

Small Project, Big Stability Problem The Block Church Road Experience



August 4, 2005 ISC Conference St. Louis, MO



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of Engineers
Buffalo District

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Outline



- Introduction
- Local Soils and Geology
- Town of Amherst Study
- The Block Church Road Project
- Other Impacts to Infrastructure
- Lessons Learned



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Past Buffalo District Small Projects

- Streambank erosion
- Simple – no geotechnical issues
- Rip rap design
- Short time frame from initiation to completion (< 3 years)
- 100% federal funding
- Successful over design life



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Local Soils and Geology



County of Amherst New York

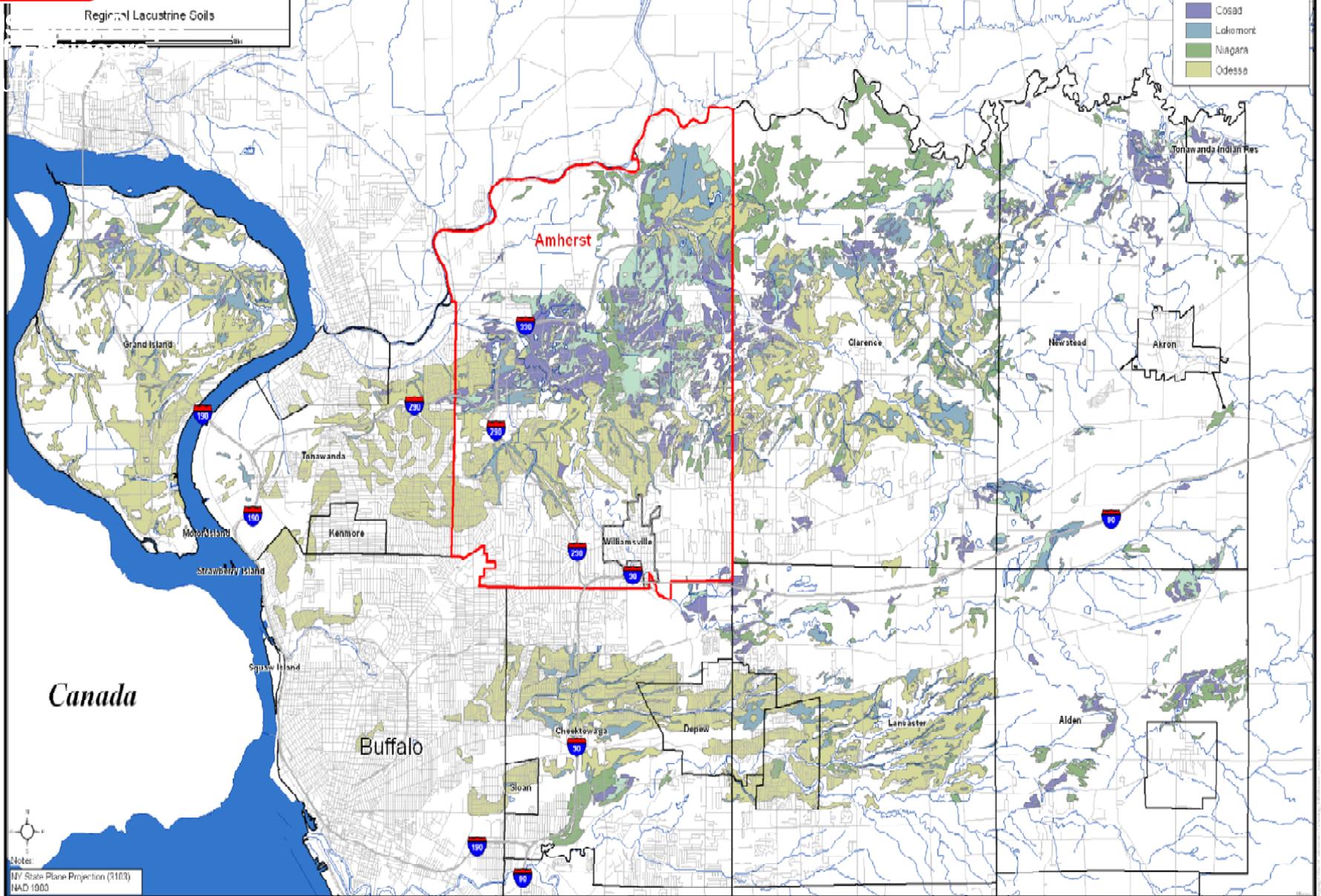


Regional Lacustrine Soils

Legend:

Soil Type

- Chockitowaga
- Cosad
- Lakemont
- Niagara
- Odessa



Canada

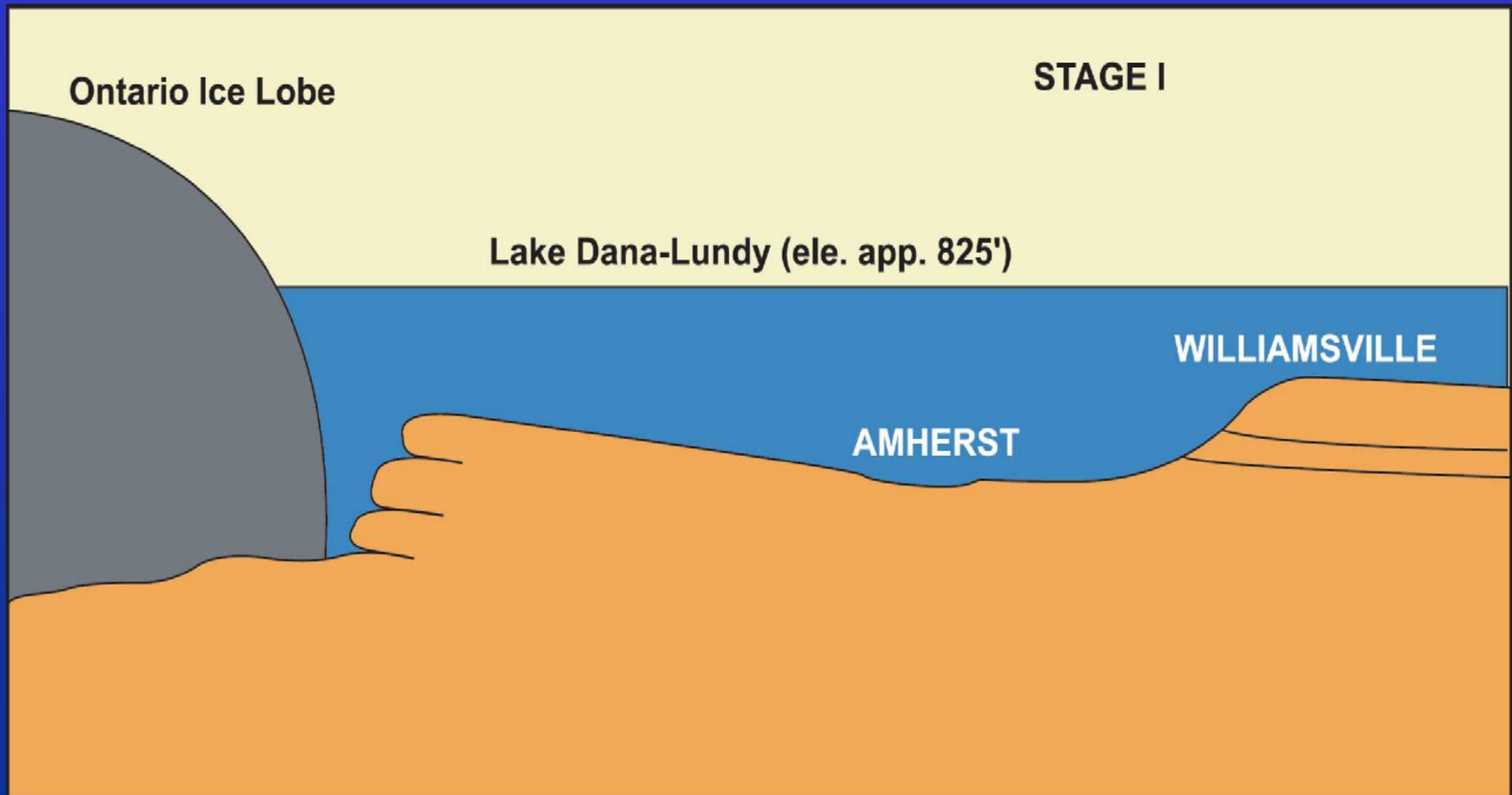


Notes:
NY State Plane Projection (3103)
NAD 1983



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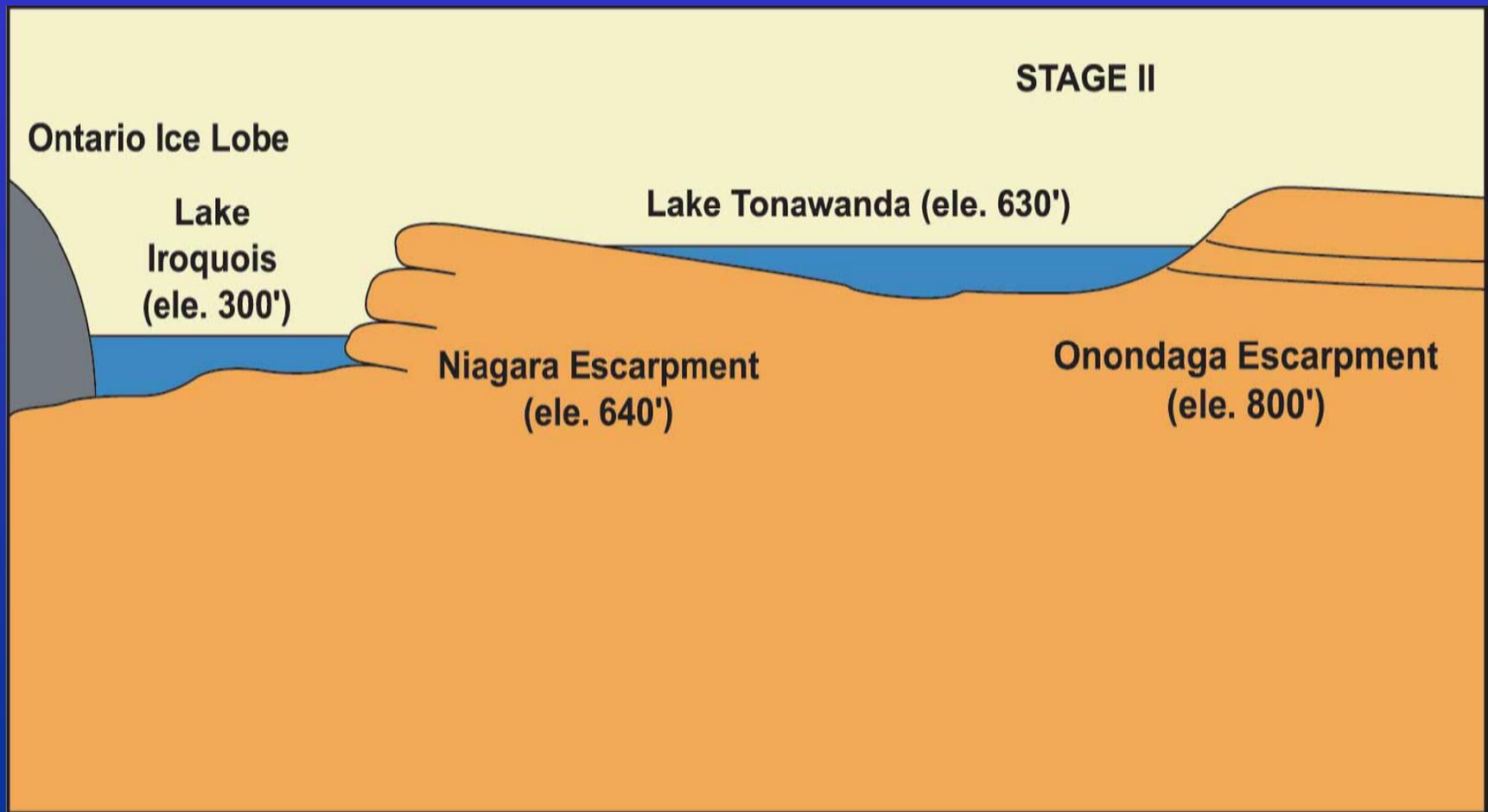
Lake Dana-Lundy Stage 1





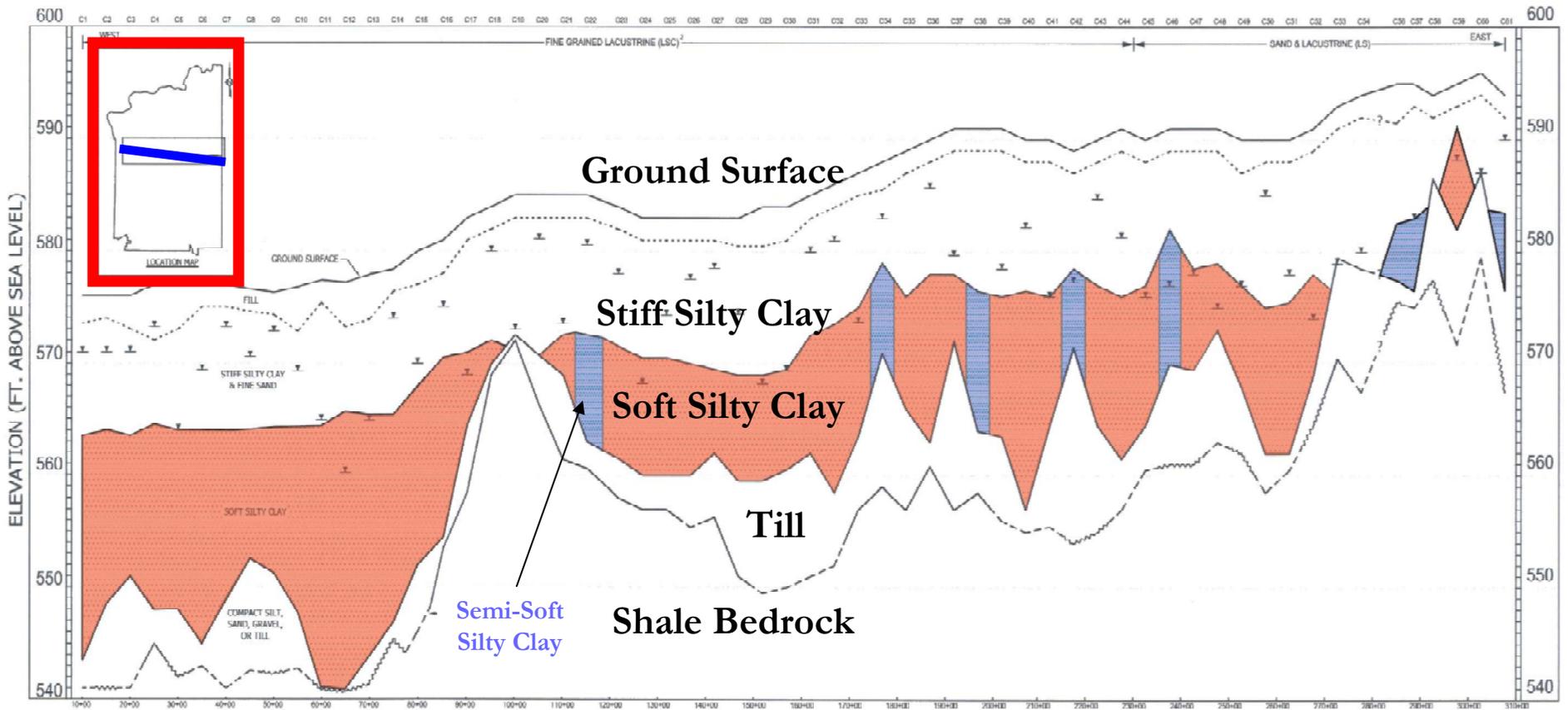
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Lake Dana-Lundy Stage 2





Geo-X-section



LEGEND

- C20 BORE LOCATION ¹
- WATER LEVEL IN BORE HOLE (12 to 72 HRS. AFTER COMPLETION)
- N < 4
- 4 <= N <= 8

DATA SOURCES

1. ANDERSON DRILLING COMPANY, INC. (JUNE 1973)
2. NYS GEOLOGICAL SURVEY, SURFICIAL GEOLOGY (MAY 1973)

DRAWING DATE:	NOVEMBER 15, 2004	DRAWN BY:	CPS
REVISED BY:		JOB NO.:	2003.007
DATE:		CHECKED BY:	RG (CORPS)
		HORIZ. SCALE:	1" = 2000'
		VERT. SCALE:	1" = 10'

GEOTECHNICAL/GEOLOGIC CROSS SECTION - PEANUT LINE

SUBSOIL PROFILE

TOWN OF AMHERST
 PAUL M. BOWERS, P.E.
 ENGINEERING DEPARTMENT
 1100 N. FOREST RD.
 WILLAMSVILLE, NY 14221
 FOR USACE, BUFFALO DISTRICT

FIG. NO.

8



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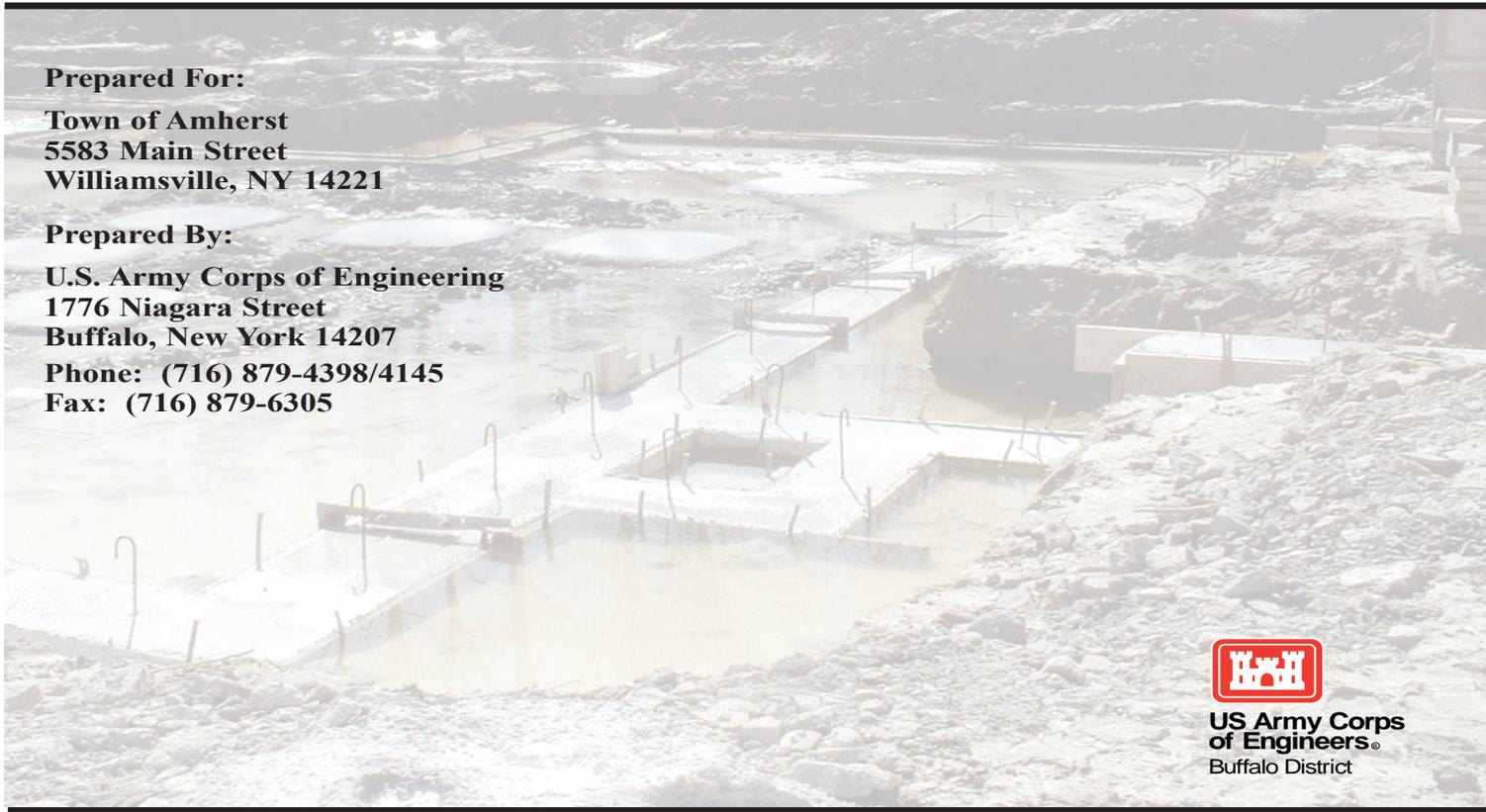
TOWN OF AMHERST SOILS AND RESIDENTIAL FOUNDATION STUDY

Prepared For:

**Town of Amherst
5583 Main Street
Williamsville, NY 14221**

Prepared By:

**U.S. Army Corps of Engineering
1776 Niagara Street
Buffalo, New York 14207
Phone: (716) 879-4398/4145
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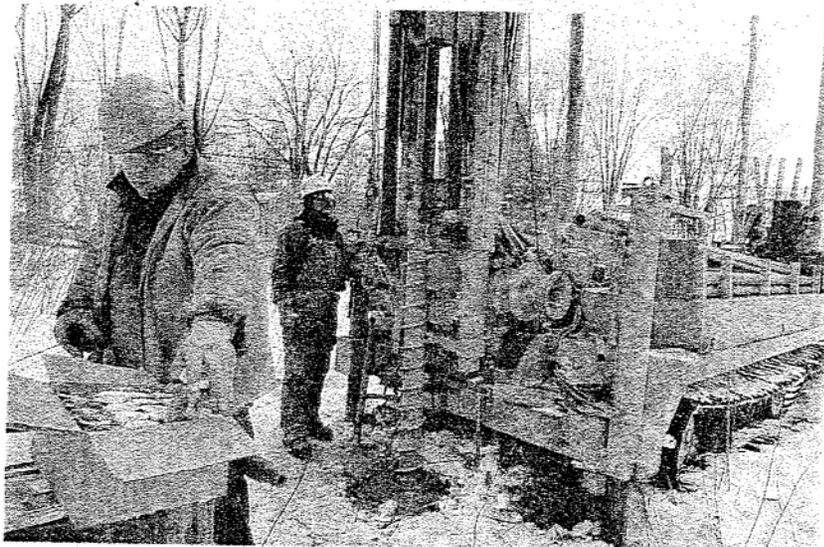
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FOCUS: AMHERST PROPERTIES

Over 1,000 homes sinking, Amherst official tells state

THURSDAY, FEBRUARY 19, 2004

FOCUS: SINKING HOMES



Michael Benedict, a driller's helper, boxes a soil sample from 25 feet down on a proposed Amherst building site. Brian Fuller, a driller with SJB Services, reads the log for another sample. DENNIS C. ENSER/Buffalo News

SINKING HOMES
State panel overturns Amherst building law

AMHERST
Builders group now favors 'rebar law'
By THOMAS J. DOLAN

Advocates to press for housing moratorium

Town Board to consider moratorium on new housing north of Maple Road

Amherst's soft soil

Subsoil as mushy as chocolate frosting or peanut butter may be a key to the "sinking homes" problem in Amherst — and may help explain the millions of dollars needed to fix the damage

Cracks in American dream

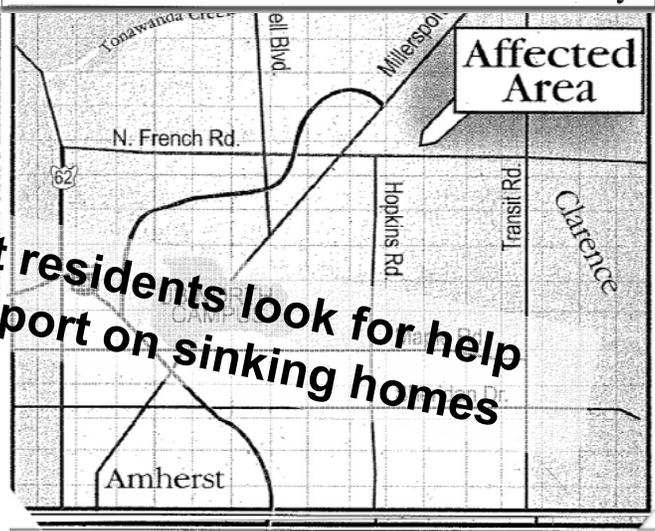
Delaying public hearing delays foundation solutions

Sinking into foreclosure

Amherst residents look for help in soil report on sinking homes

Town not liable for soil issues, judge rules

UB Rises Above as Amherst Sinks Slowly





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Soft Lacustrine Clays, Commonly Described as “Peanut Butter”







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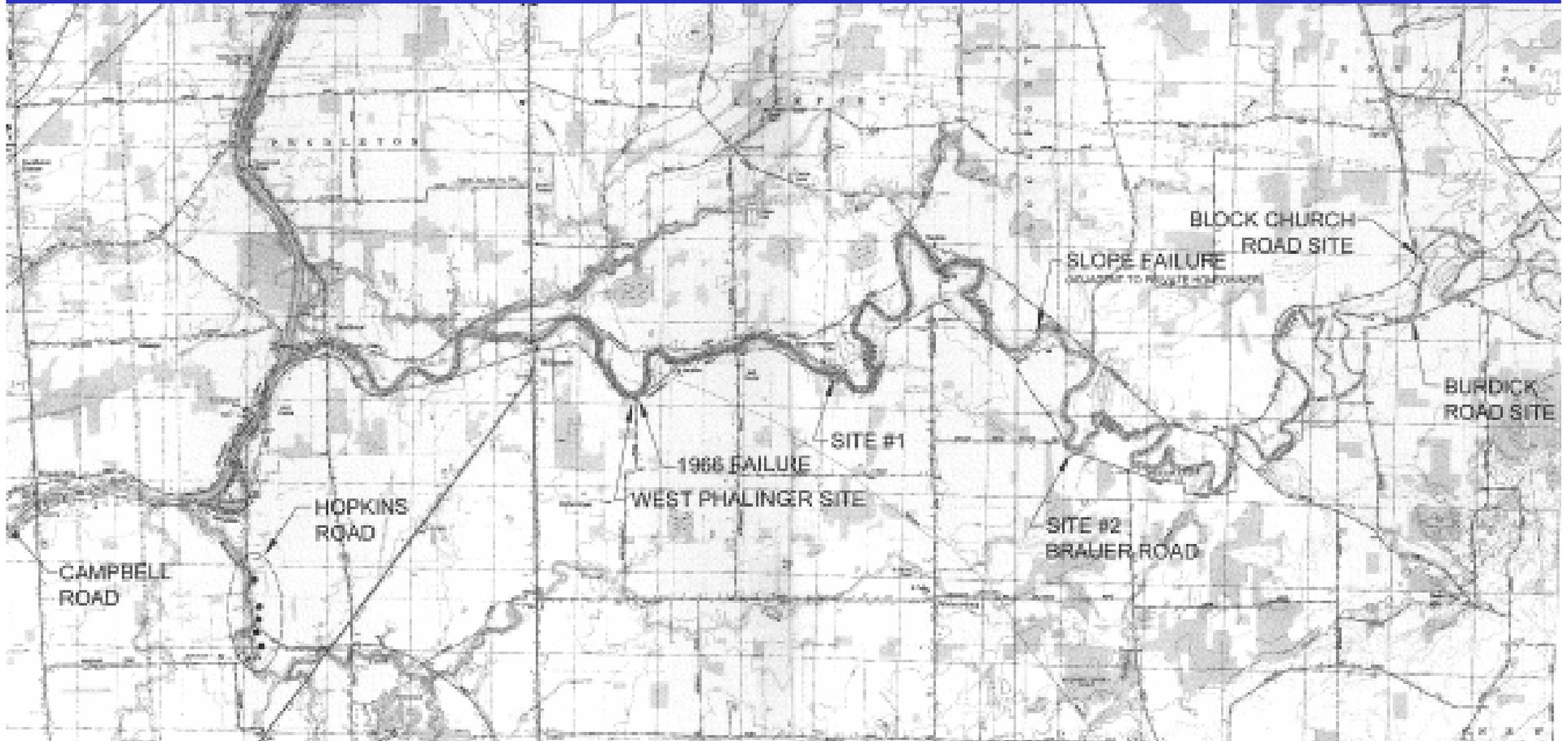
Geotechnical Properties of the Soft Clay

- $N = 0$ blows/foot $w = 50\%$
- $LL = 50-60$ $PL = 25$ $PI = 25-35$
- Unit weight (total) = 110 pcf
- Unified classification CL or CH
- Maximum shear strength = 300 psf
- Remolded shear strength = 50 psf
- Sensitivity 2-6.5



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Block Church Road





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Block Church Road Summary

- Recon 1992
- Preliminary design 1994
- Draft plans and specs 1998
- Final plans and specs 2003
- Construction began 9/15/2003
- Slope failure 9/25/2003
- Remedial design 2004
- Remedial construction 2004



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Block Church Road Summary (continued)

- Original cost about \$1/4 million
- Final cost about \$3/4 million



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Pre-Project Conditions (Low Flow)





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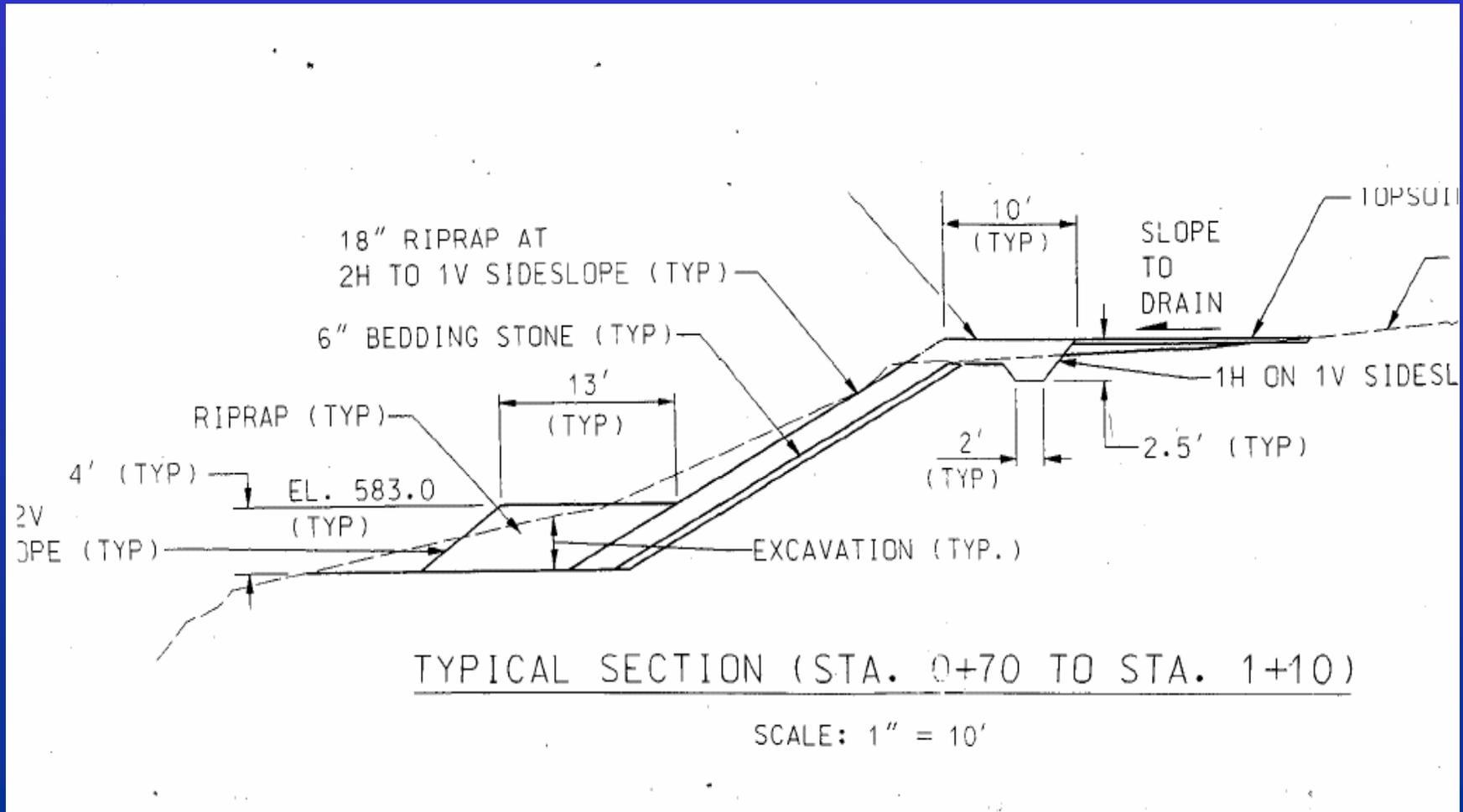
Pre-Project Conditions (High Flow)





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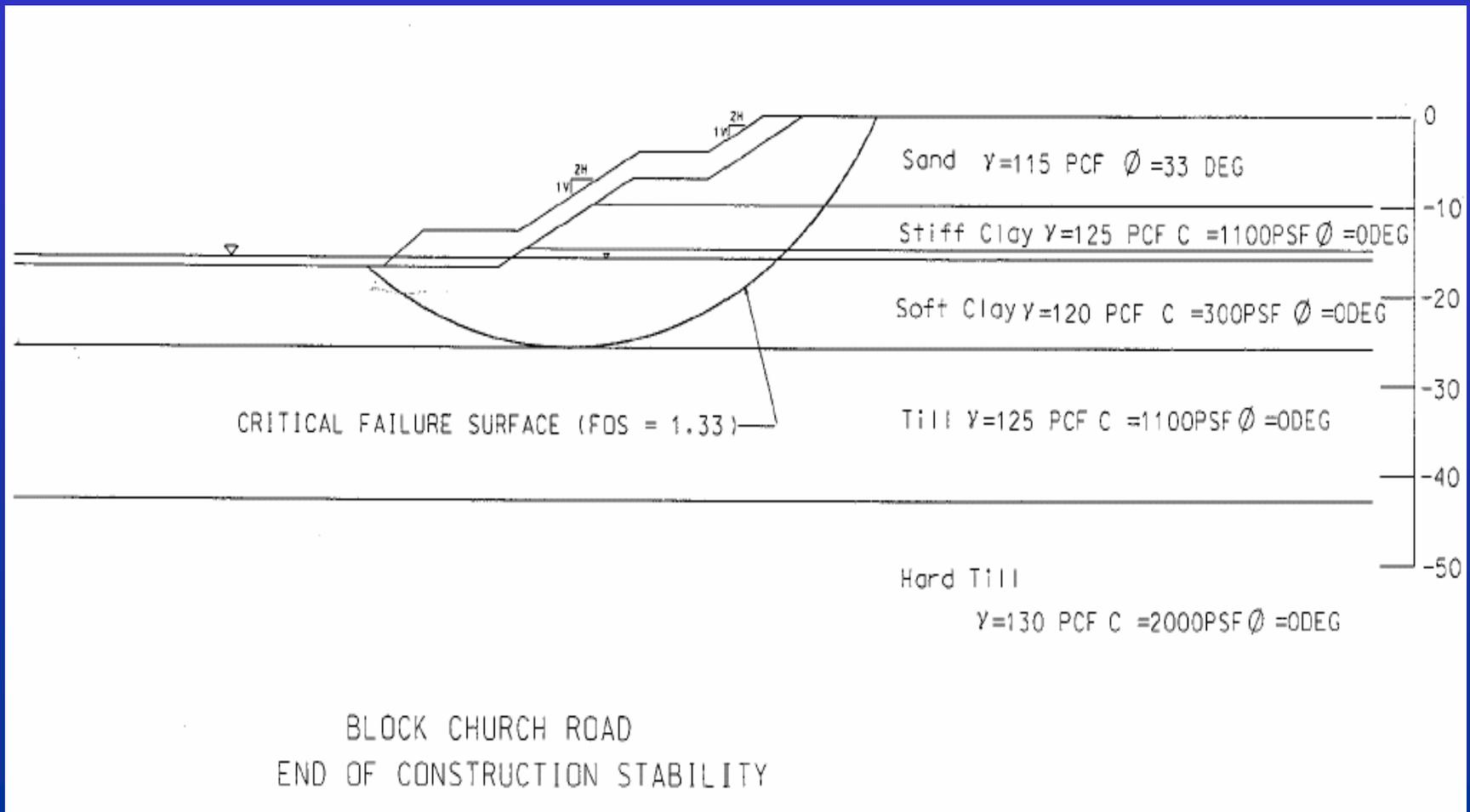
Original Design Section





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Slope Stability Analysis





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Slope Failure





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Factors Which Contributed to the Block Church Road Failure

- Long time frame between start and finish of project (11 years)
- No construction sequence specified
- Non-free-draining backfill
- No pre-construction meeting
- Lack of understanding the mode of failure



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Slope Stability Analysis (Back-Figure Shear Strength at Failure)

Soil: 1
Description: Fill
Unit Weight: 120
Cohesion: 0
Phi: 36
Unit Wt. above WT: 105

Soil: 2
Description: old fill
Unit Weight: 125
Cohesion: 0
Phi: 25
Unit Wt. above WT: 120
Piezometric Line #: 1

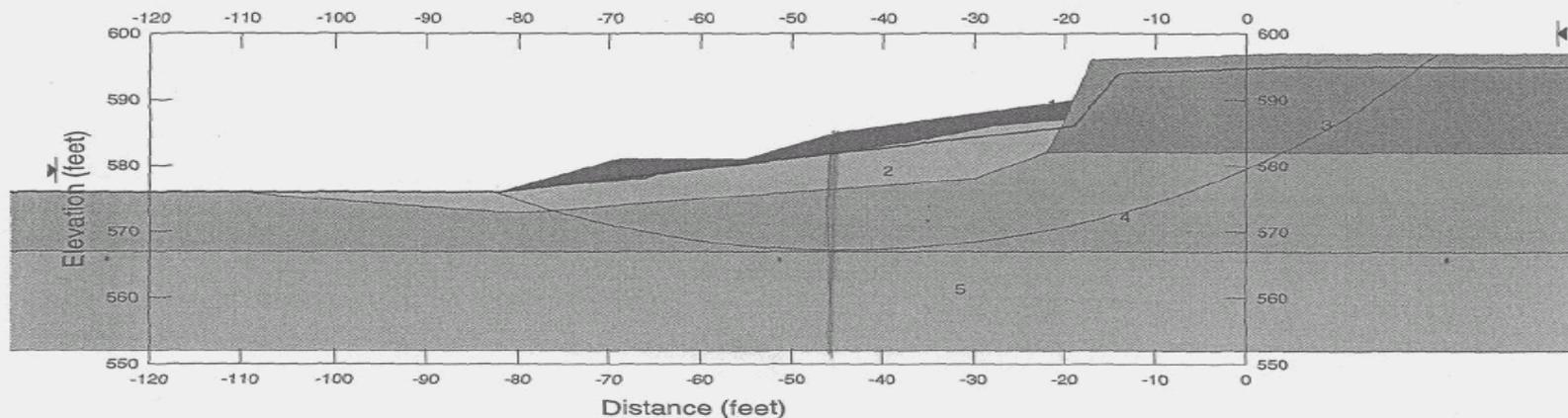
Soil: 3
Description: upper non-plastic
Unit Weight: 125
Cohesion: 0
Phi: 29
Unit Wt. above WT: 120
Piezometric Line #: 1

Description: Block Church - Section 4
Comments: critical upper stability check
File Name: section4foroembd4.siz

Soil: 4
Description: soft clay
Unit Weight: 105
Cohesion: 290
Piezometric Line #: 0

Soil: 5
Description: stiff silt
Unit Weight: 125
Cohesion: 0
Phi: 26
Piezometric Line #: 1

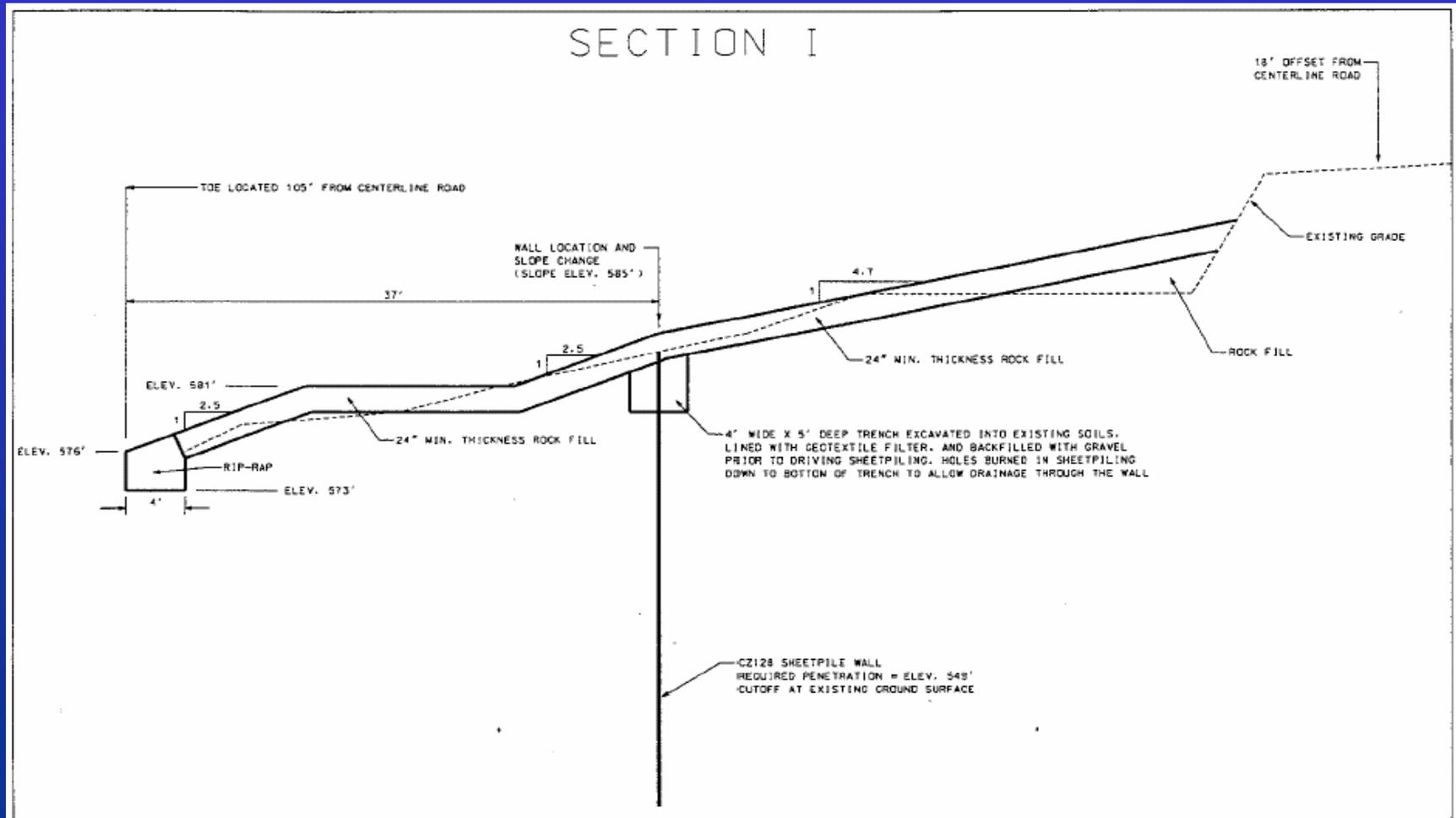
0.867





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Remedial Design Section





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Remedial Construction





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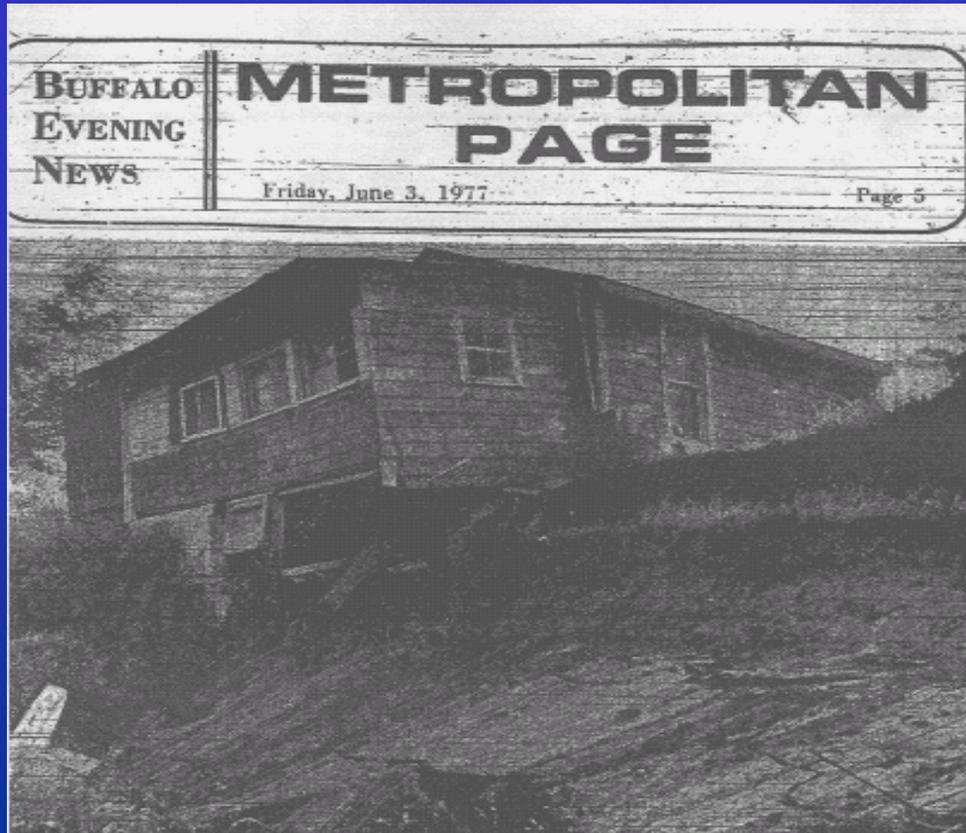
Completed Project





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Additional Impacts - Infrastructure



ON THE EDGE — The wandering path of Tonawanda Creek undermined three homes in the Town of Lockport Thursday afternoon, but the families, aware of the erosion, escaped. The U. S. Corps of Engineers is assisting local officials in assessing the damage. No injuries were reported.

Erie County Legislator Michael H. Ranzenhofer (R-Clarence) and Town of Clarence Supervisor Kathleen E. Hallock announced today that they will be seeking the assistance of all levels of government in order to repair the fallen section of road on Tonawanda Creek Road.



"We will be utilizing Town, County, State and Federal resources in order to implement a course of action regarding this section of Tonawanda Creek Road," said Ranzenhofer, who pointed out that a similar instance had occurred in 1991 approximately 1 1/2 miles from the current collapse. "We are seeking the advice of the engineers from the Erie County Department of Public Works and the Clarence Highway Department on how to proceed."

Canal banks collapse in Pendleton
By Bill Wolcott / bwolcott@gnewspring.com
Friday, April 08, 2005

PENDLETON — About 100 yards of the Erie Barge Canal banks slid into the canal over the last two days, which could postpone the boating season on the historic waterway.

The major erosion occurred about a half-mile from the Ship'n'Shore Restaurant near Tonawanda Creek Road. About 25 trees that were standing on the east bank are now floating or standing upright in the middle of the canal. Some ash and willow trees are about 30-feet above water level.

The original erosion was spotted on the west bank Tuesday by Jim Argo deputy superintendent of the Highway Department.

"I have never seen anything like that before," Argo said. "It was a sight. First, I saw one tree standing in the middle of the canal, then they slid in from the east."

"Over the last 24 hours, the whole other bank caved in," said Jeff Stowell town highway superintendent. "A series of dikes caved in."



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Rough Road: *Collapse in Clarence*



Charles Lewis/Buffalo News

Closed for repairs: Town officials believe ground water pushing out clay soil may have buckled and broken this stretch of Tonawanda Creek Road in Clarence. A 150-foot section of the road, at the northeast edge of the town, began collapsing Friday, forcing at least two families to evacuate their homes.



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Potential Future Projects

Niagara County:

- Minnick Road Section 14

Erie County:

- Hopkins Road Section 14 (5 slides)
- Burdick Road
- Tonawanda Creek Road (2 sites)



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Our main partner in future projects of
this type, Erie County, is going through
tough fiscal problems these days...



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COUNTY TOILET PAPER ARRIVES

Posted by: Judy Wichrowski, Producer
Created: 3/23/2005 11:12:37 AM
Updated: 3/24/2005 4:14:38 PM

14,000 mega rolls of toilet paper were delivered to the Rath Building this morning.

The toilet paper was donated by Proctor and Gamble. The company heard about the restroom supply shortage at the Rath Building and decided to make the donation.

Erie County's Budget crisis made national news because of a shortage of supplies at the Rath Building.

The donated toilet paper is worth an



Harry Scull Jr./Buffalo News

Erie County is so financially strapped that it accepted a truckload of donated toilet paper, being unloaded here by Jim Ortman, head janitor, yet it isn't increased property taxes.



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Lessons learned

- Adverse geology has complicated matters
- Need to be careful before making future project commitments which are partnered/cost-shared



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Lessons Learned (continued)

- Long time frames (> 5 years) from initiation to completion of small projects are not conducive to success
- Small projects with big geotechnical issues are no longer small projects



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Questions?





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