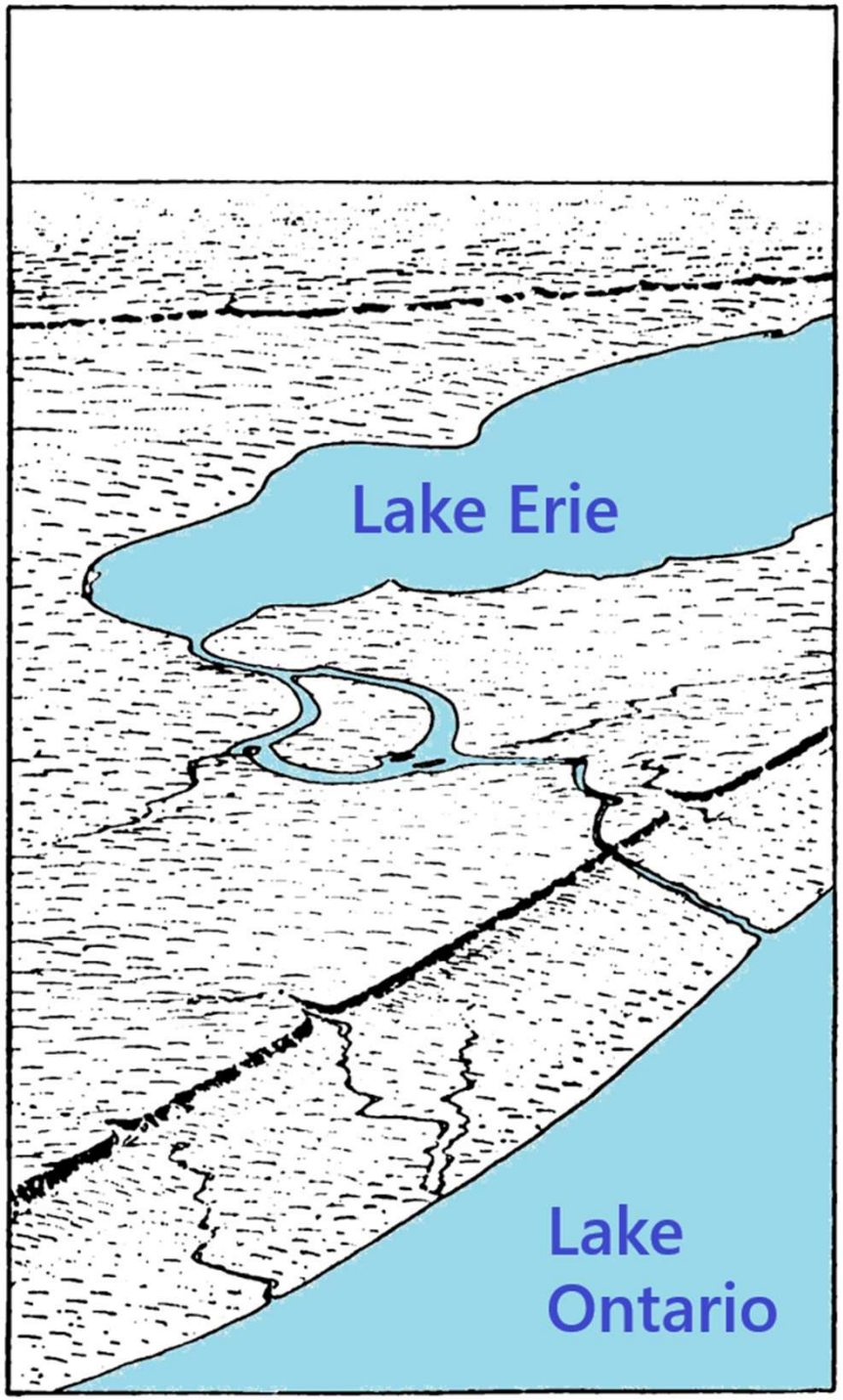


Adapted from Gilbert (1890)

A Partially Characterized Fault near Springville, NY

Raymond C. Vaughan, Ph.D., P.G.

West Valley Citizen Task Force meeting

October 28, 2026

- **In general, faults near the West Valley site and their associated earthquake (seismic) risk need to be understood.**
- **One of the deep faults near the site has not been adequately characterized -- it needs further investigation and clearer understanding.**
- **This presentation pulls together the evidence for the existence and location of this fault.**
- **Additional investigation should identify details (such as strike, dip, and branching) of this fault, its association with other nearby faults and with local/regional stress fields.**
- **Seismic effects on slope stability need to be integrated into probabilistic erosion rates.**

Effects on slope stability are a primary reason why seismic activity needs to be well understood at the West Valley site. The site is highly susceptible to both erosion and slope failures…; however, seismically-induced slope failures have not been adequately addressed…and cannot be reliably addressed without a better understanding of faults, seismicity, and recurrence intervals in the immediate vicinity of the West Valley site.

The connection between slope failures (i.e., landslides of various types) and earthquakes is well-known…, but smaller seismic events may also cause failures on susceptible slopes. Sidle et al. (1985) note that, "For most landslides that were initiated by earthquakes, the direct physical and mechanical influence of the ground motions appeared sufficient to generate failures on slopes that were in a delicate state of balance." The "delicate state of balance" criterion seems to be met at the West Valley site, given the many slope failures that are presently occurring at the site without additional seismic enhancement…. The main impact of seismically induced slope failures at the West Valley site under loss-of-institutional-control scenarios would be an intermittent acceleration of the backcutting of ravine edges. Such accelerated backcutting of ravine edges would expose buried wastes more rapidly than under normal erosional conditions.

Vaughan, "Issues the Core Team Needs to Address," dated January 15, 2008 and included as Appendix E in Sept. 2, 2009 Vaughan comments on the 2008 Draft EIS

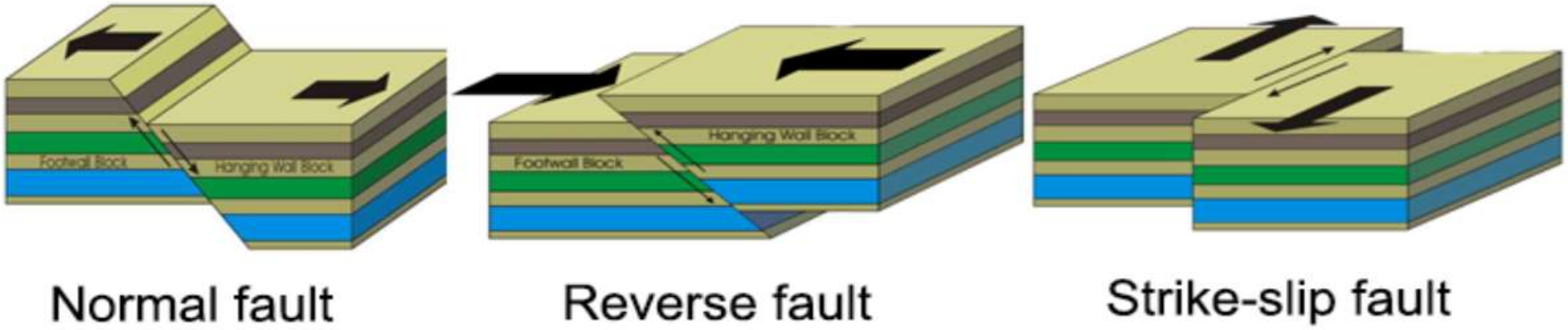
WHAT ARE FAULTS?

Faults are fractures in bedrock across which some movement of the rock has occurred.

In general, the fracture(s) and the movement occurred as a result of local/regional stress.

The fractures and the movement generally relieve the stress, either permanently or until it builds up again.

What are the three main types of faults?



Black arrows show direction of slip or movement that has occurred across the fault -- and also show the direction of force (stress) that caused rock to move

Faults are fractures in bedrock across which some movement of the rock has occurred.

Note the past tense: "…occurred." Many old faults are no longer active, meaning the stress has been relieved and there's no longer any movement across the fault.

Some faults are still active. An understanding of local/regional stresses can help determine whether a fault remains active.

If an active fault continues to slip freely, there's usually little or no ongoing build-up of stress.

But when active faults stick (when the rock at the fault doesn't slide freely), stress can build up until the rock suddenly slips (earthquake!).

CURRENTLY KNOWN and/or NEWLY PRESENTED EVIDENCE OF FAULT

1. Vaughan 1996 DEIS comments & Figs. 2-3 re: Packer Shell bed misalignment near Dutch Hill/Spooner Creek (*up on north*), seen in projections south from Miller #1 well and north from Glazier #1 well. Not dispositive on its own but reinforces the Bay Geophysical work.

2. Bay Geophysical's 2001 seismic identification of the fault (called "Cattaraugus Creek Feature"), *up on north*; unknown strike & dip.

3. Fault traces exposed in bedrock on Ashford side of Cattaraugus Creek, across creek from Springville Country Club, including two steeply dipping fault exposures, ~800 m from where the fault crosses US 219 (see *Geology Reports of CWVNW* figure and text). Also including gabled pop-ups below Springville Dam?

4. Other well logs (in addition to Miller #1 and Glazier #1) indicative of misalignment of beds in vicinity of Dutch Hill and Spooner Creek.

5. Temperature excursion (indicative of fracture flow?) at 620' depth on Kelview well log, ~1.8 km from where the fault crosses US 219.

6. (possible evidence?) Several WNYNSC wells exhibiting vertical fractures and very low Rock Quality Designation (RQD) values.

FAULTS THAT ARE GENERALLY RECOGNIZED IN WNY

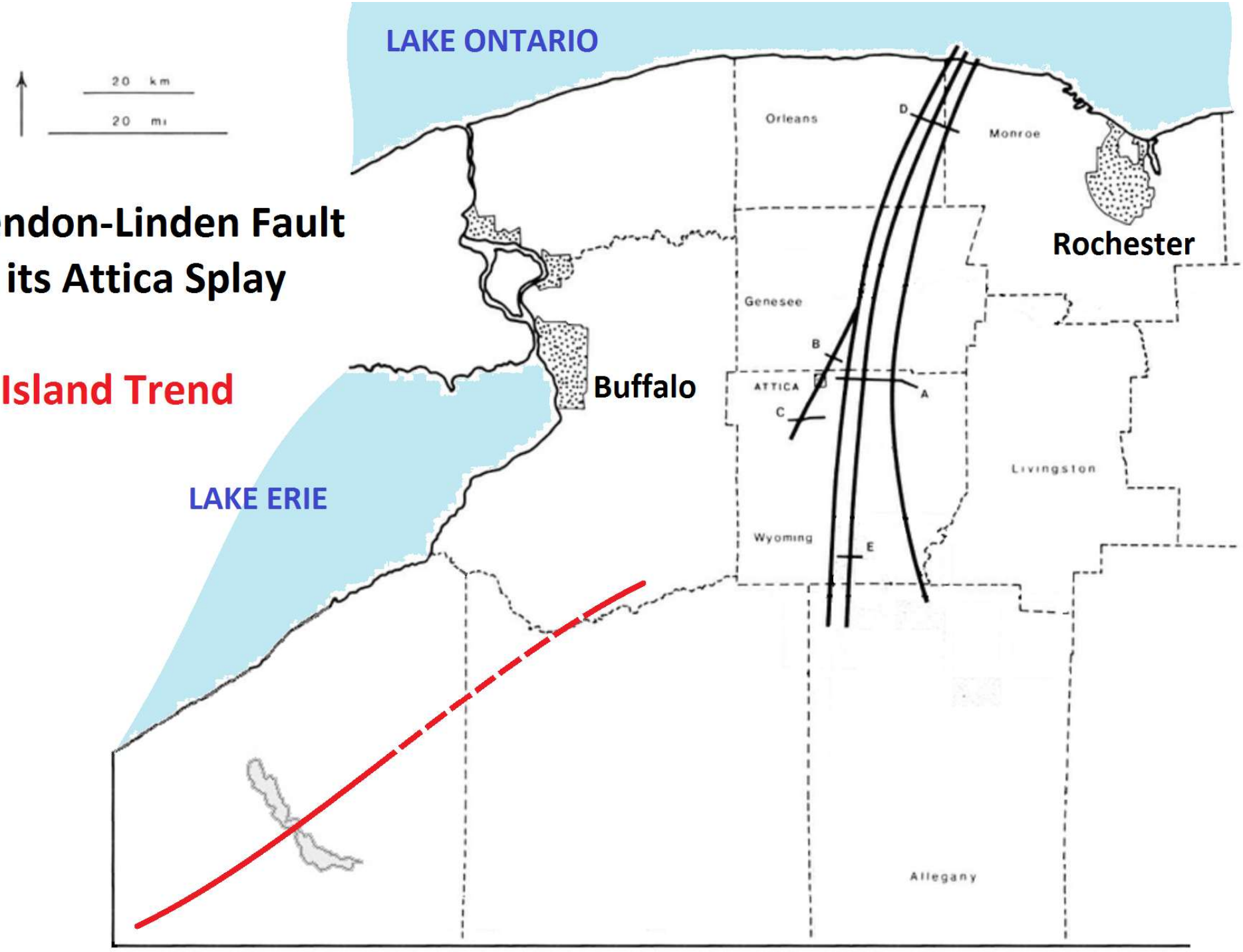
Clarendon-Linden Fault and its Attica branch or "splay" (these are deep; active)

Bass Island Trend (shallow; not active)

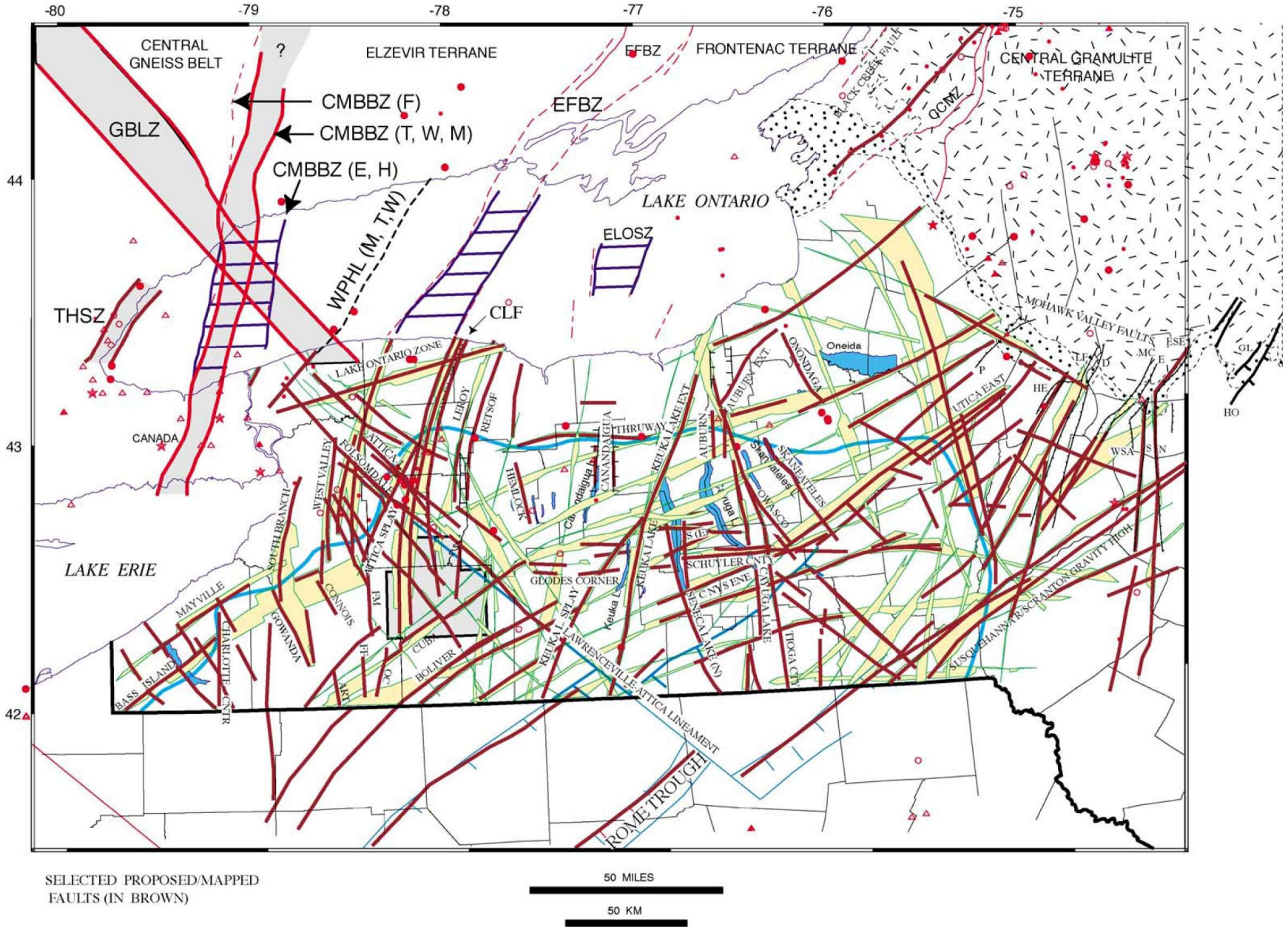
Prof. Robert Jacobi (UB) has mapped many other likely faults in New York State that are not fully documented; more evidence (esp. seismic testing) would be needed to verify their existence.

Clarendon-Linden Fault and its Attica Splay

Bass Island Trend



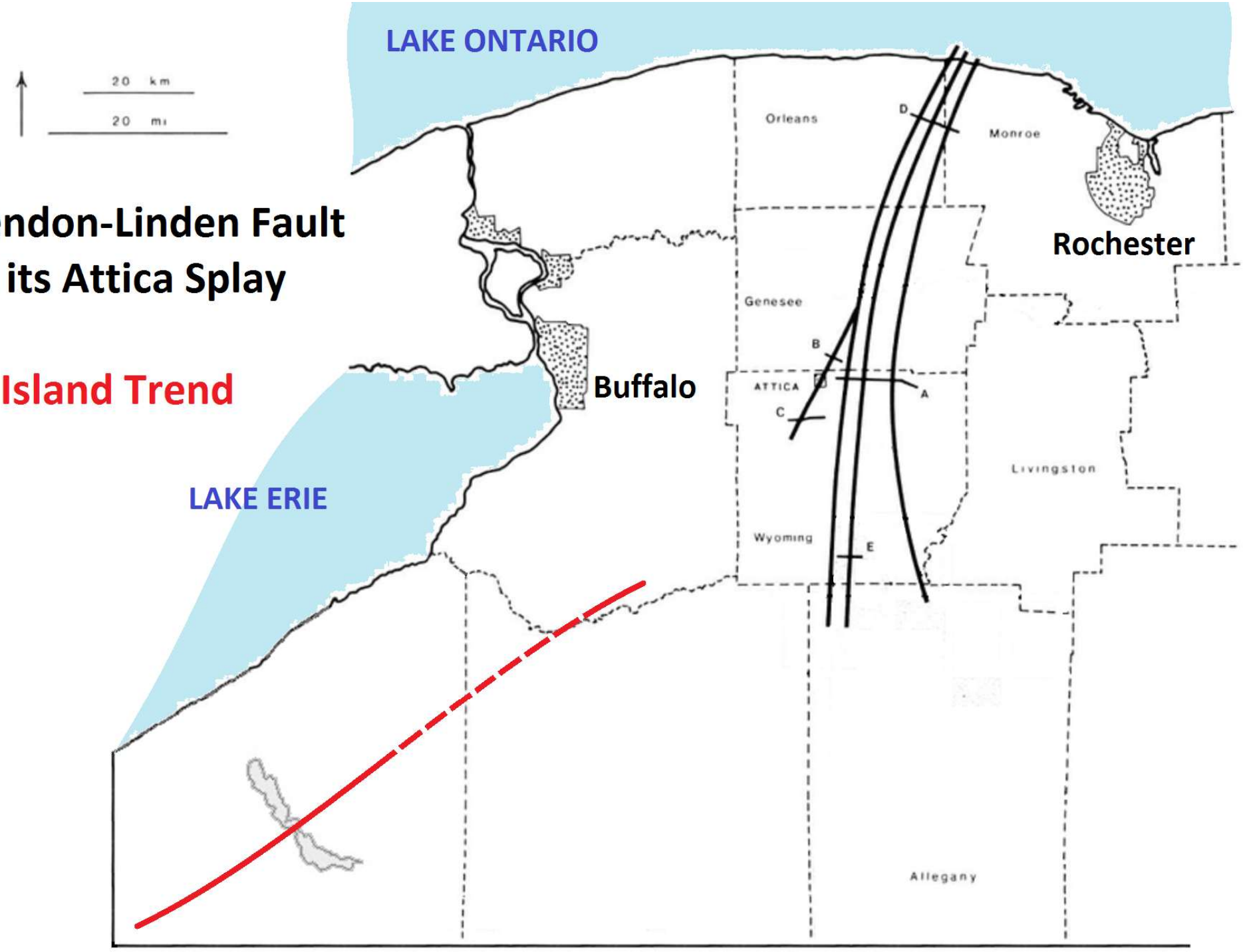
Adapted from Jacobi 1990


-80
-79
-78
-77
-76
-75
44
43
42
CENTRAL GNEISS BELT
?
ELZEVIR TERRANE
EFBZ
FRONTENAC TERRANE
CENTRAL GRANULITE TERRANE
GBLZ
CMBBZ (F)
CMBBZ (T, W, M)
CMBBZ (E, H)
EFBZ
GCMZ
BLACK CREEK FAULT
LAKE ONTARIO
ELOSZ
WPHL (M, T,W)
THSZ
CLF
CANADA
LAKE ONTARIO ZONE
MOHAWK VALLEY FAULTS
Oneida
ONONDAGA
AUBURN EXT
UTICA EAST
LEROY
RETSOF
ATTICA
FOLSOMDALE
WEST VALLEY
THRUWAY
KEUKA LAKE EXT
AUBURN
SKANEATELES L
OWASCO
HEMLOCK
CANANDAIGUA
SOUTH BRANCH
ATTICA SPLAY
LAKE ERIE
MAYVILLE
CONNOIS
GOWANDA
CHARLOTTE CNTR
BASS ISLAND
GLODES CORNER
KEUKA L
KEUKA LAKE
SCHUYLER CNTY
CAYUGA LAKE
SENECA LAKE (N)
TIOGA CTY
KEUKA L. SPLAY
LAWRENCEVILLE-ATTICA LINEAMENT
ROME TROUGH
SUSQUEHANNA TR/SCRANTON GRAVITY HIGH
SELECTED PROPOSED/MAPPED FAULTS (IN BROWN)
50 MILES
50 KM

Jacobi 2002

Clarendon-Linden Fault and its Attica Splay

Bass Island Trend



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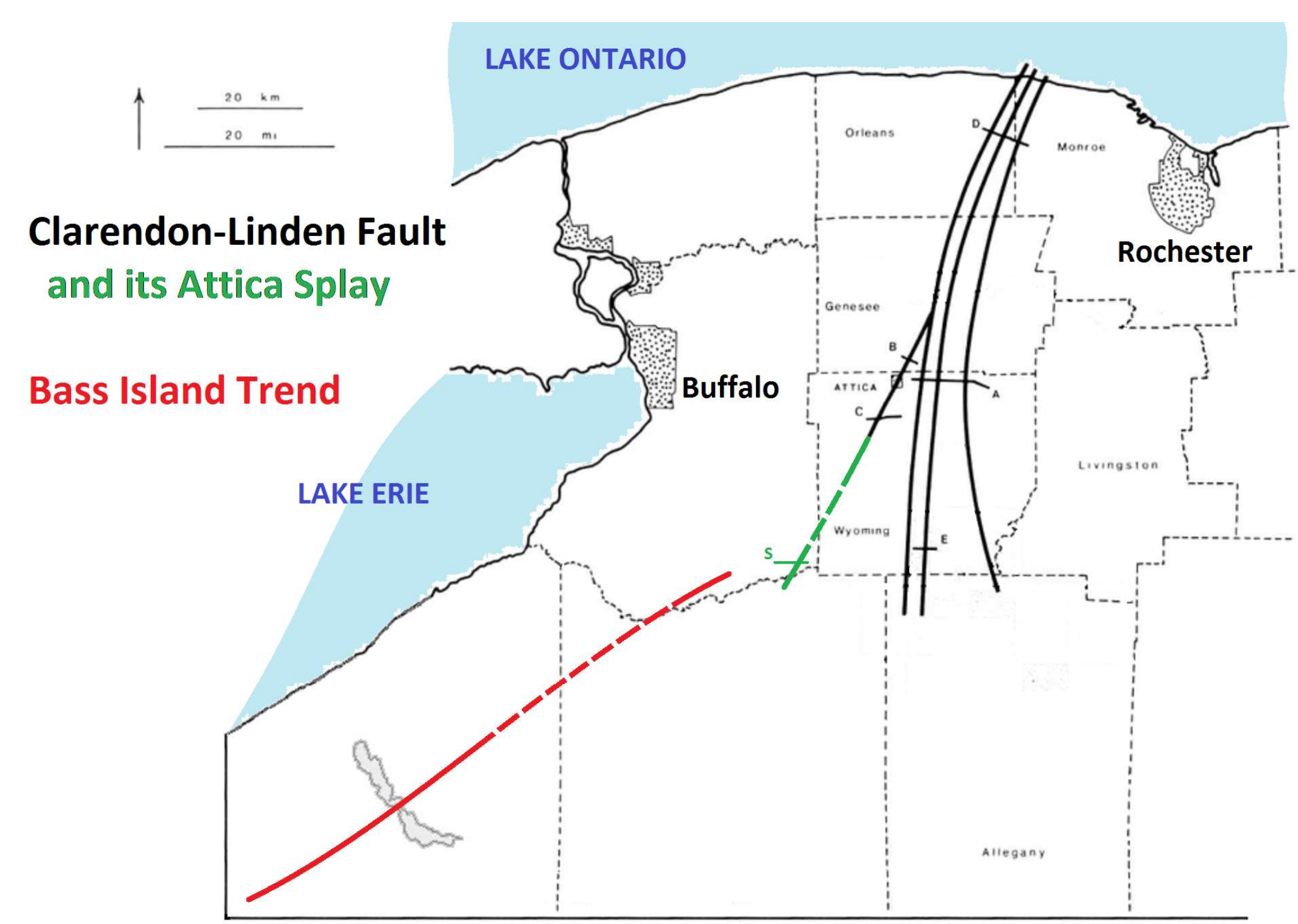
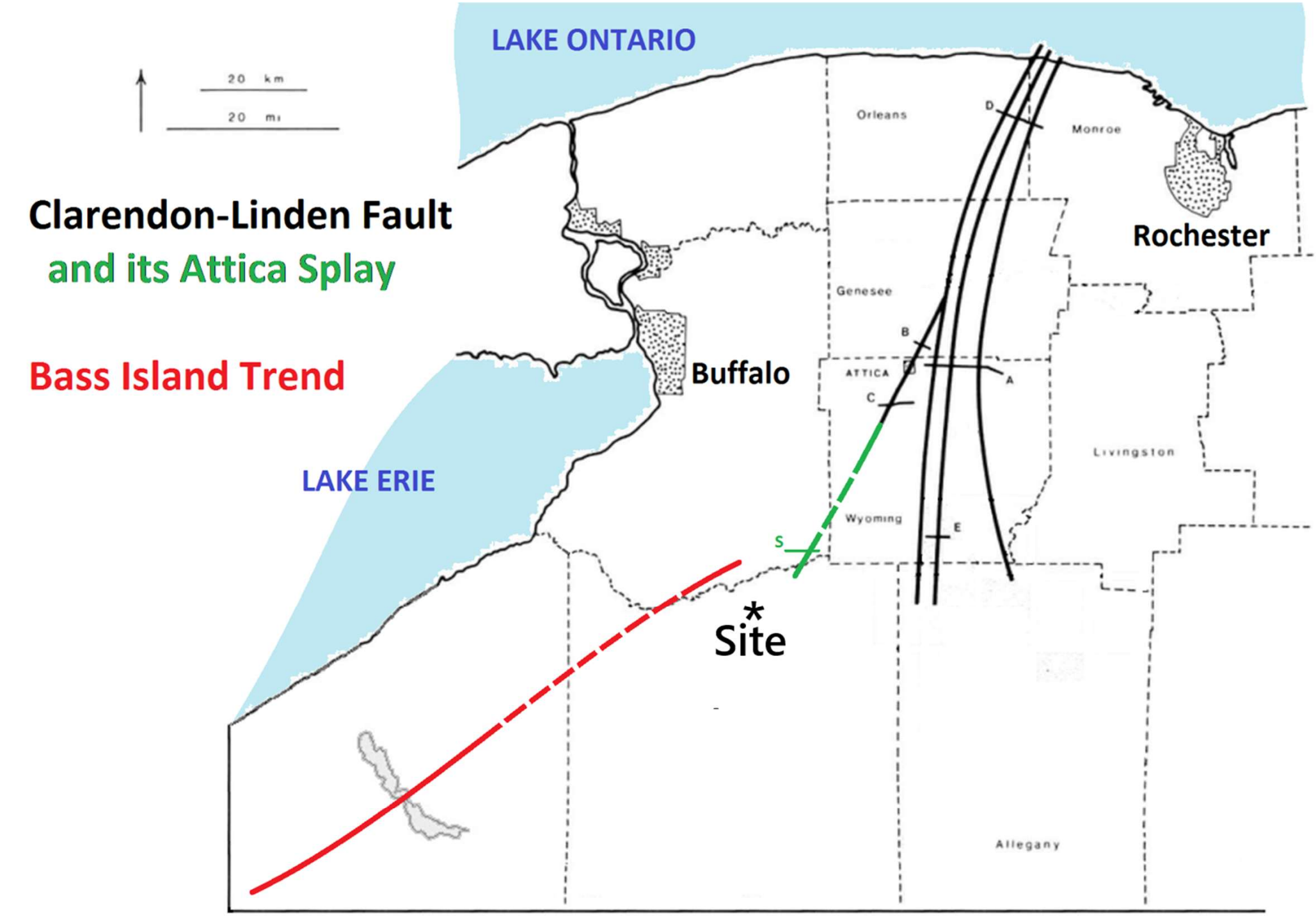


Clarendon-Linden Fault
and its Attica Splay

Bass Island Trend

Adapted from Jacobi 1990



Adapted from Jacobi 1990

FAULTS DETECTED BY BAY GEOPHYSICAL

The Clarendon-Linden Fault and its Attica Splay (deep; active). The fault that Bay Geophysical calls the "Sardinia Feature" apparently matches the Attica Splay and extends its identification further southward.

Bass Island Trend (shallow; not active) is called the "Intersection Feature" by Bay Geophysical.

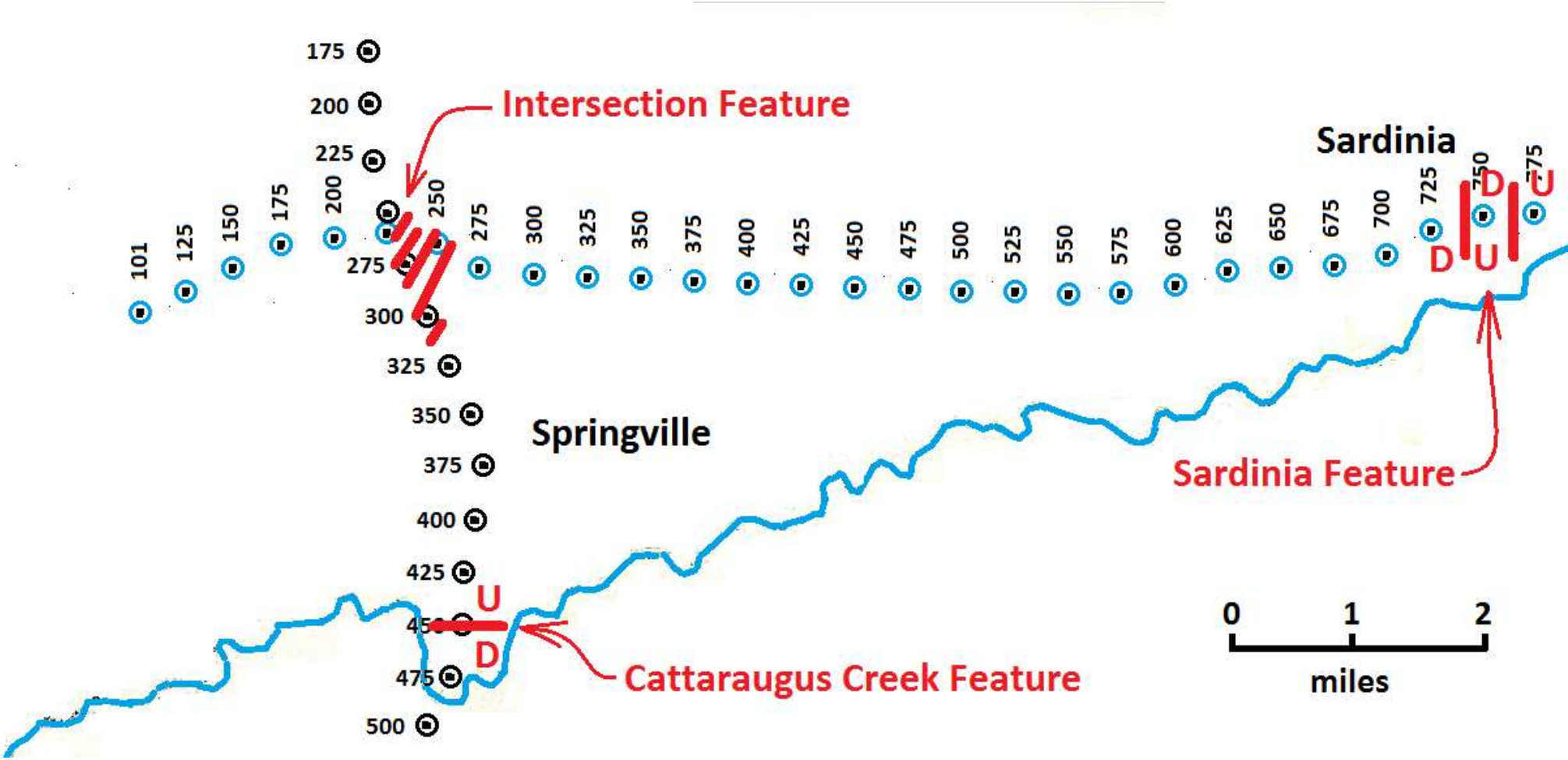
Bay Geophysical shows the "Cattaraugus Creek Feature" as a deep fault. An active fault? Not clear. This fault -- the subject of this presentation -- was not previously known to the general public, or to the WNY geological community at large, prior to Bay Geophysical's 2001 report.

TWO SEISMIC LINES: Line BER83-2A along US 219

Line WVN-1 mostly along Middle Rd. & NY 39

Intersection Feature = shallow thrust(s); above the salt

The other two faults are deep-seated

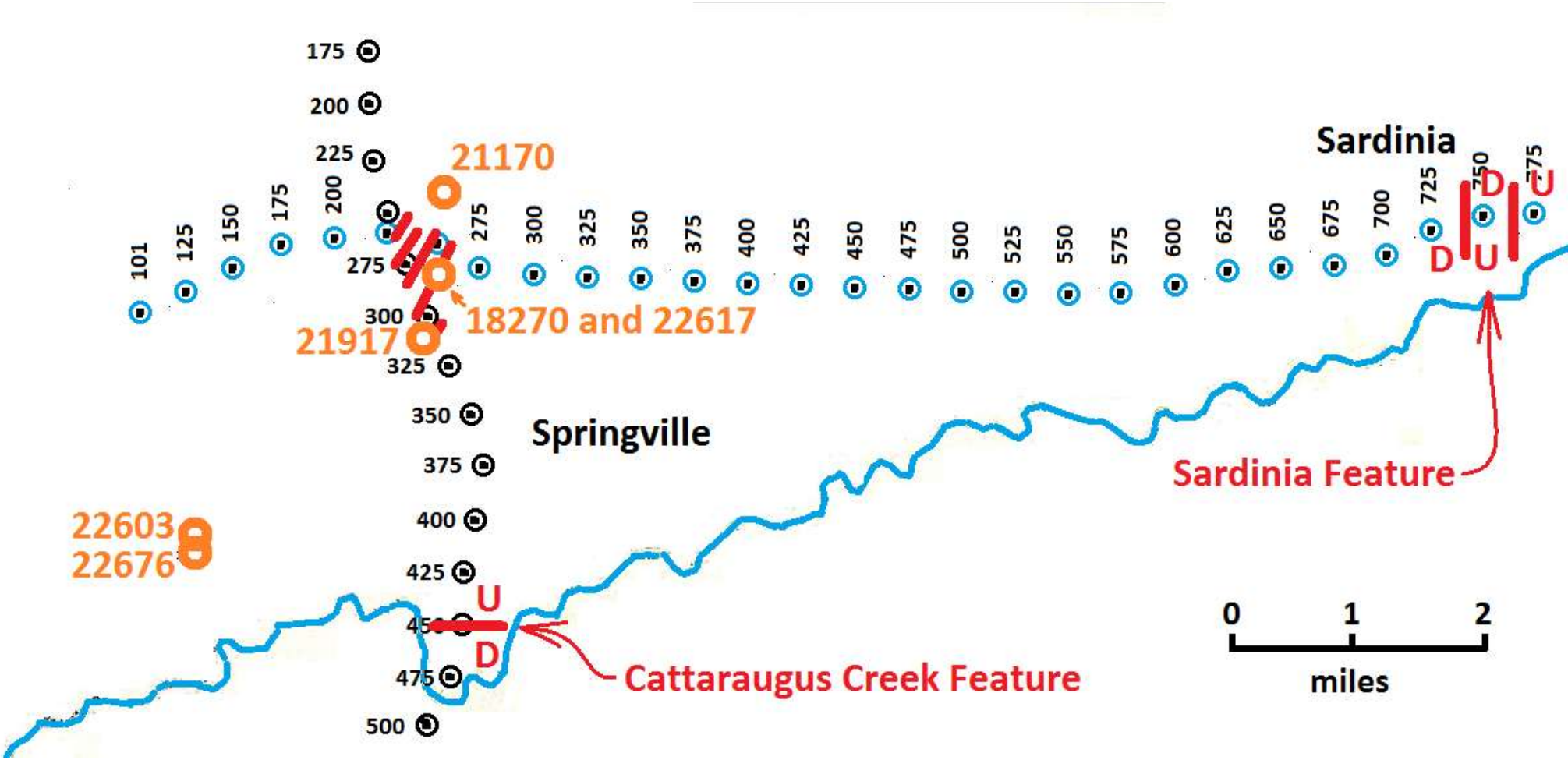


Adapted from Bay Geophysical 2001

Intersection Feature = Bass Island Trend; seen on <u>both</u> seismic lines and also as repeated section(s) in gas wells

Sardinia Feature appears to be Attica Splay (thus active?)

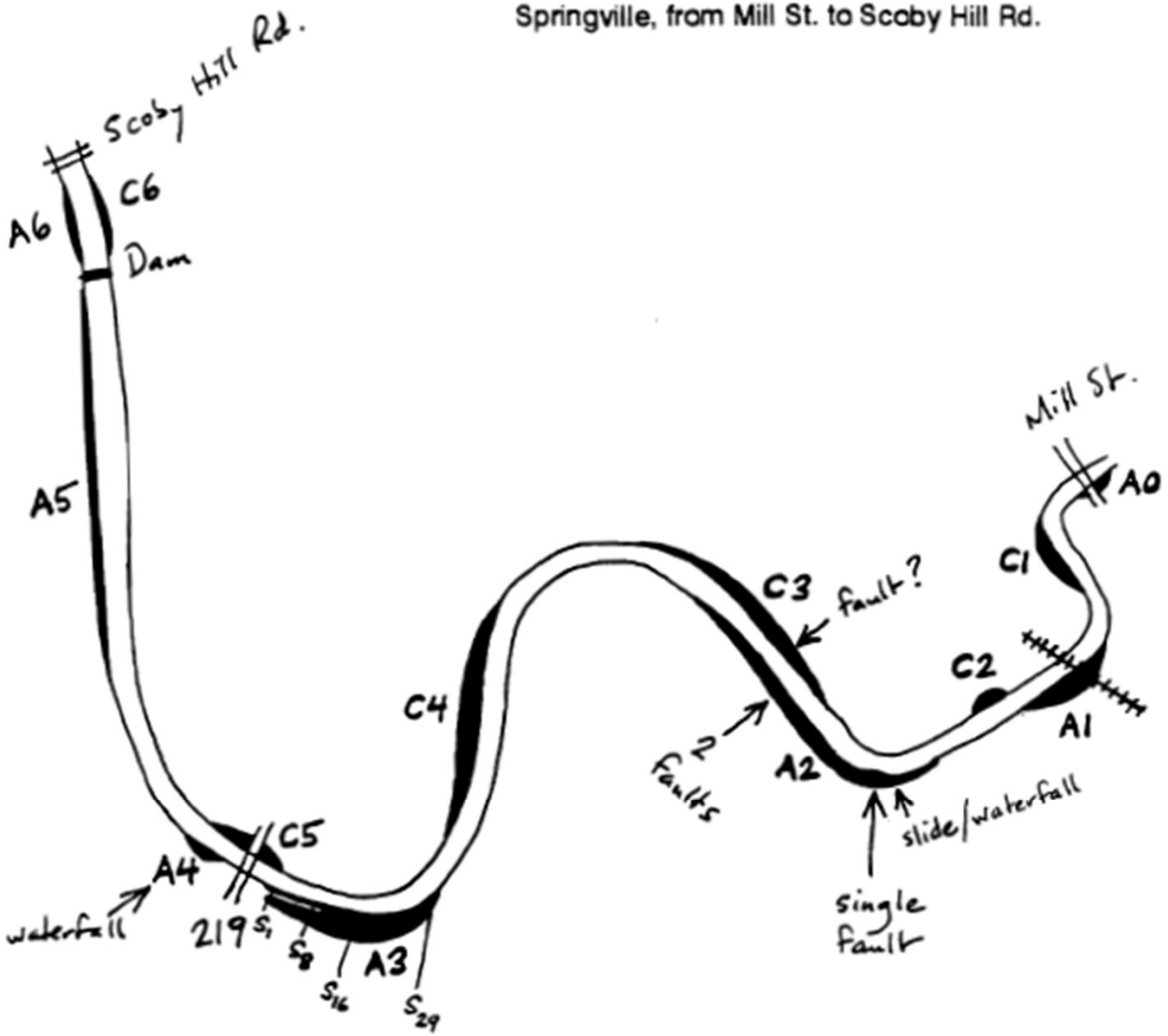
Cattaraugus Creek Feature not otherwise known (strike?)



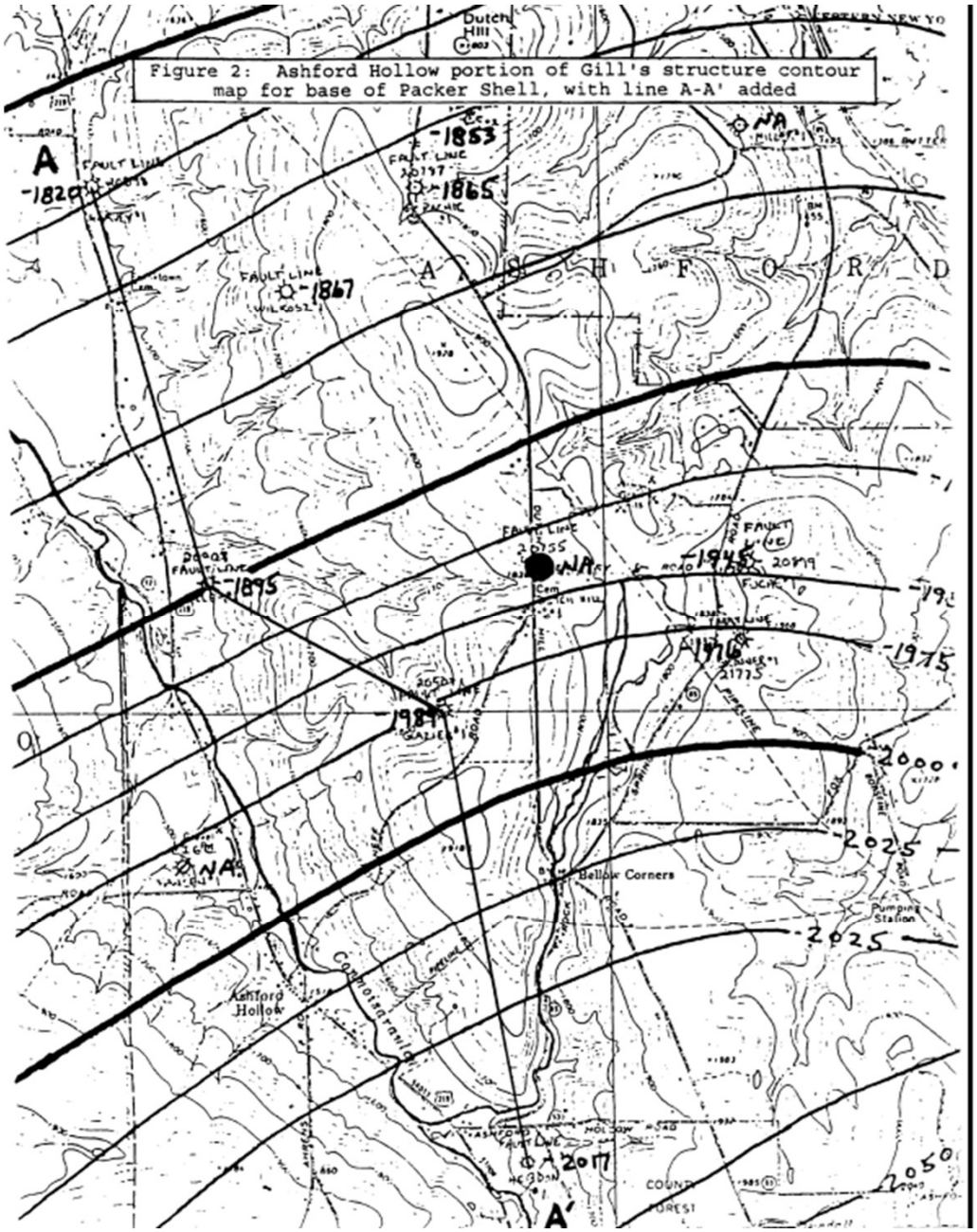
Adapted from Bay Geophysical 2001

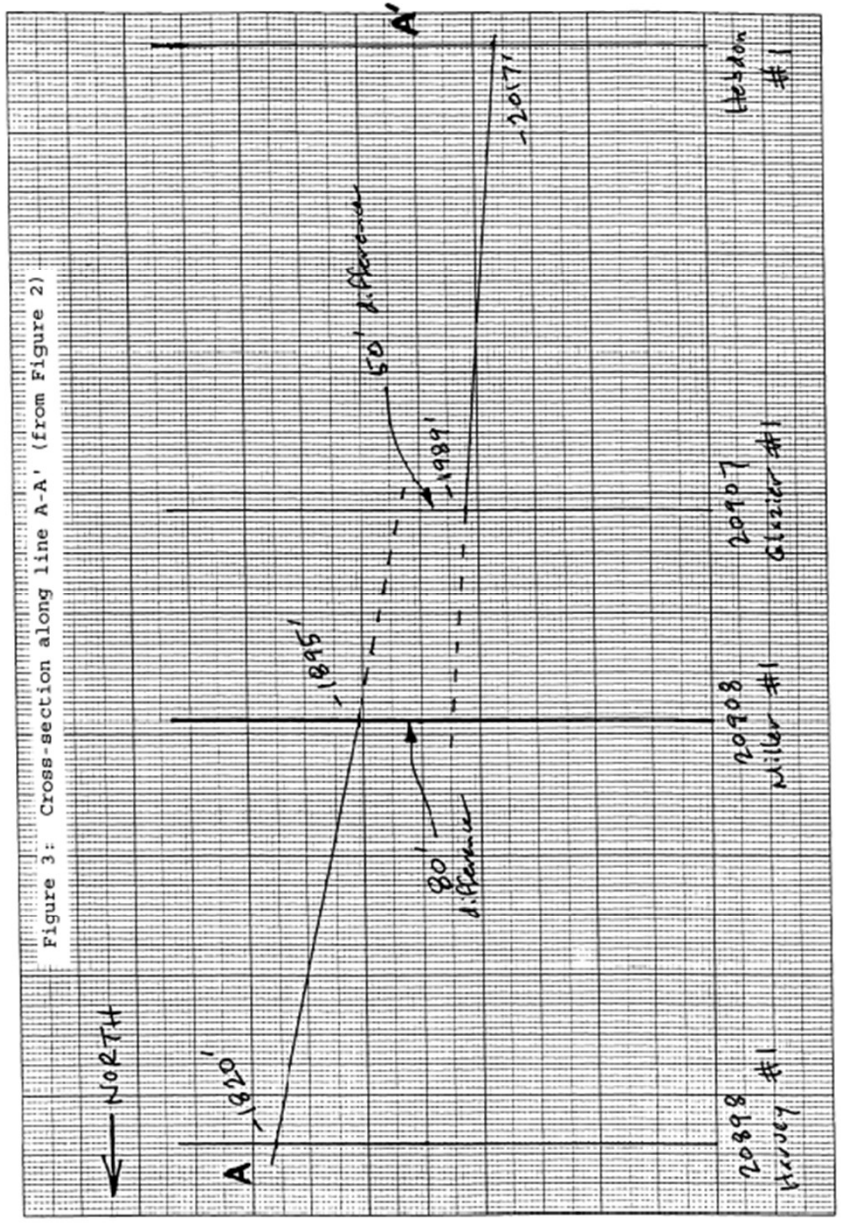
Geology Reports of the CWVNW, page 47; see location of 2 faults in cliff A2.

Figure 1: Cattaraugus Creek immediately south of Springville, from Mill St. to Scoby Hill Rd.



CLIFF DESIGNATIONS :
A0 through A6 on Ashford side
C1 through C6 on Concord side





Figs. 2-3 of Vaughan 1996 DEIS comments (also included in later Vaughan EIS comments)

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CONCLUSIONS: WHAT'S BEEN COVERED HERE

- **A review of what's known & what remains unknown about the "Cattaraugus Creek Feature" fault**
- **Slope failures occur on the West Valley site regardless of any additional seismic enhancement, but note that….**
- **Seismically induced slope failures that result in intermittent acceleration of the backcutting of ravine walls also need to be considered. Such accelerated backcutting can be expected to expose buried wastes more rapidly than under "normal" erosional conditions.**

All of this is a crucial part of what DOE, NYSERDA, and Neptune need to build into their models. Beyond just doing this, the agencies need to explain how it can and will be done. They need to explain how their probabilistic modeling will merge the site's "normal" erosion rate with occasional episodes of accelerated erosion arising from seismic slope failures.

CONCLUSIONS: THE ATTICA SPLAY ALSO NEEDS ATTENTION

Even though this presentation has focused on the "Cattaraugus Creek Feature" fault, there are also important gaps in what's known about the Attica Splay, which appears to be an active fault, at least at its north end.

Such gaps in knowledge should be filled, so that modeled episodes of accelerated erosion can take both the Cattaraugus Creek Feature and the Attica Splay seismicity into account.

QUESTIONS?