake Chamberlain Till in southern CT.
<i>Sangamonian(?)</i>			Wantagh Fm. (in Jones Beach subsurface).
	IIIA	NW to SE	Ronkonkoma Terminal Moraine and associated outwash (Merrick Fm. in Jones Beach subsurface).
Illinoian(?)	IIIB		Manhasset Fm. of Fuller (with middle Montauk Till Member; in lower member, coarse delta foresets (including debris flows) deposited in Proglacial Lake Long Island dammed in on S by pre-Ronkonkoma terminal moraine.
	IIIC		
<i>Yarmouthian</i>			Jacob Sand, Gardiners Clay.
Kansan(?)	IV	NNE to SSW	Gray till with decayed stones at Teller's Point (Croton Point Park, Westchester Co.); gray till with green metavolcanic stones, Target Rock, LI.
<i>Aftonian(?)</i>			No deposits; deep chemical decay of Till V.
Nebraskan (?)	V	NW to SE	Reddish-brown decayed-stone till and -outwash at AKR Co., Staten Island, and at Garvies Point, Long Island; Jameco Gravel fills subsurface valley in SW Queens.
			Pre-glacial (?) Mannetto Gravel fills subsurface valleys.

Sanders and Merguerian (1998)



SE-directed Glacial Striae, Central Park, NYC



SE-directed Chattermarks and Roche Moutonnee, Bear Mtn., NY



NW Glacial Grooves and Striae



S35E Striae, So. Twin Is., NY

The Big Kahuna Glacial Event

A map of the New York City area, including parts of New Jersey and Long Island. The map highlights the Harbor Hill Moraine in red, which runs along the coast from the Hudson River down to the tip of Long Island. Key locations labeled include Morristown, Newark, Elizabeth, Staten Island, Perth Amboy, Yonkers, and Jamaica. The Hudson River is shown flowing into the city. The map also indicates the Upper Bay and Lower Bay. A large red arrow points from the title 'The Big Kahuna Glacial Event' down to the Harbor Hill Moraine. The text 'Prince's Bay' is written in large black letters over the map, and 'Harbor Hill Moraine' is written in red, slanted letters over the moraine itself.

The Big Kahuna Glacial Event

The Big Kahuna Glacial Event

Map showing the Hudson River, Manhattan, Newark, Elizabeth, Upper Bay, Lower Bay, Staten Island, Long Island, and Jamaica Bay. The event is indicated by a large orange arrow pointing southwards. Key locations labeled include Morristown, Plainfield, Perth Amboy, Staten Island, Newark, Elizabeth, Upper Bay, Lower Bay, Manhattan, Hudson River, Yonkers, Jamaica, and Jamaica Bay. The Harbor Hill Moraine is also labeled.

The Big Kahuna Glacial Event

The Big Kahuna Glacial Event

Map labels: Morristown, Plainfield, Perth Amboy, Staten Island, Newark, Elizabeth, Upper Bay, Lower Bay, Manhattan, Hudson River, Yonkers, Jamaica, Jamaica Bay.

Harbor Hill Moraine

Prince's Bay

The Big Kahuna Glacial Event

A map of the New York City area, including parts of New Jersey and Long Island. The map highlights the Harbor Hill Moraine, a large, reddish-brown, textured area that runs from the Hudson River in the north, through the New York Harbor, and along the coast of Long Island. Key locations labeled include Morristown, Newark, Elizabeth, Perth Amboy, Yonkers, and Jamaica. The Hudson River is shown flowing into the harbor. The map also shows the locations of Staten Island, Long Island, and Jamaica Bay. A large, stylized orange arrow points from the Hudson River area towards the harbor. The text 'Prince's Bay' is written in large, bold, black letters over the lower part of the map. The text 'Harbor Hill Moraine' is written in large, bold, red letters over the moraine area. The text 'The Big Kahuna Glacial Event' is written in large, bold, black letters at the top of the map.

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[illegible][illegible]

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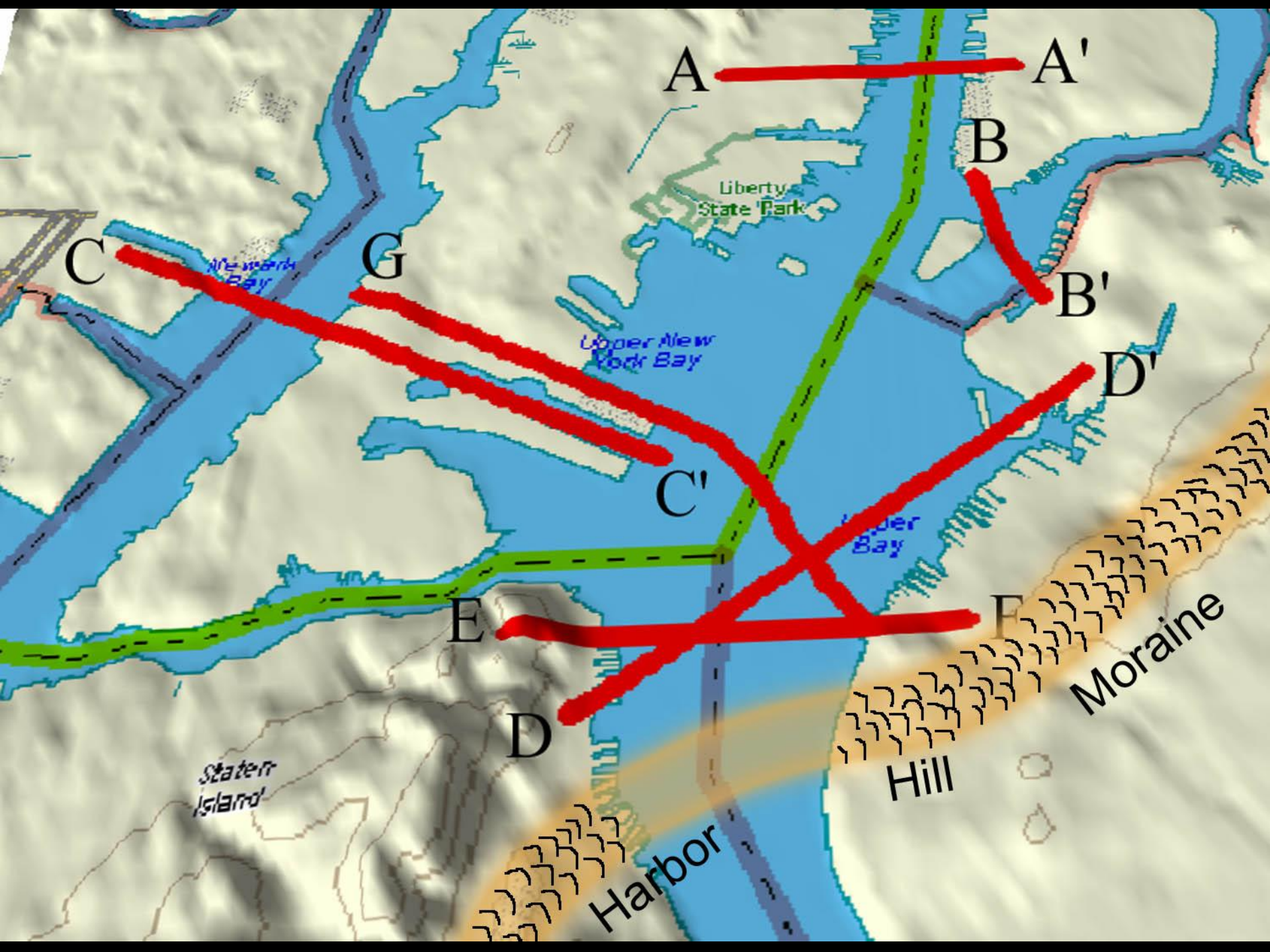
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The Big Kahuna Glacial Event

A map of the New York City area, including parts of New Jersey and Long Island. The map highlights the Harbor Hill Moraine in red, which runs along the coast from the Hudson River down to the tip of Long Island. Key locations labeled include Morristown, Newark, Elizabeth, Staten Island, Perth Amboy, Yonkers, and Jamaica. The Hudson River is shown flowing into the city. The map also indicates the Upper Bay and Lower Bay. A large red arrow points from the title 'The Big Kahuna Glacial Event' down to the Harbor Hill Moraine. The text 'Prince's Bay' is written in large black letters over the lower part of the map, with an arrow pointing to the area between Staten Island and the tip of Long Island. The text 'Harbor Hill Moraine' is written in large red letters over the red-shaded area. The word 'MANHATTAN' is written vertically along the island.

[illegible][illegible][illegible][illegible]



A

A'

B

B'

D'

C'

E

F

D

C

G

Staten Island

Harbor

Hill

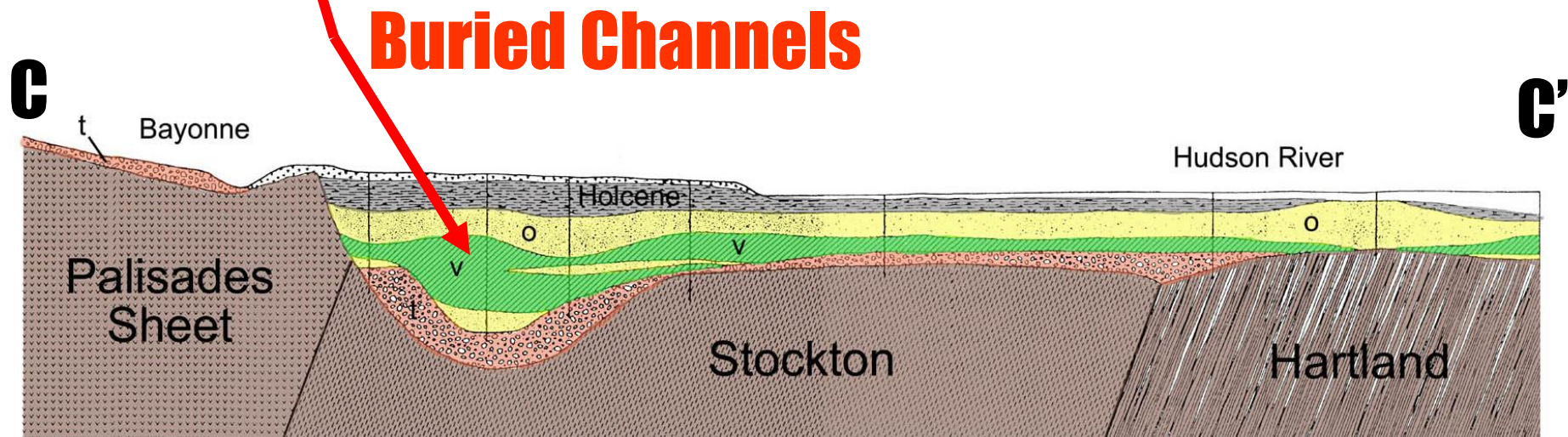
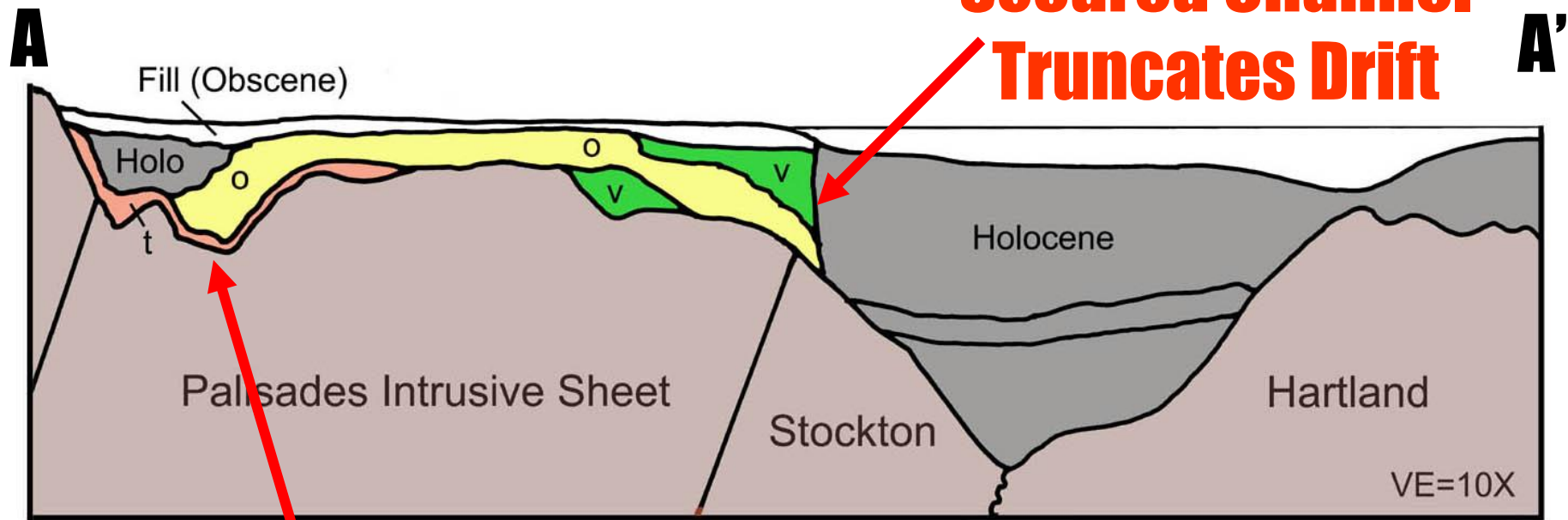
Moraine

Liberty State Park

Upper New York Bay

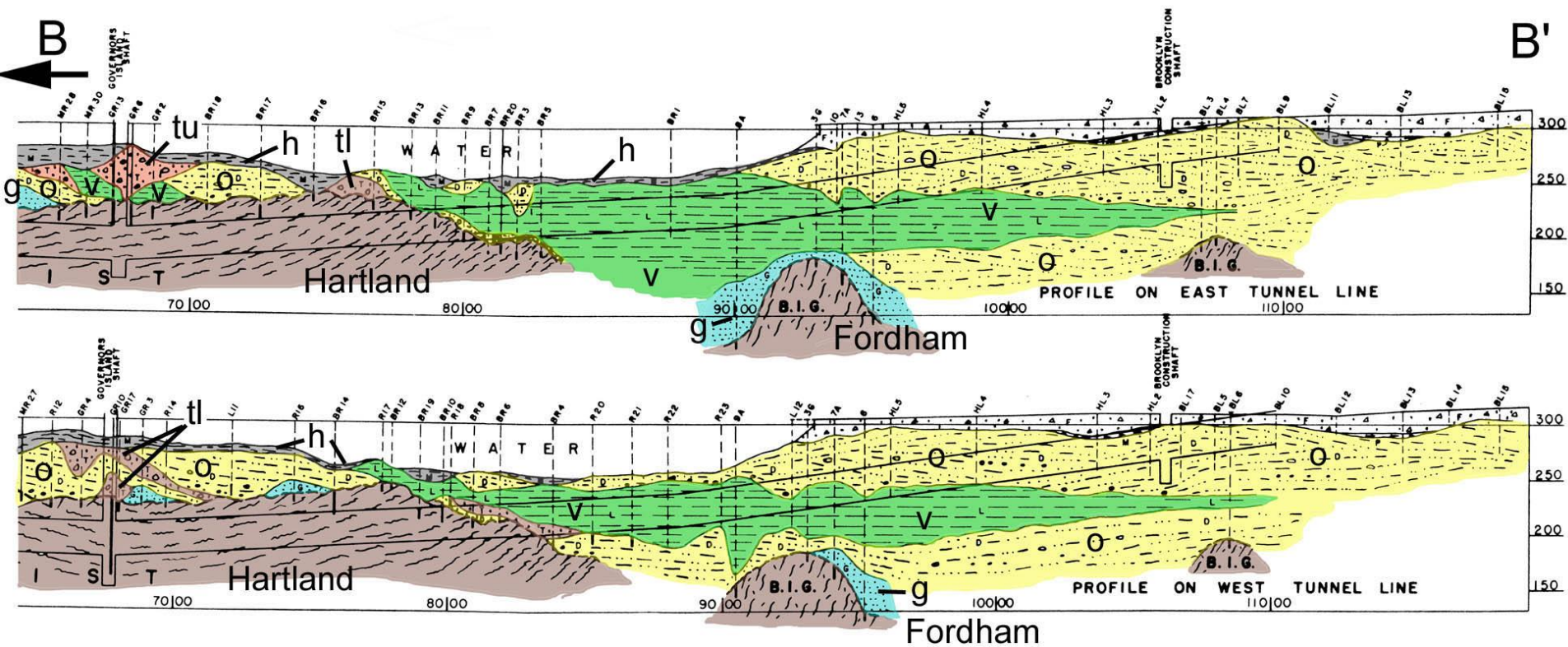
Upper Bay

New York Bay



Lovegreen (1974)

Brooklyn Battery Tunnel

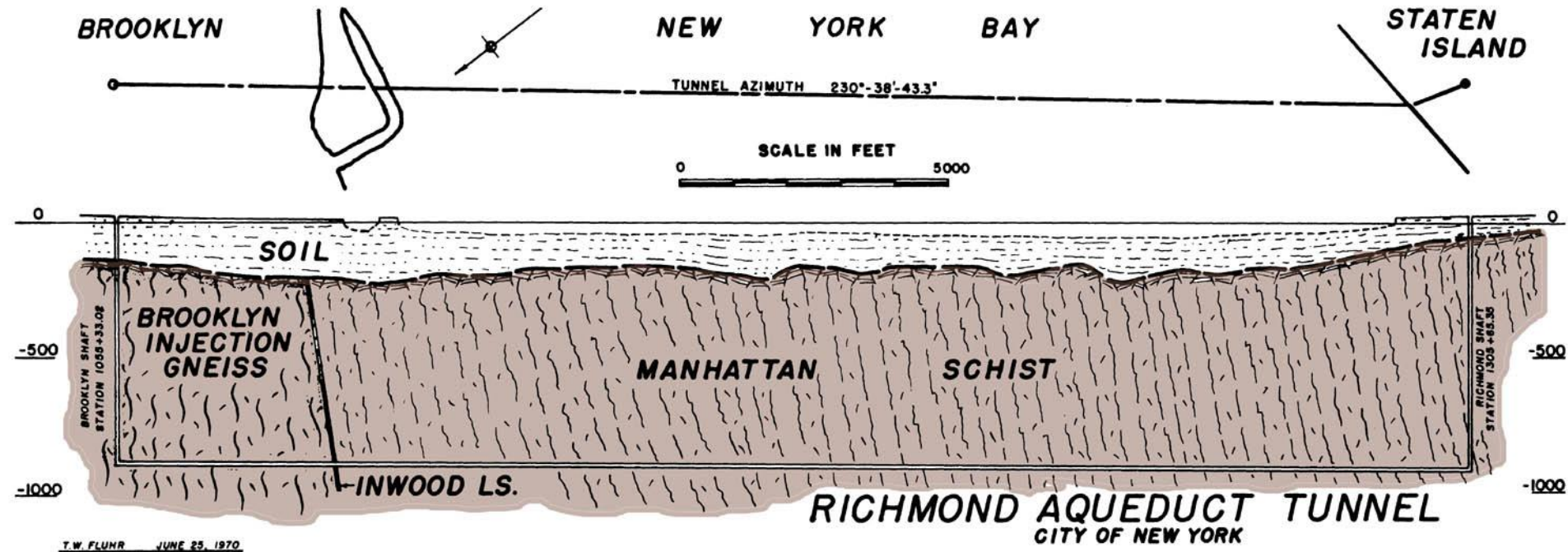


Berkey (1948)

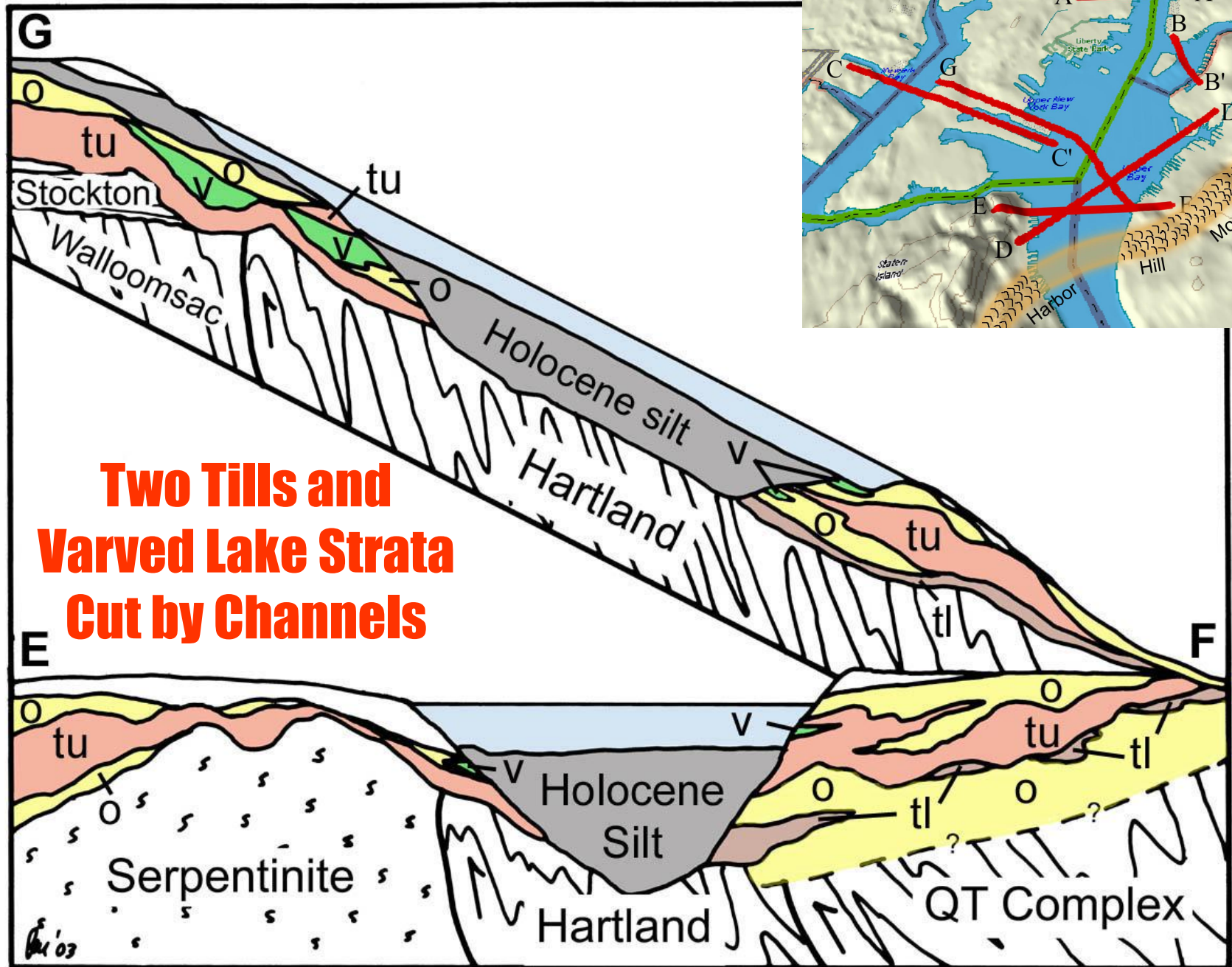
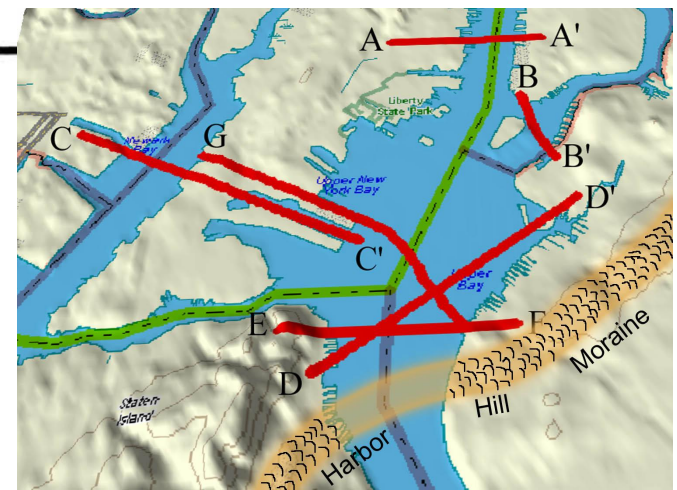
Richmond Aqueduct Tunnel

D'

D



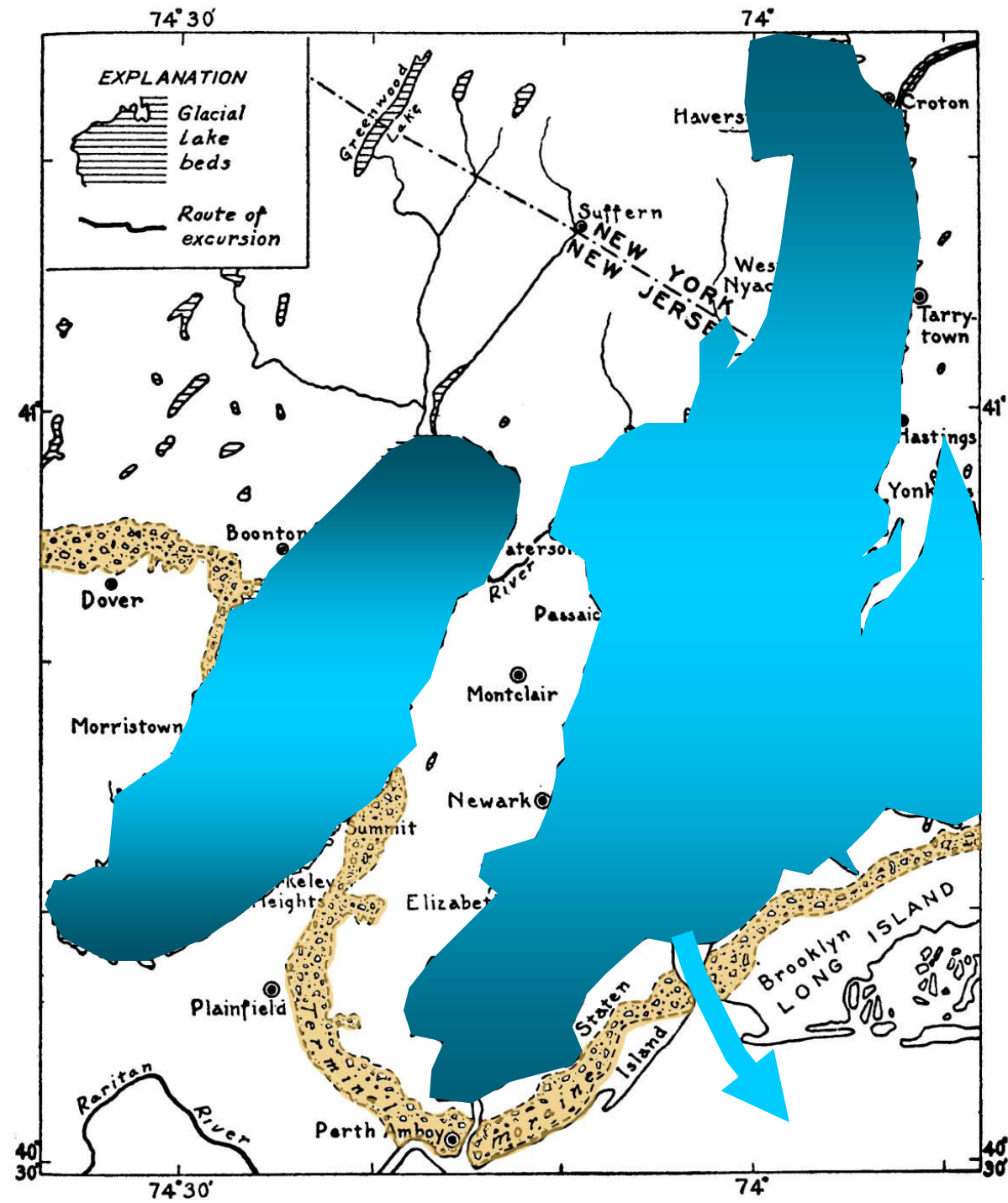
Fluhr (1962)



Glacial Lake Strata and the Harbor Hill Moraine

Post-
Woodfordian
Drainage
Through
The Narrows

Berkey (1933)





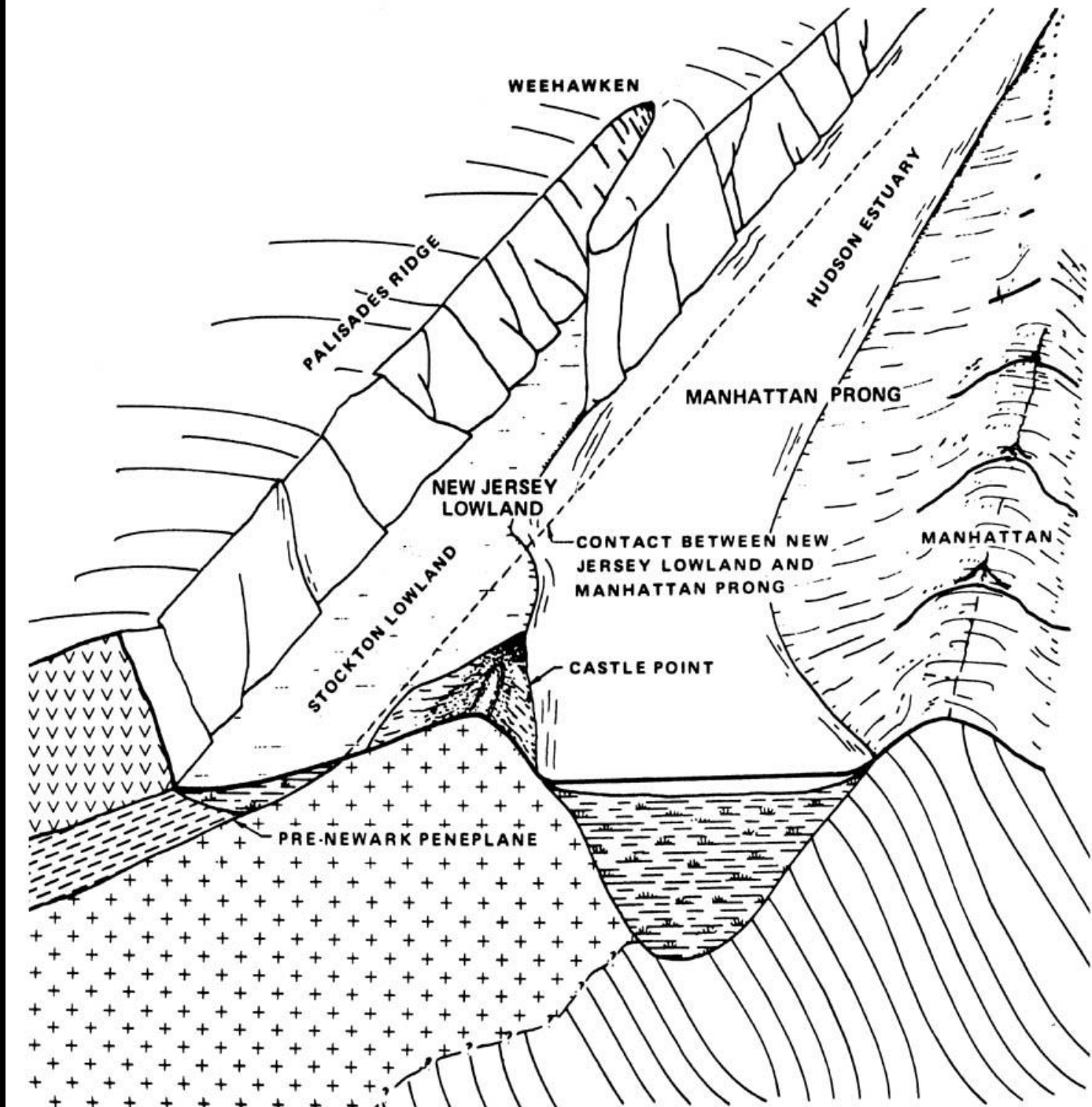
**Hudson
Abandons
Former
Channel –
Floods
Through
Narrows**

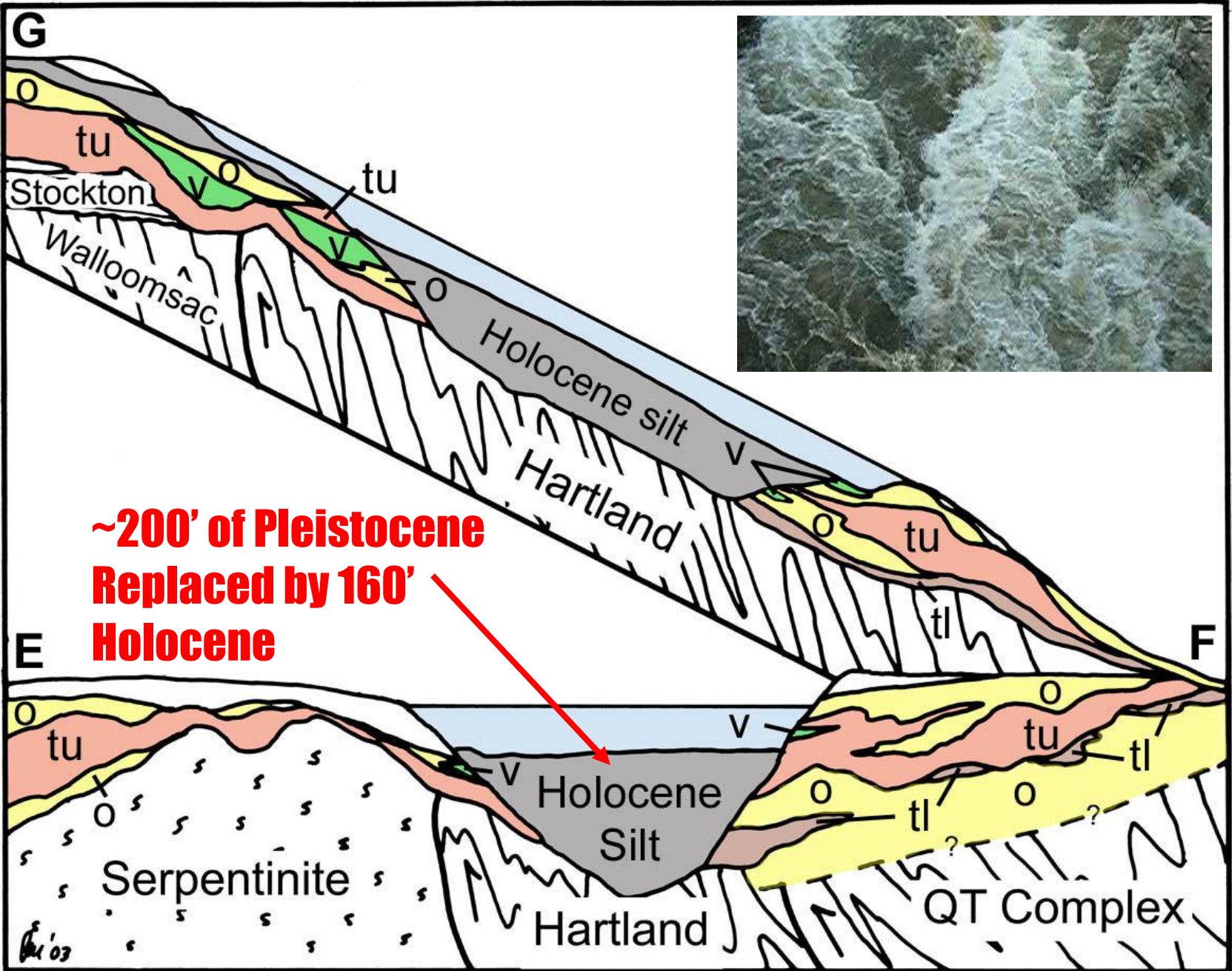


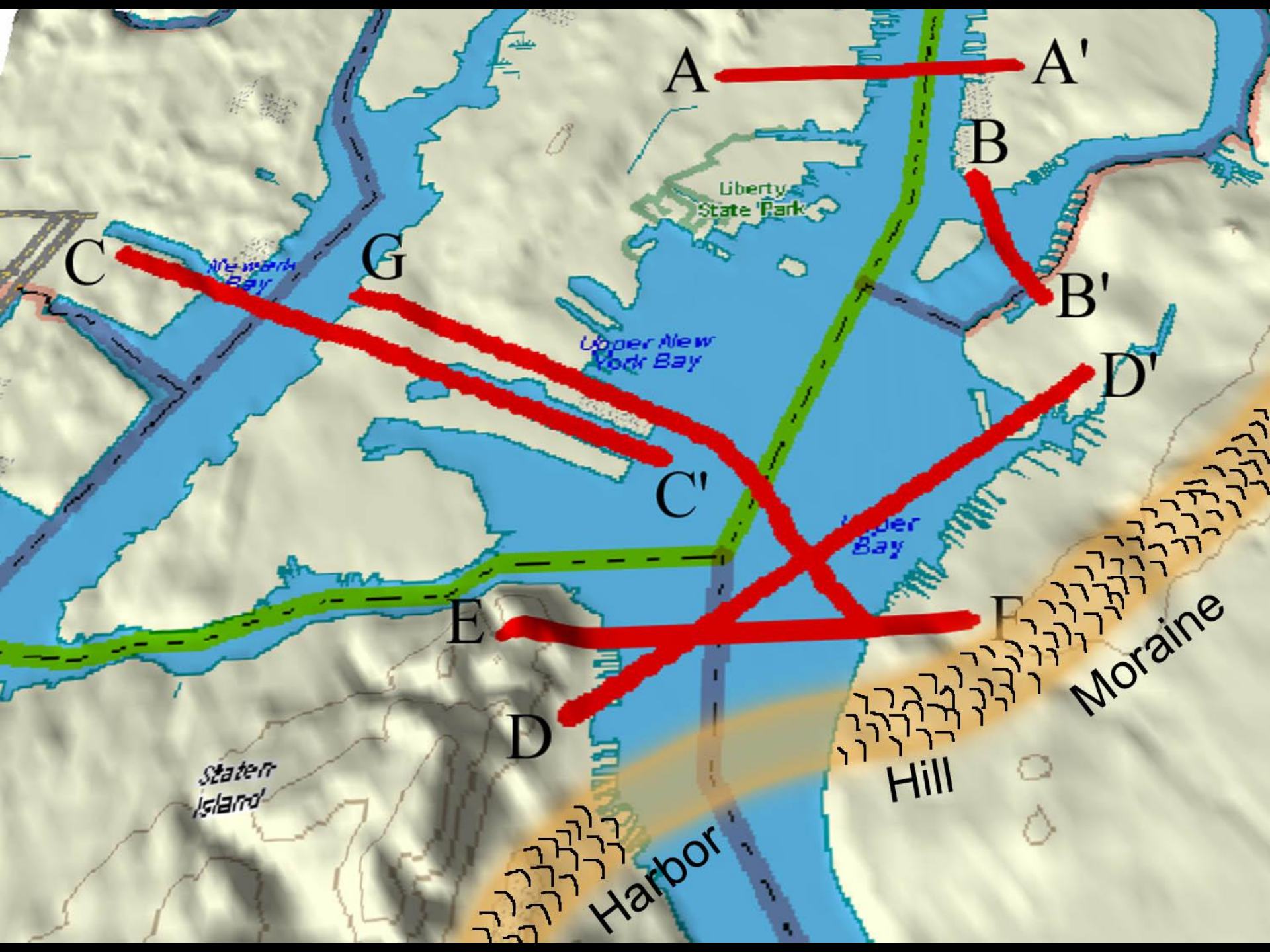


**Plunge Pool Upflow of Narrows Breach
Cuts to Bedrock**

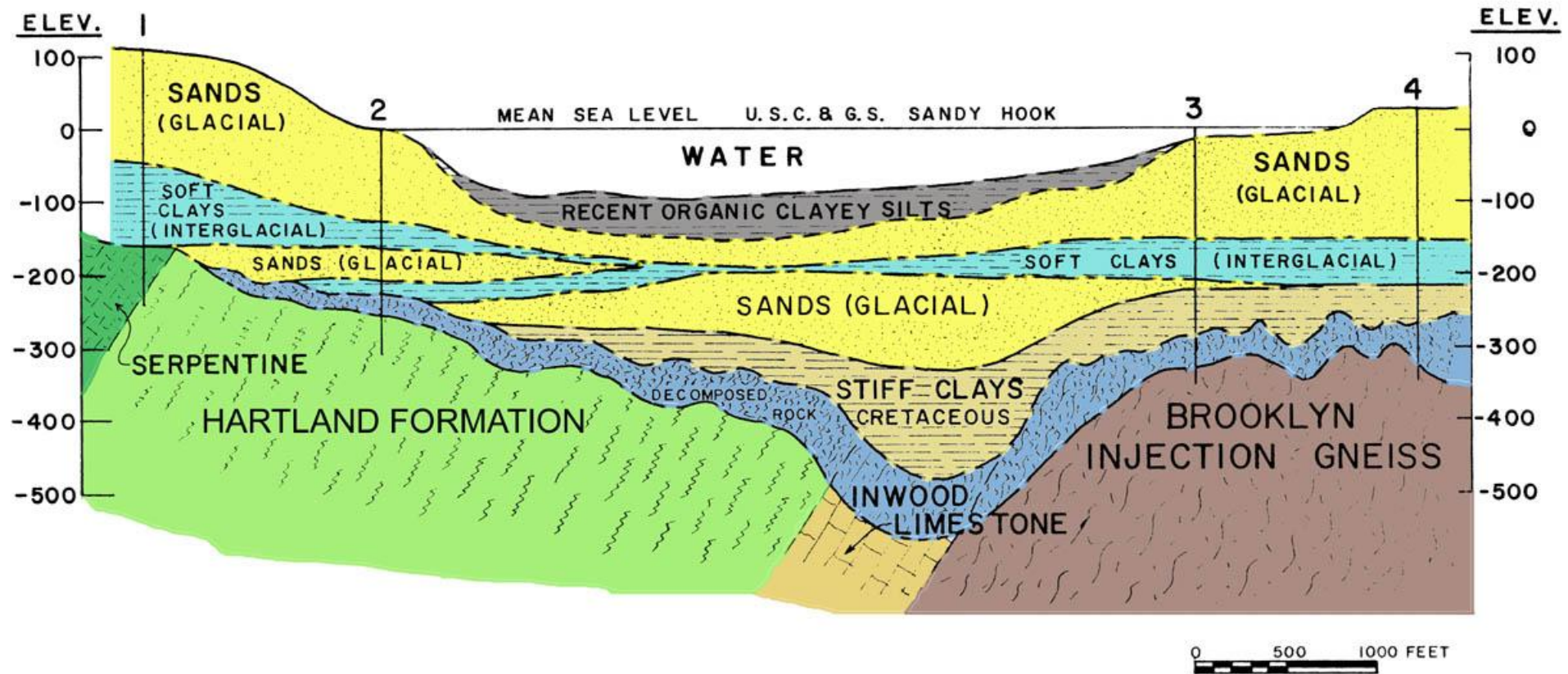
Castle Point Abandoned Channel



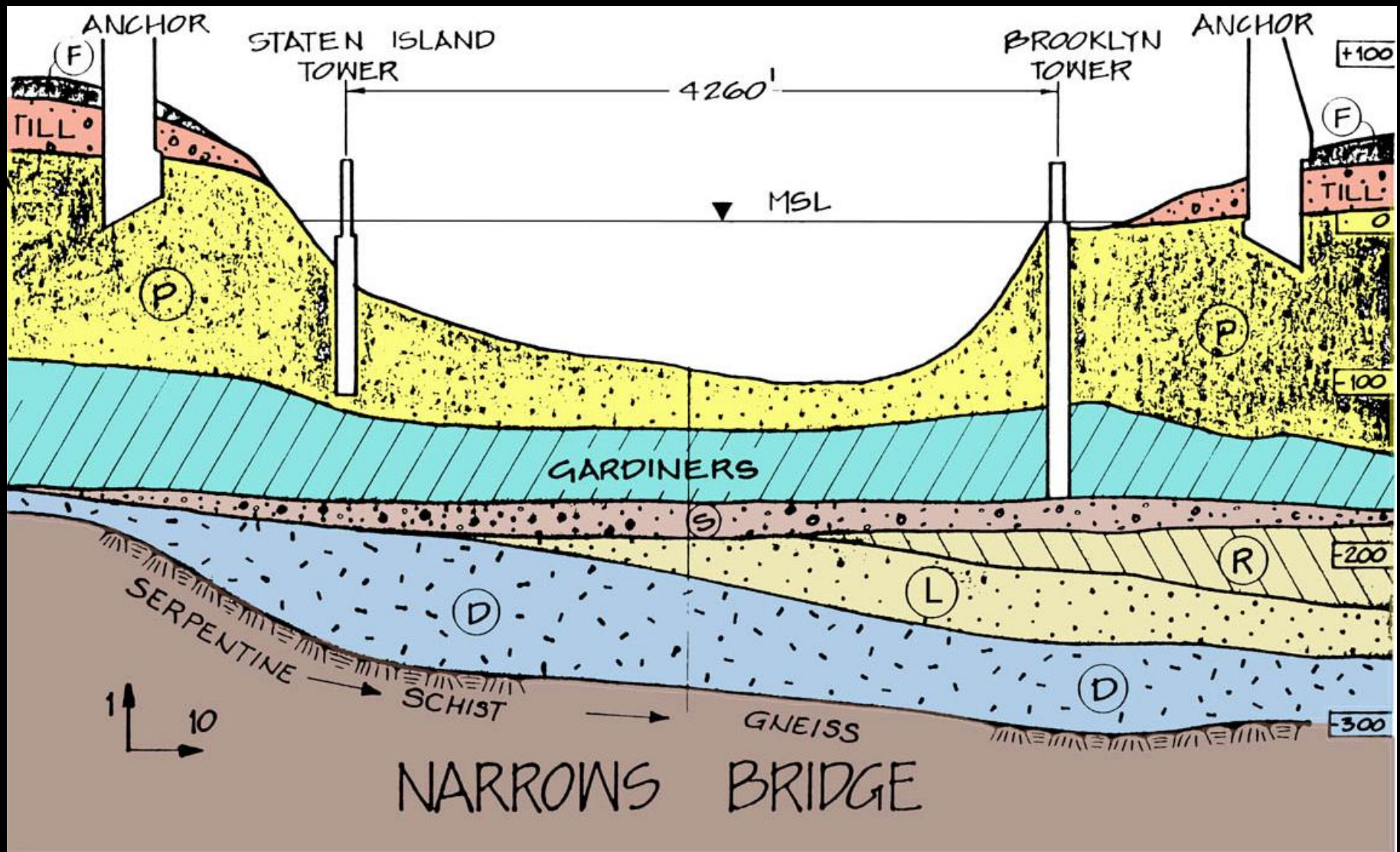




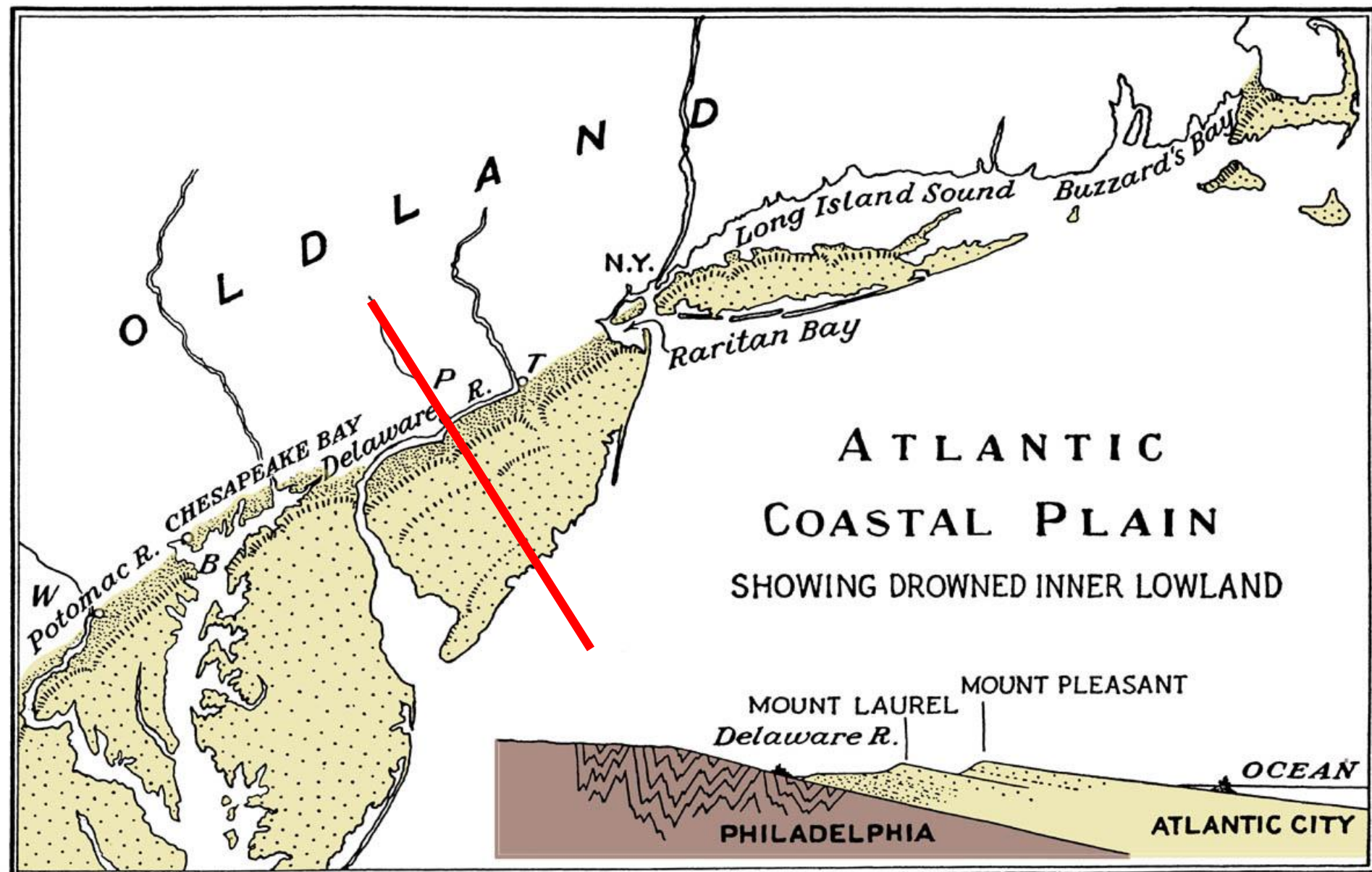
Verrazano-Narrows Bridge

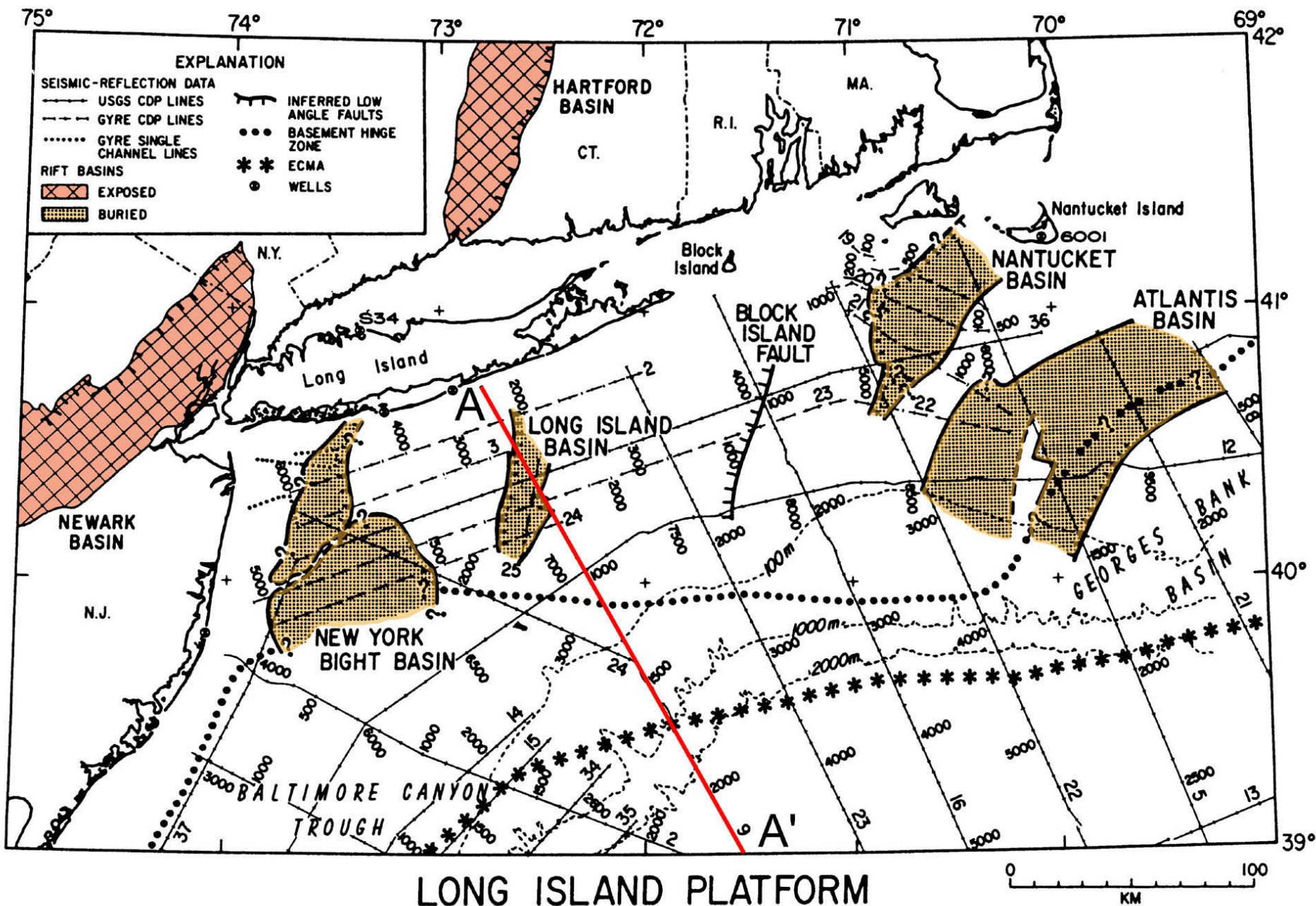


Fluhr (1969)

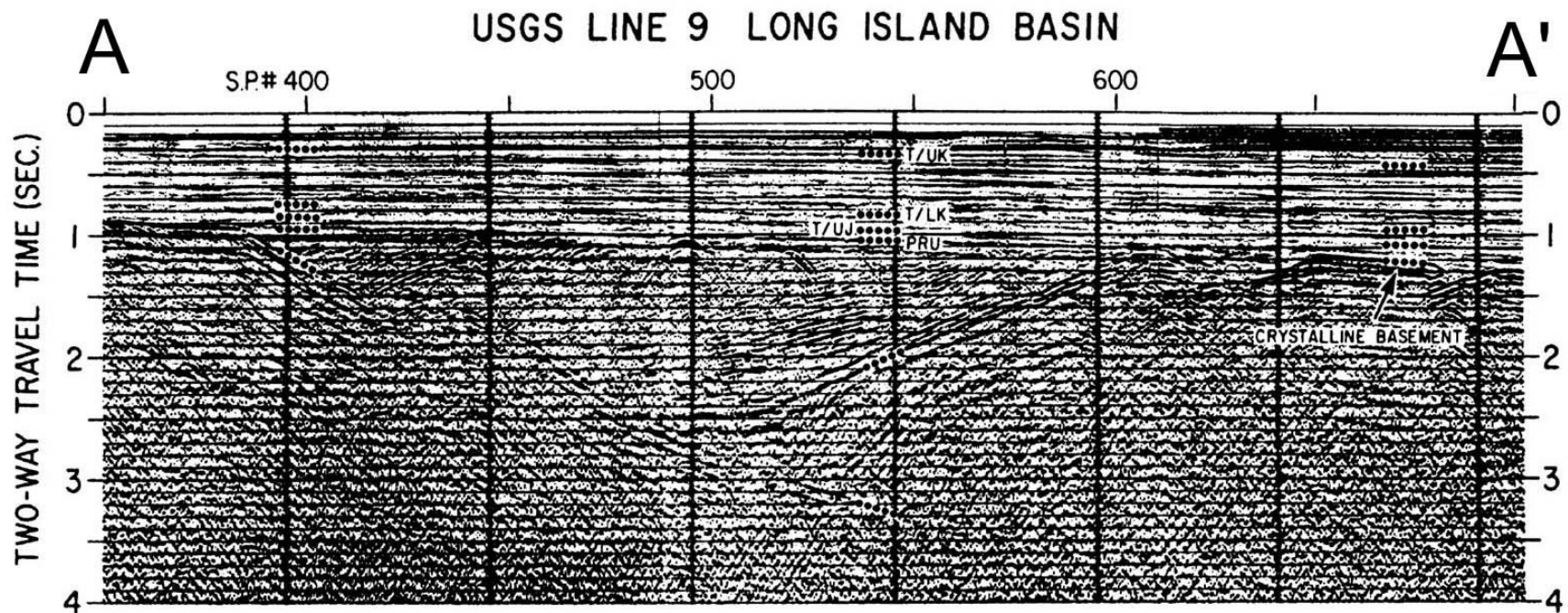
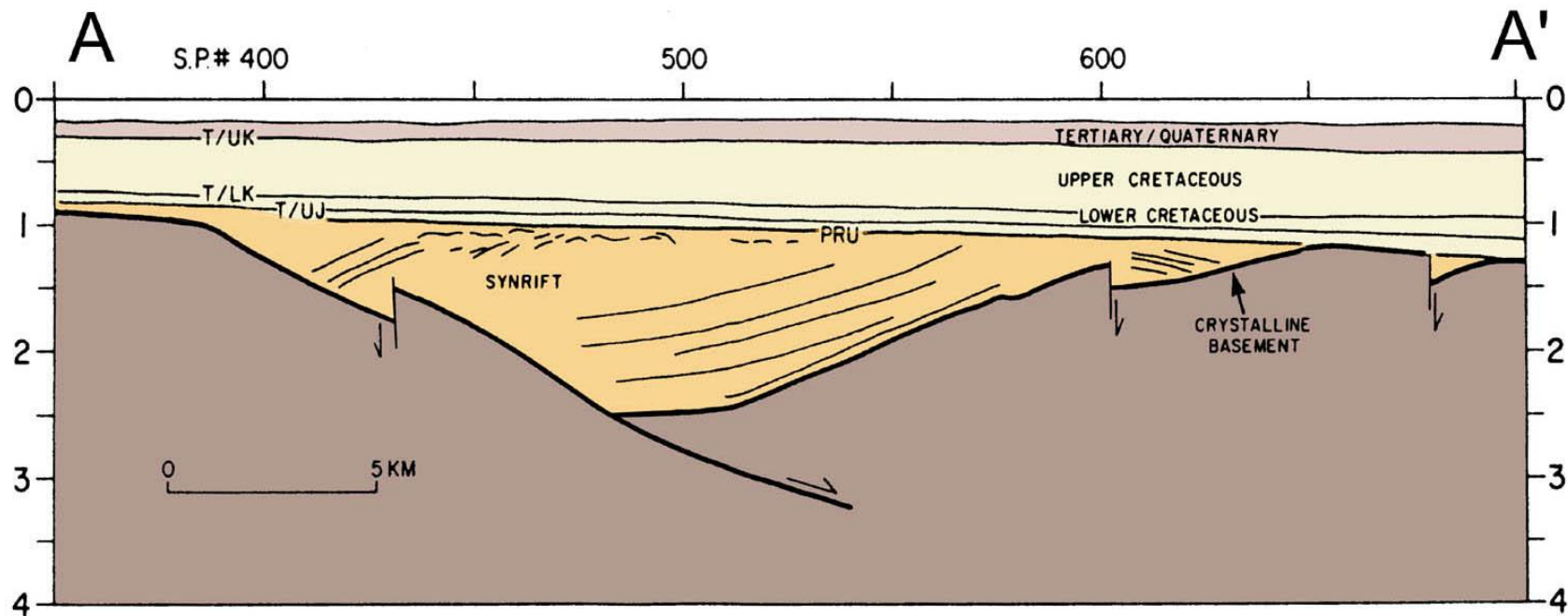


Gould (1982)

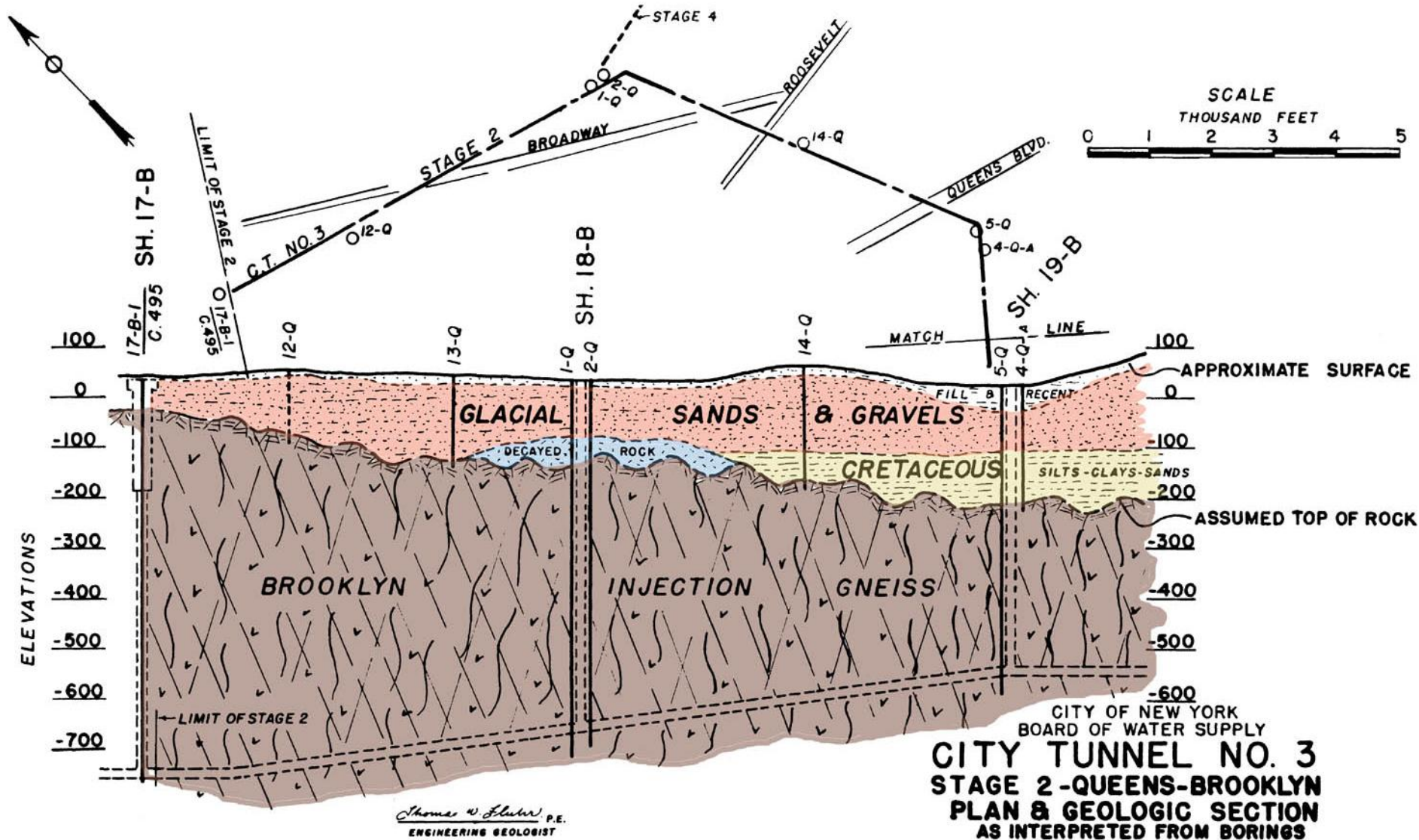




LONG ISLAND PLATFORM

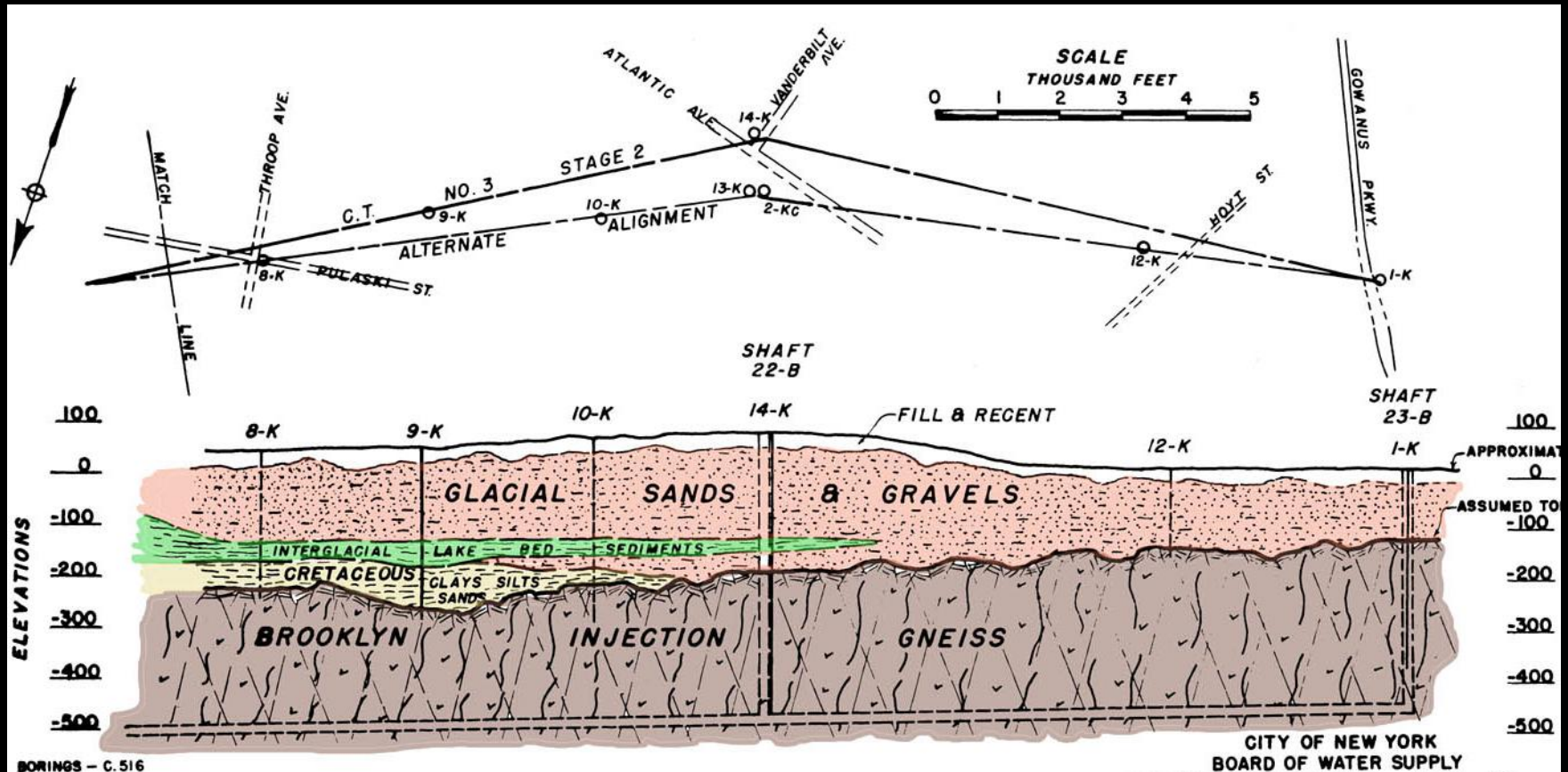


Buried Cretaceous, Queens

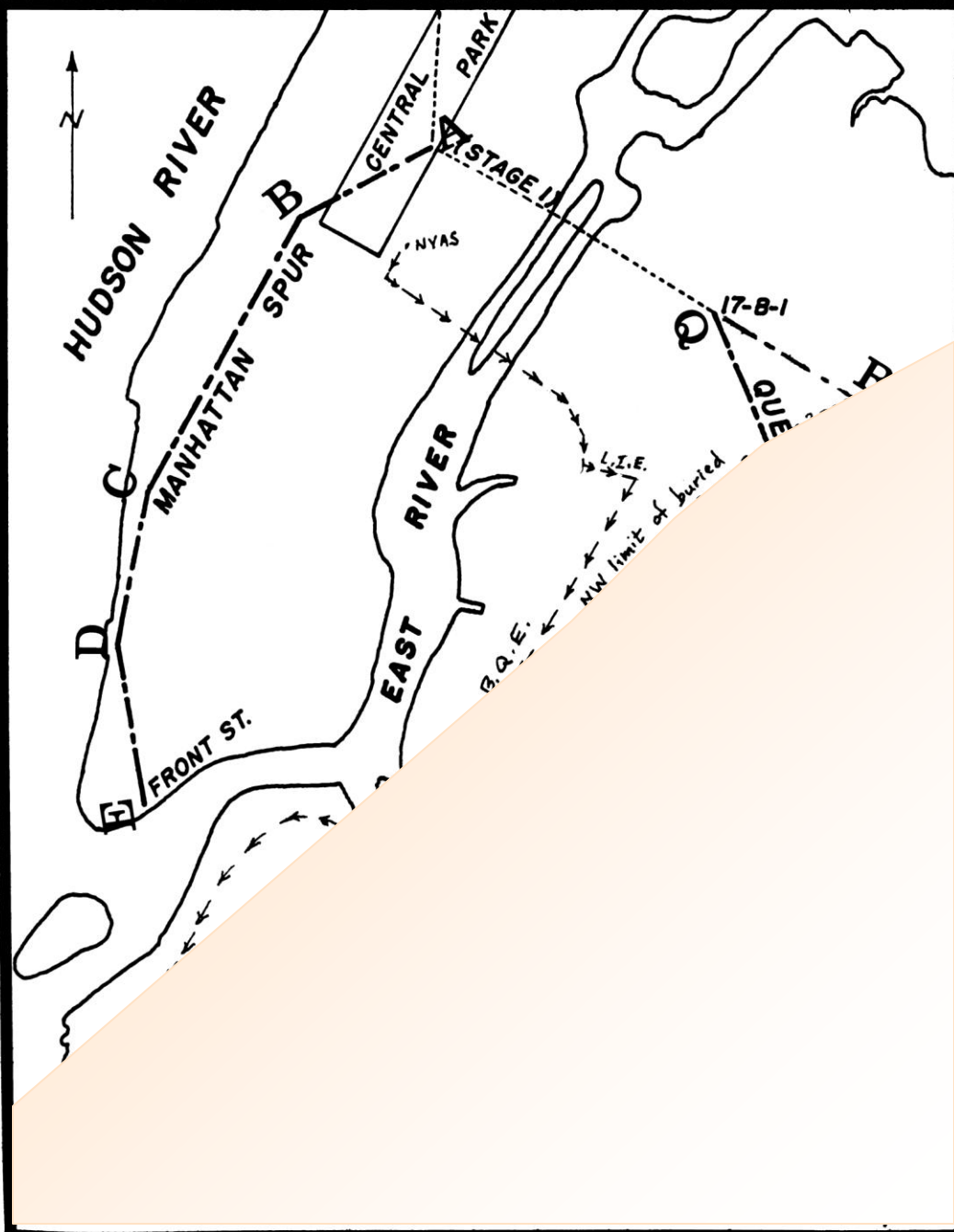


Fluhr and Terenzio (1984)

Buried Cretaceous, Brooklyn



Fluhr and Terenzio (1984)

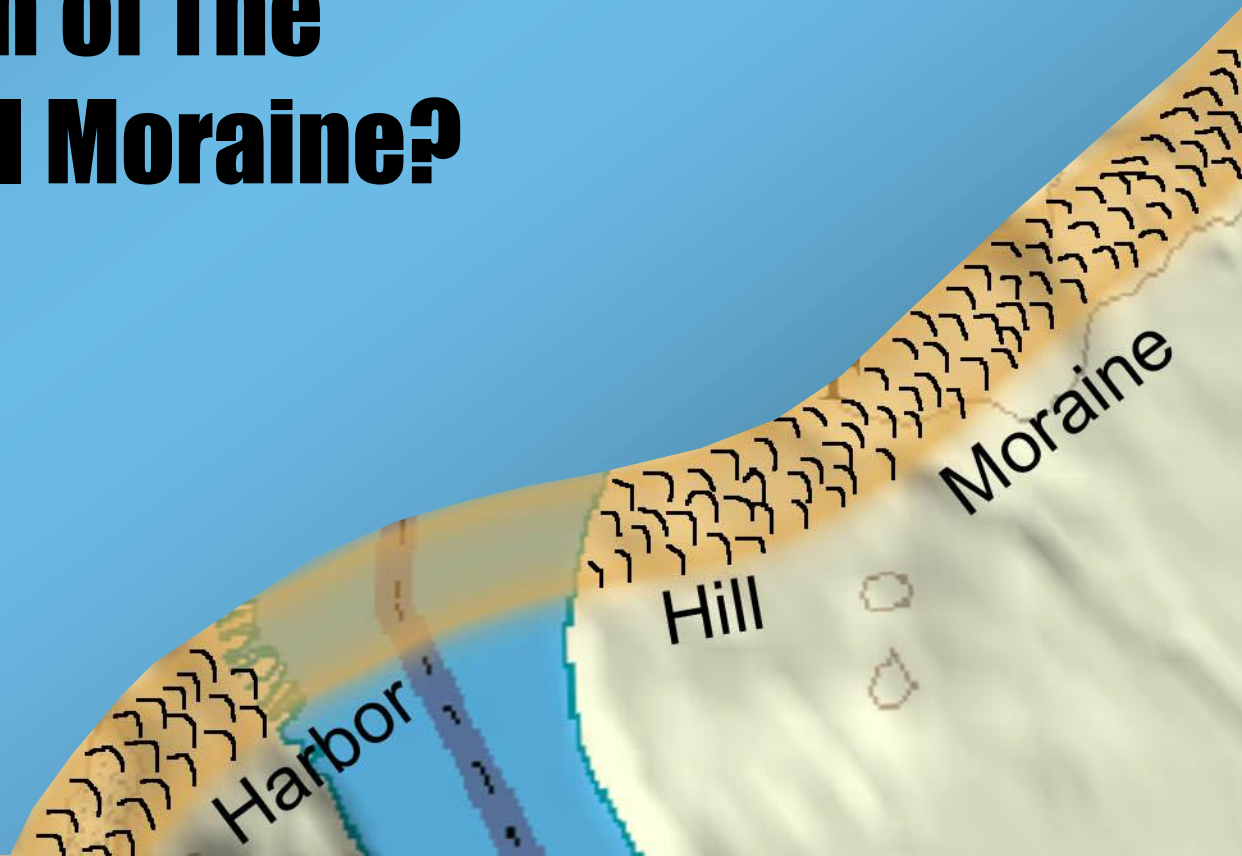


**CT3 Stage 2
Borings Define the
NW Limit of
The Buried
Cretaceous**

**Edge of Buried
Cretaceous
Underlies
The Harbor Hill
Moraine**

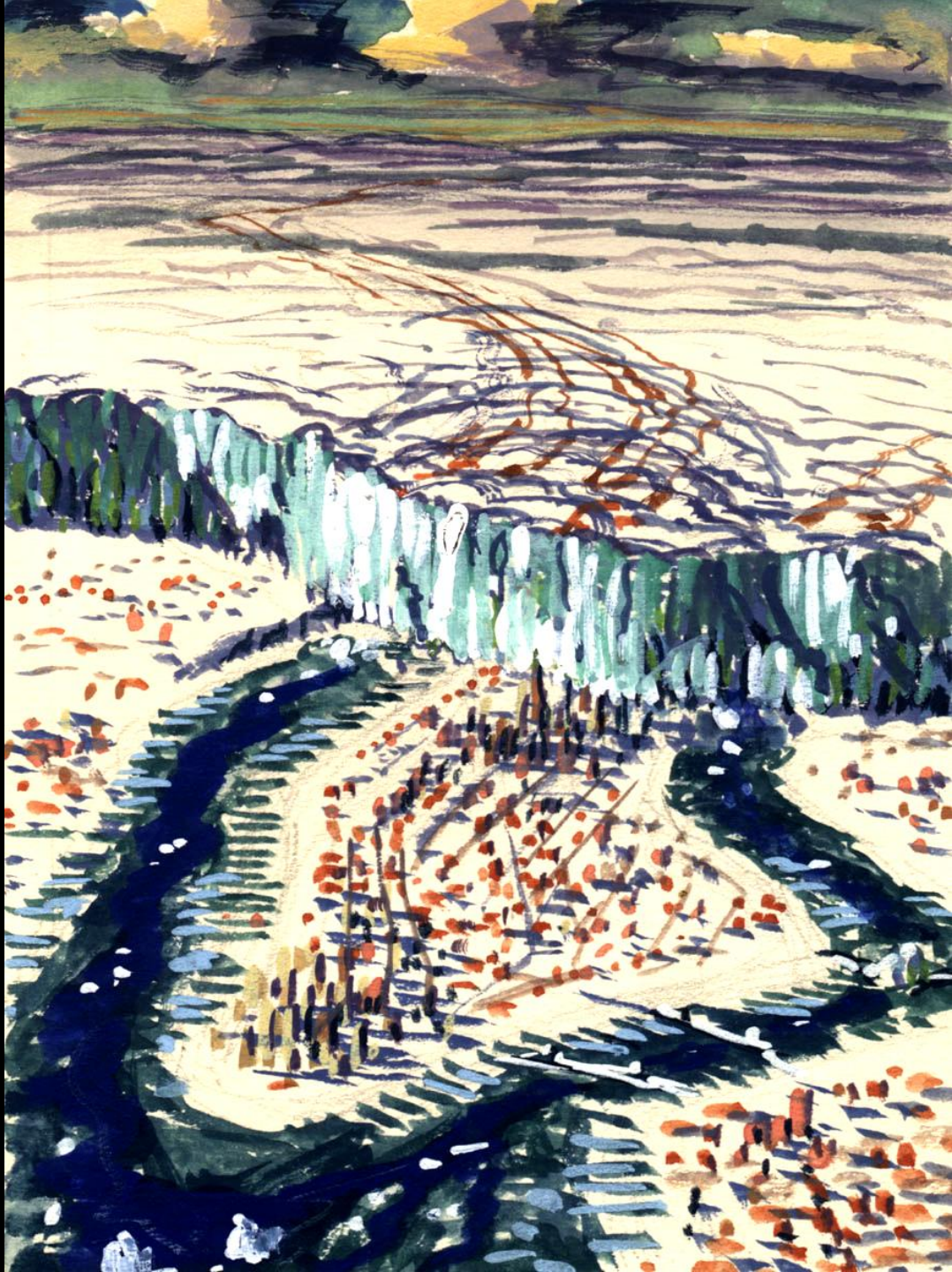
Fluhr and Terenzio (1984)

Did Eroded Cretaceous Coastal Plain Cuesta Influence the Terminal Position of The Harbor Hill Moraine?



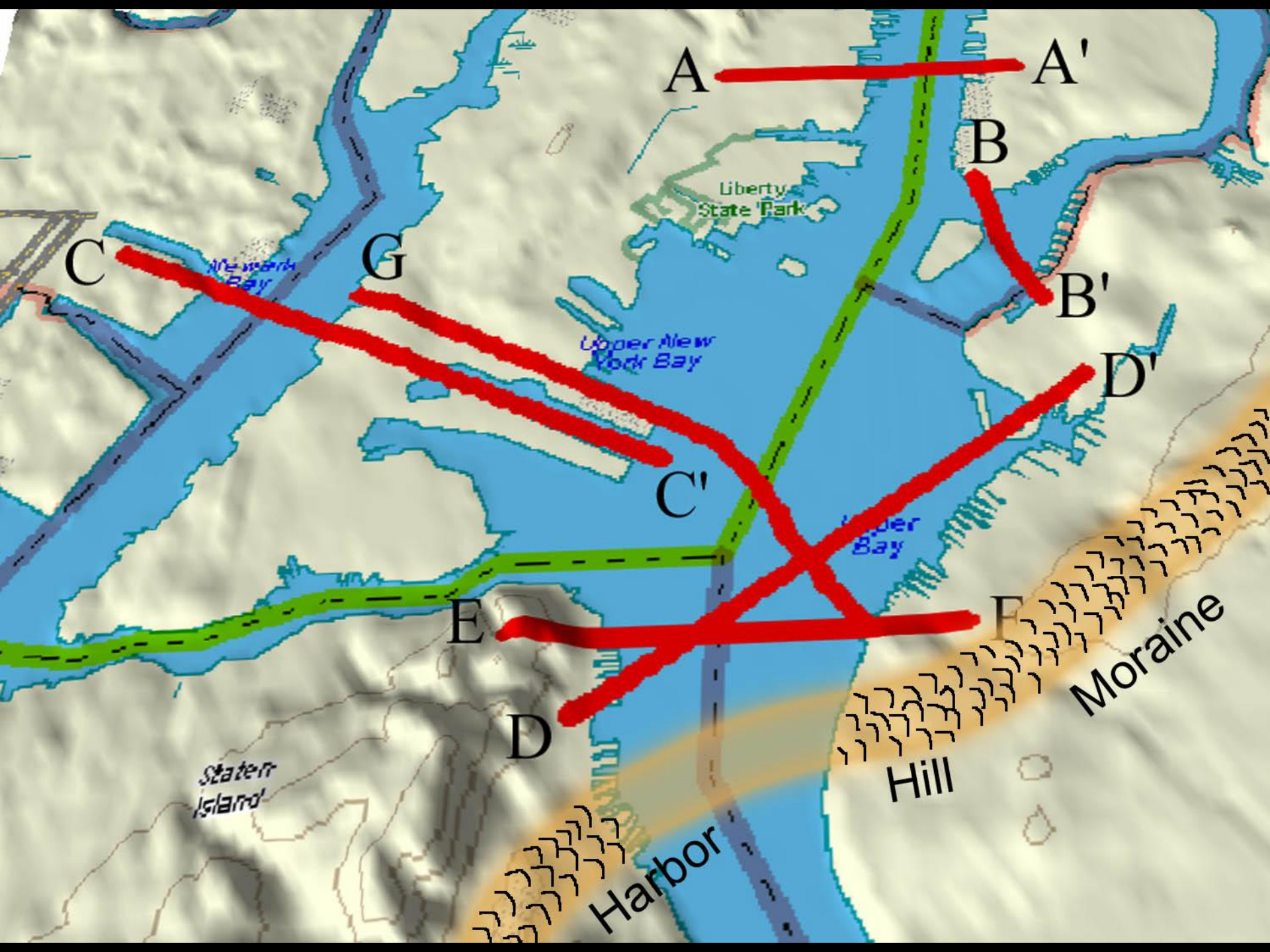


**Ready For Some
More Winter?**

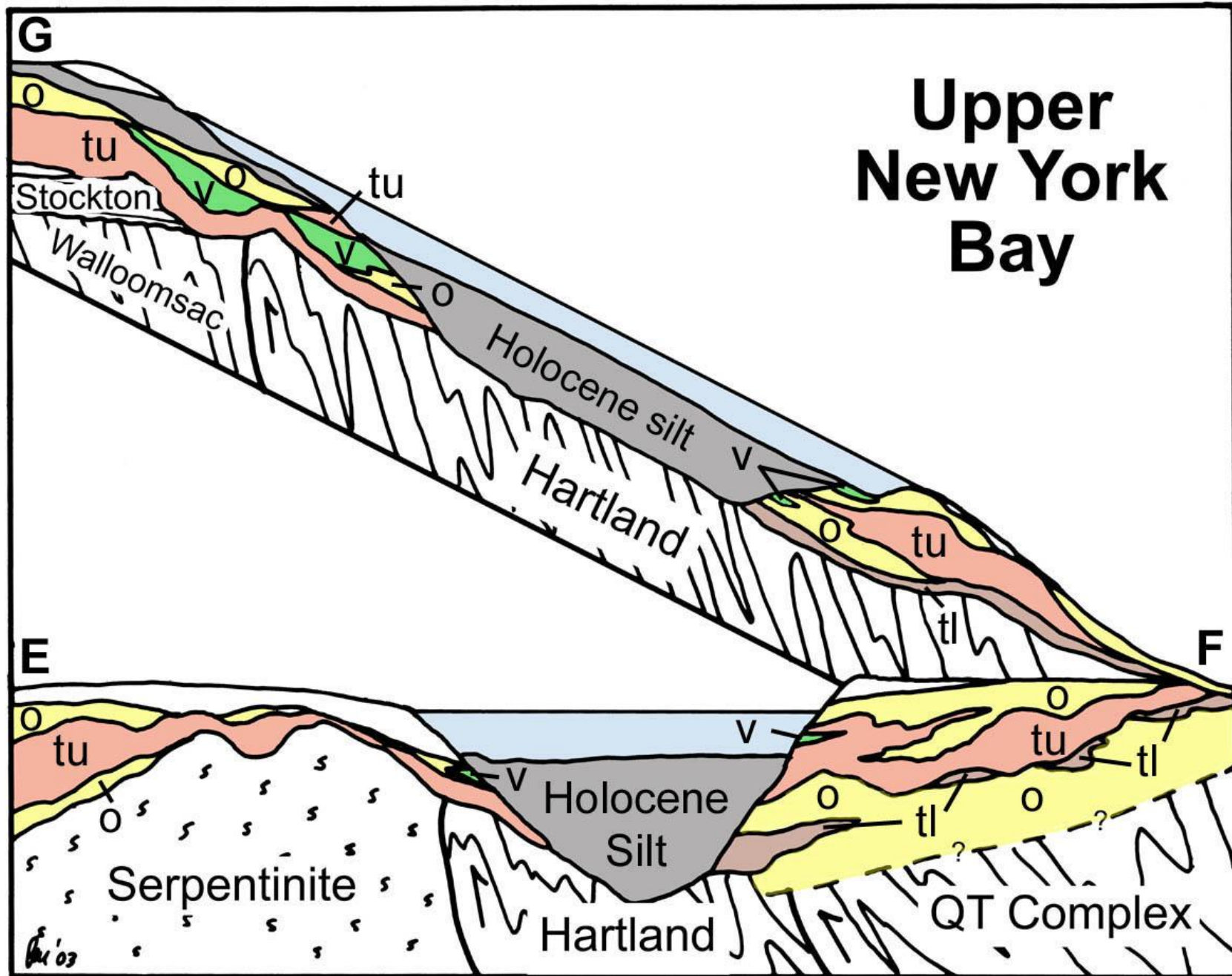


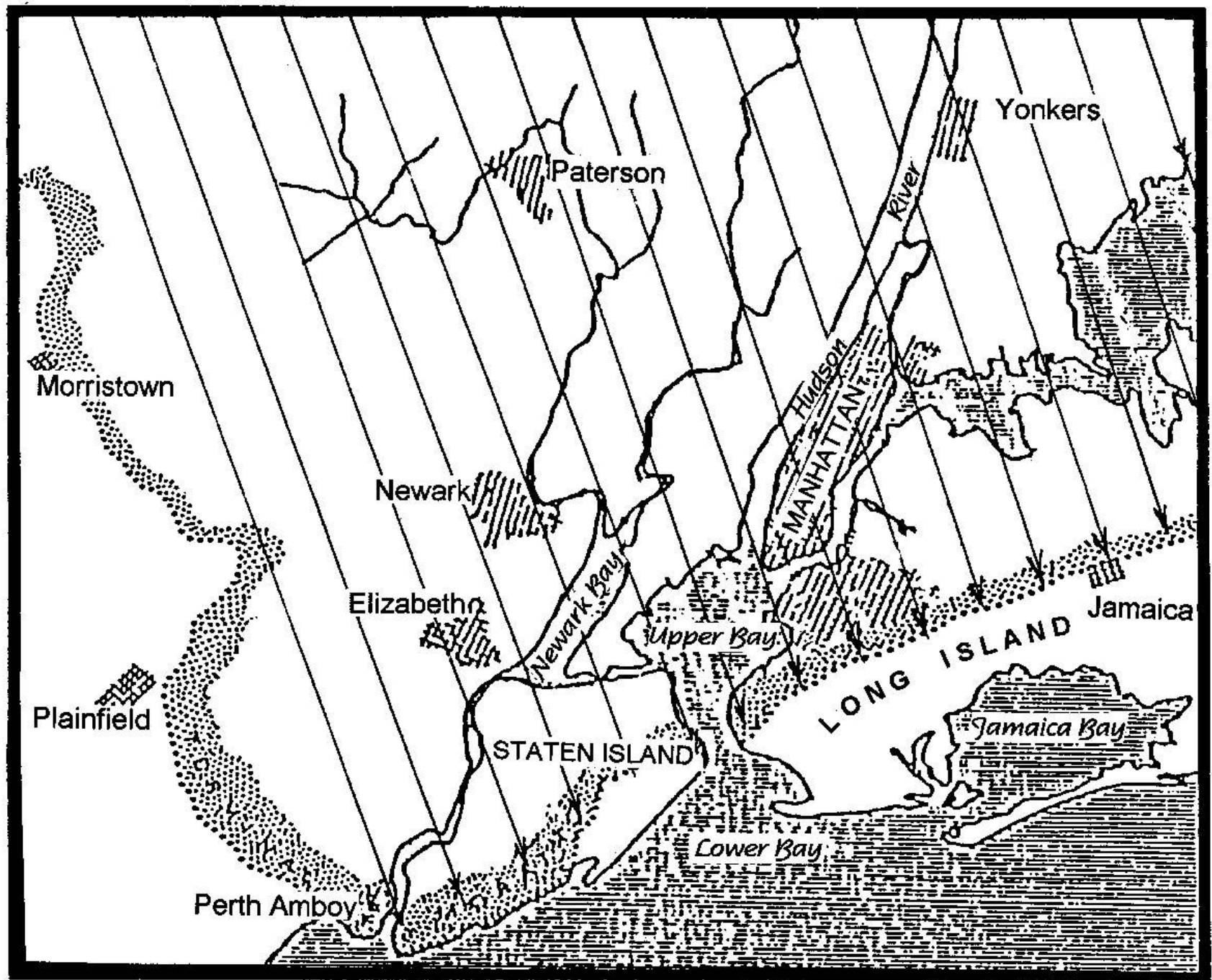
EXTRA SLIDES





Upper New York Bay

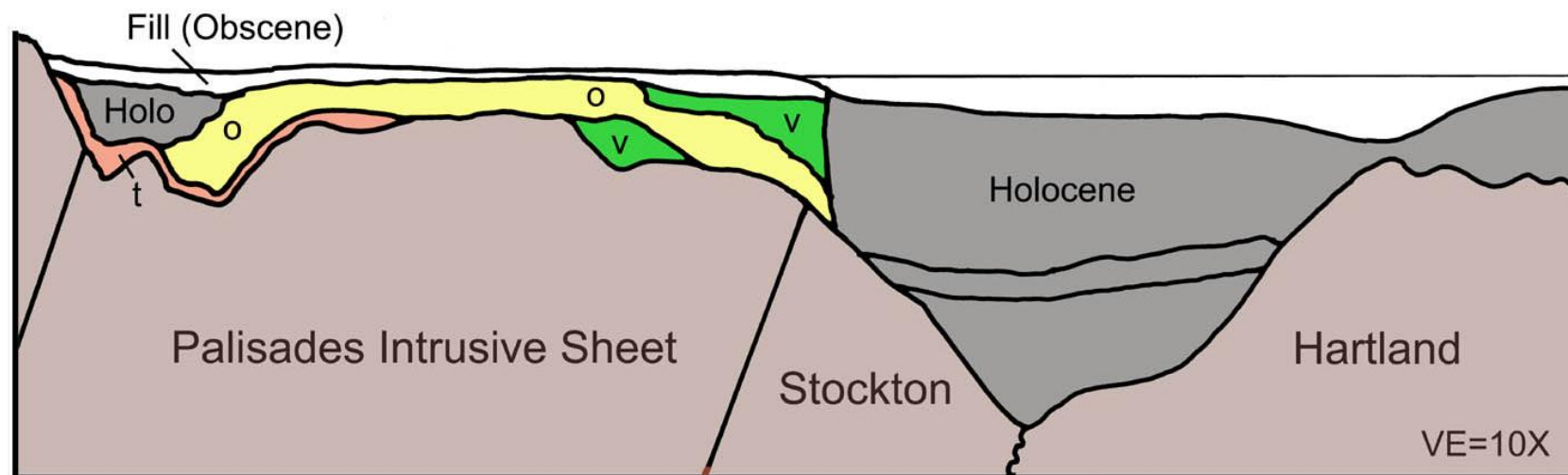




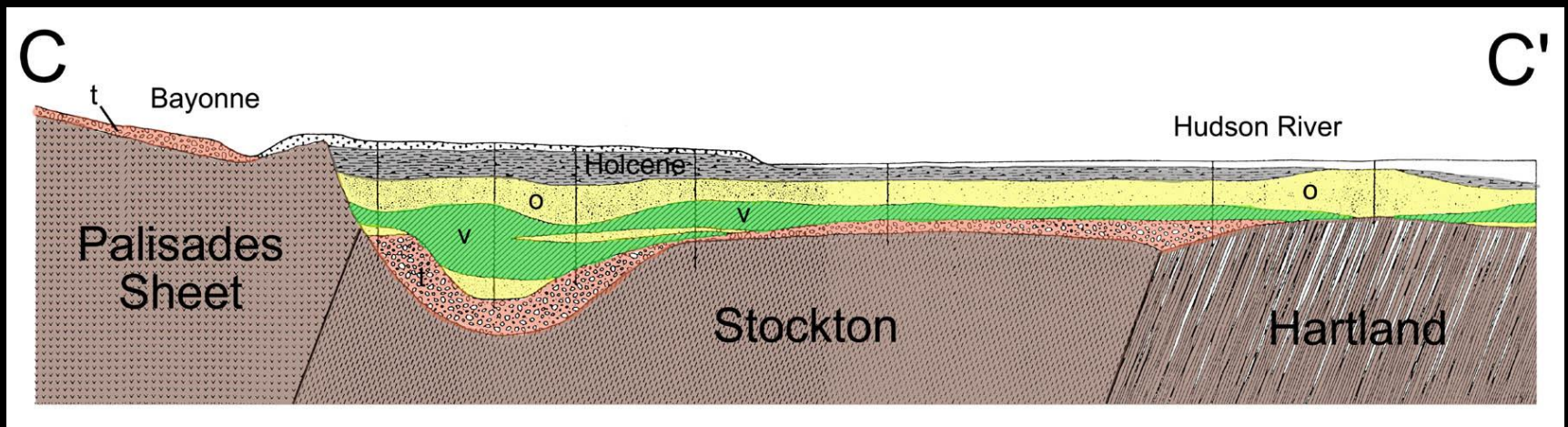


A

A'



Lovegreen (1974)



Lovegreen (1974)



