



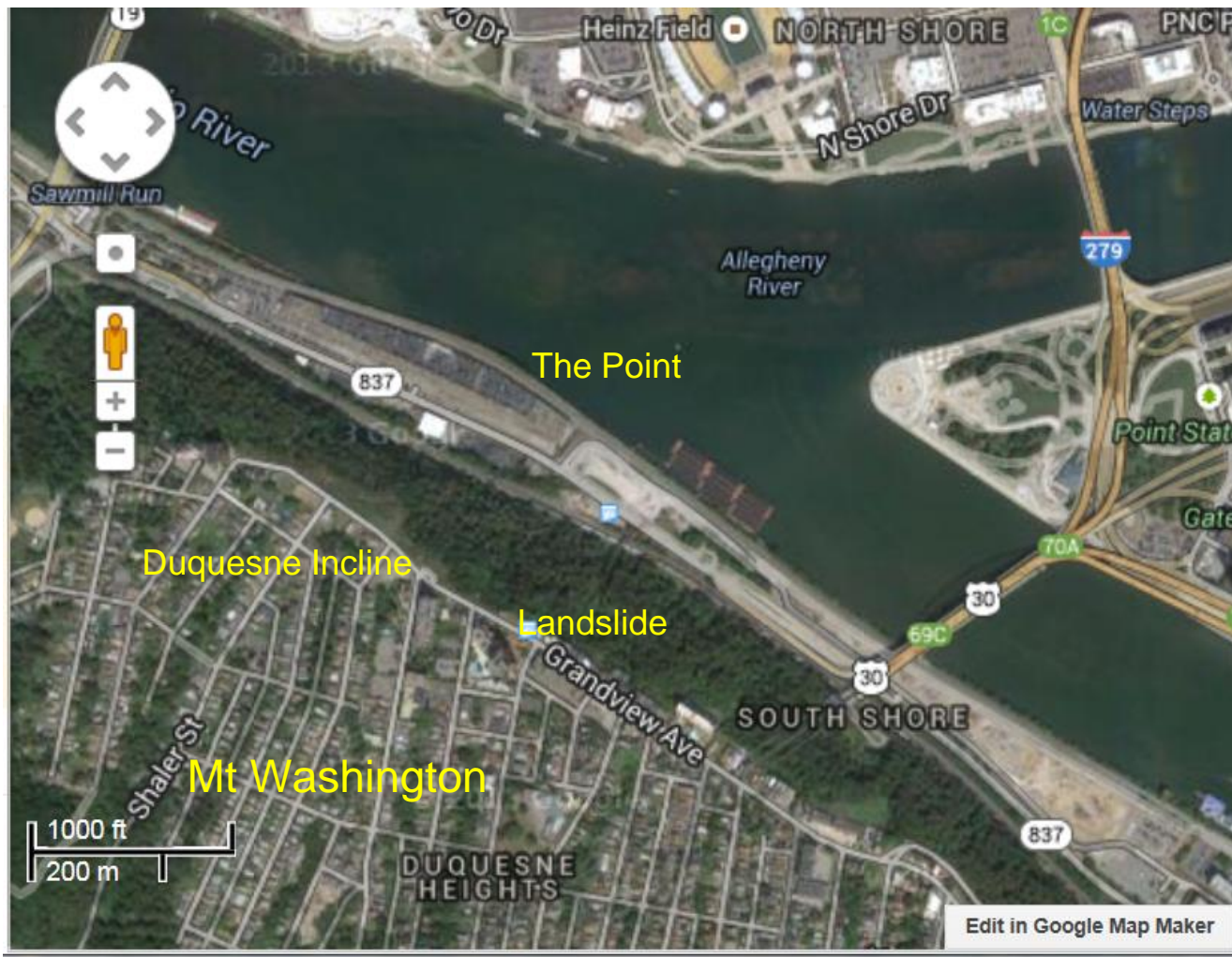
Mt. Washington Landslide April 8, 2014

Presented at Pitt IRISE September 4, 2020



gai consultants

Welcome



Project Background

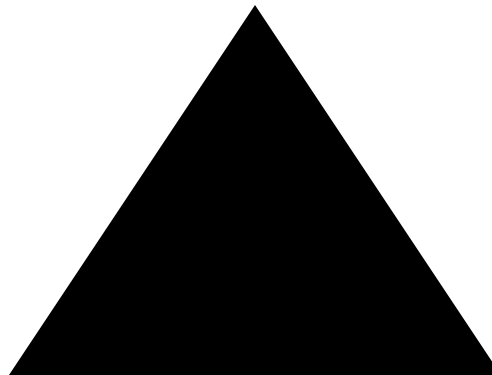
+ Landslide from the Air

Courtesy of Hawkeye Aerial
Photography



Message Triangle of Bill Clinton 1992

Universal
Health Care



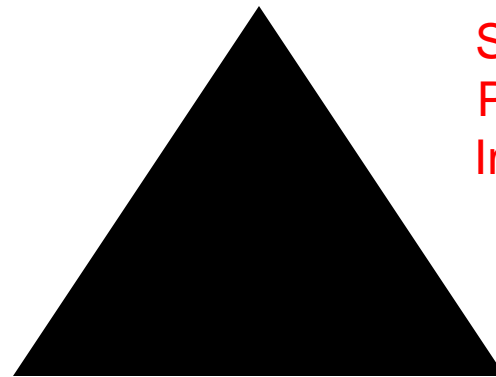
It's the
Economy
Stupid

Change Vs
More of the
Same

Ref: What to Say
When Things Get
Tough, Leonard
Greenberger

Message Triangle

Geotechnical
Engineers
Evaluate the
Stability of
Slopes and
Risks of Site
Conditions

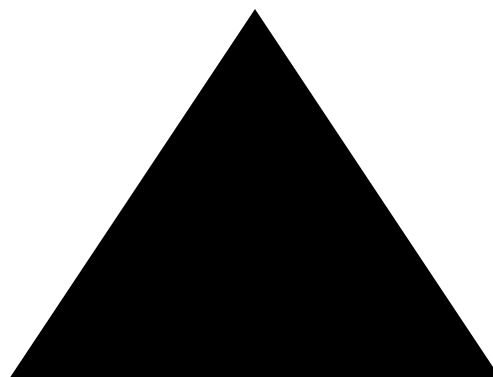


Public
Safety is of
Paramount
Importance

Follow an
Established
Procedure to
Investigate
the Slide

Message Triangle

Geotechnical
Engineers
Evaluate the
Stability of
Slopes and
Risks of Site
Conditions



Project Background

+ Landslide from the Air (Hawkeye Aerial Photo)



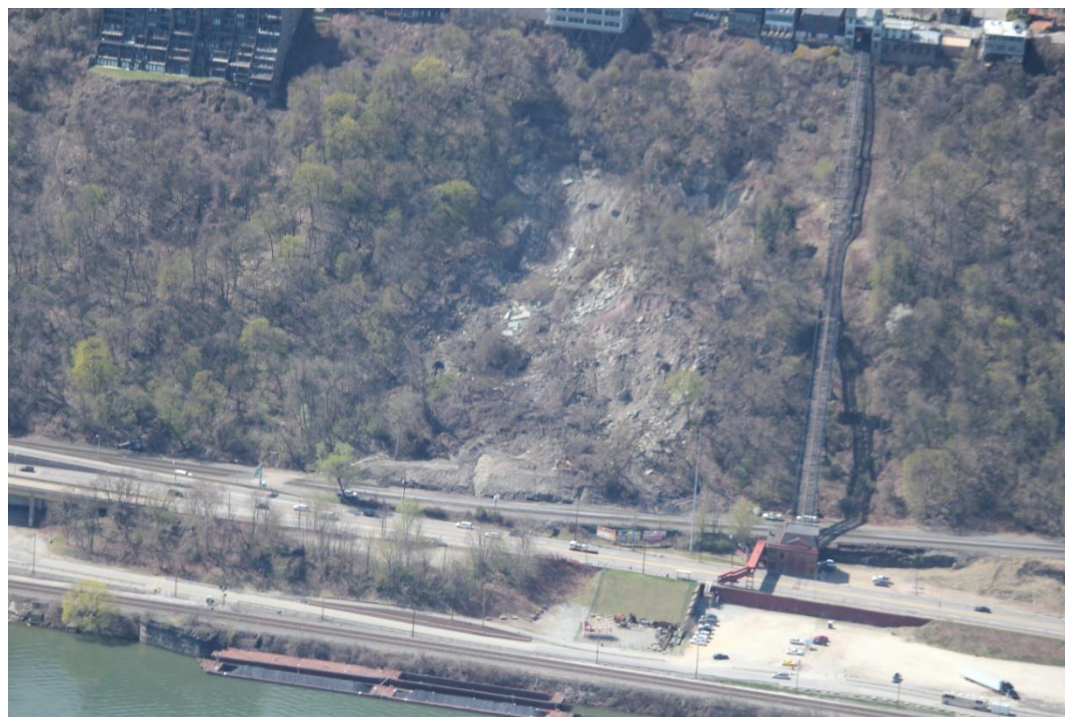
Slide Mechanics

-



Project Background

+ Landslide from the Air

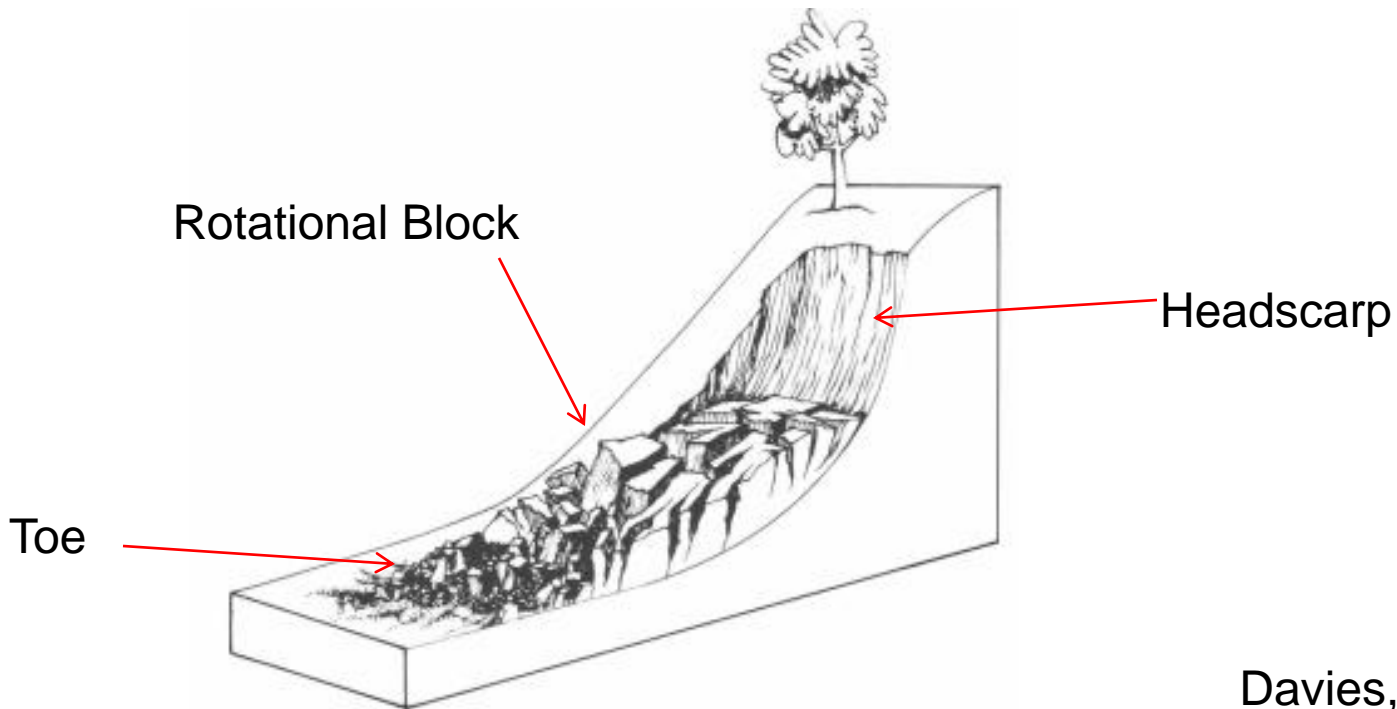


Project Background

+ Landslide from the Air



Landslide Mechanics



Davies, 1978

FIGURE 6.—Debris slide—*incoherent or broken masses of rock and other debris that move downslope by sliding on a surface that underlies the deposit (from Nilsen, 1972).*

Slide Mechanics

+ Scarp on the Face of Rotational Block



Slide Mechanics

+ Back of Rotational Block

Slickenside Face



Slide Mechanics

+ From on Top of Rotational Block



Slide Mechanics

+ Cliff Face Above Slide With Seepage

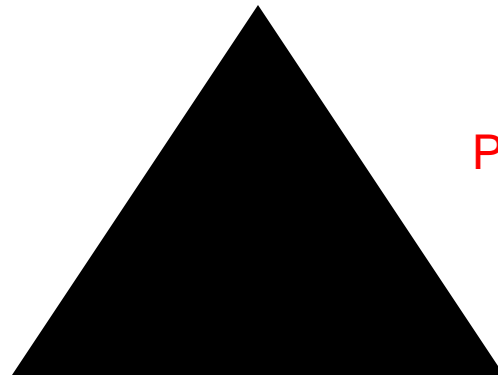


Slide Mechanics

+ Drains Onto Slope



Message Triangle



Public
Safety is
Paramount

Safety

+ Landslide from the Air



Railroad Operations

+ Clearing Tracks



Railroad Operations

+ Clearing Tracks



Railroad Operations

+ Rock Drainage Channel



Railroad Operations

+ Rock Drainage Channel



Railroad Operations

+ Rock Drainage Channel



Railroad Operations

+ Seeps into Rock Drainage Channel



Railroad Operations

+ Borings



Railroad Operations

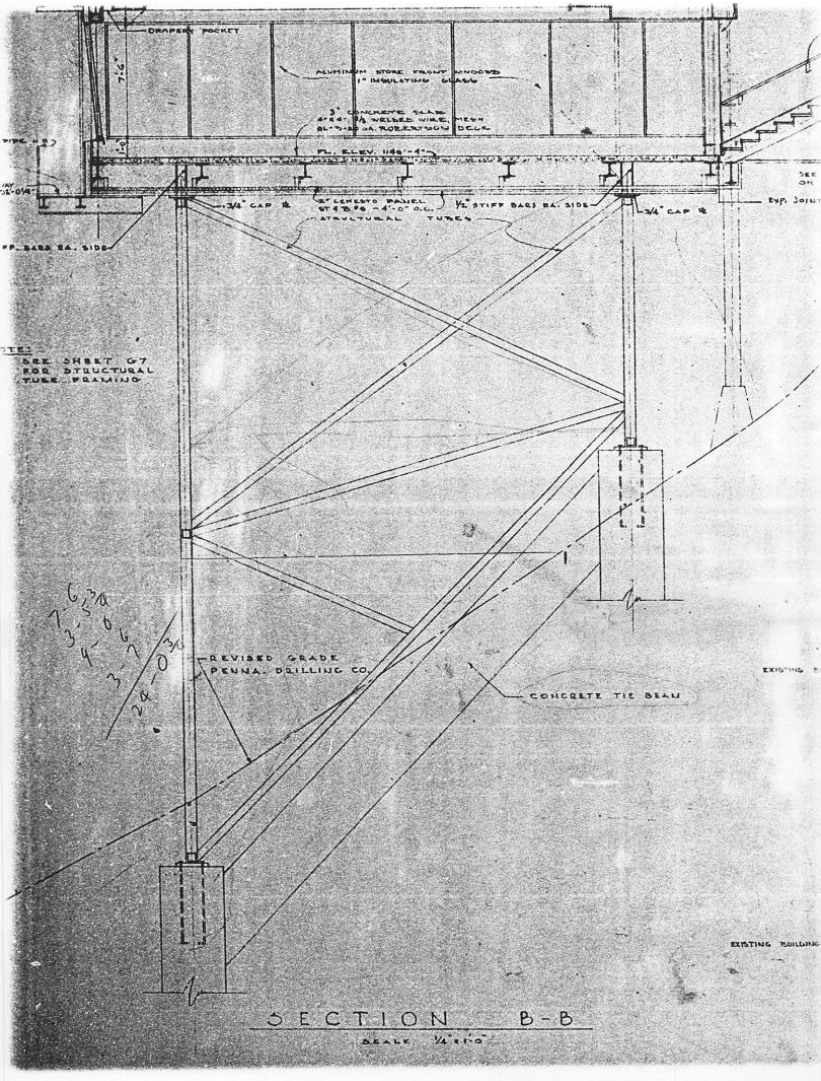
+ New Wall



Le Mont



LeMont



EI 1096

EI 1051

LeMont



Incline

+ Prior to Slide



Incline

+ After the Slide



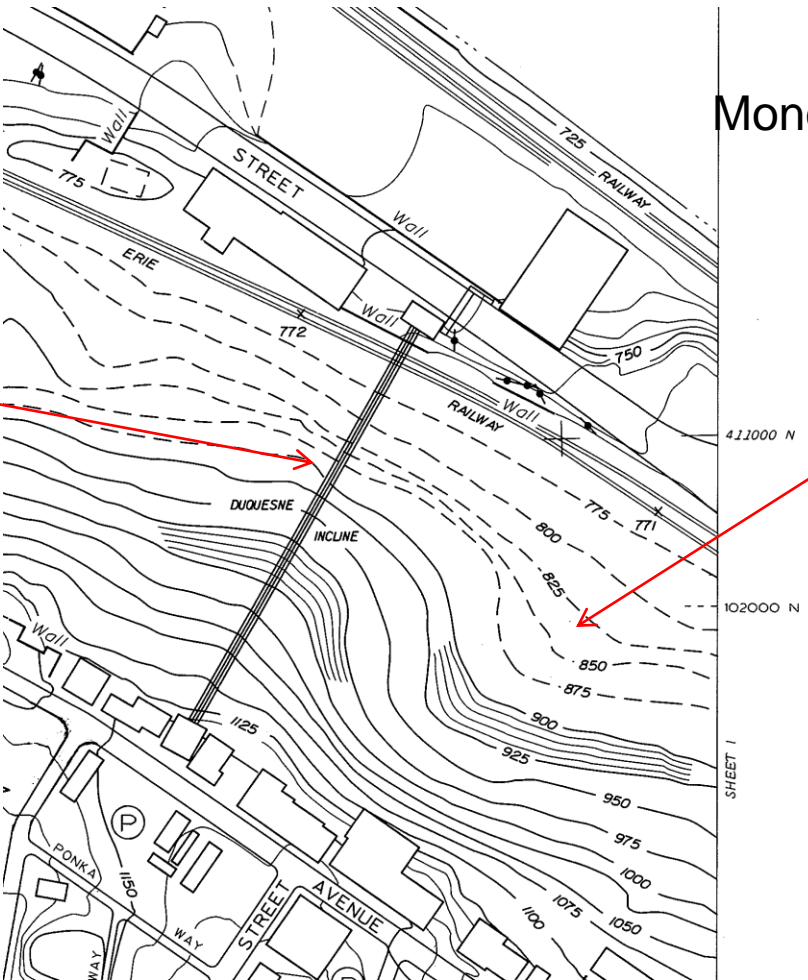
Duquesne Incline

Duquesne Incline

Grandview Ave

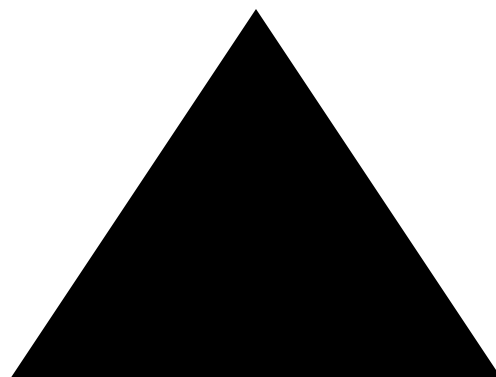
Monongahela River

Landslide



1984 topo map City of Pittsburgh

Message Triangle



Established
Procedure to
Investigate
Landslides

History

+ Pittsburgh Coal



Geology

+ Pittsburgh Coal

10-ft +/-



History

+ 1929



History

+ Pittsburgh Coal



History



March 17, 1938

History

March
17, 1938

Freight Cars Block Slide Of Hill Onto Carson Street

50 Policemen Reroute Auto Traffic From Danger Zone Below Duquesne Heights.

A string of freight cars were used as "backstops" last night to halt the huge landslide from Duquesne Heights to the Pennsylvania railroad tracks above West Carson street near the Point bridge.

The cars were placed adjacent to the slide after a series of dynamite blasts failed to loosen the large boulders, which were inched to a falling position by the slow movement of soggy, saturated earth.

Three blasts, the first with 50 pounds of dynamite, the second 100 and the third 150 pounds, were touched off. Windows in the immediate vicinity were shattered, and police received calls from per-

after 2 p. m., when the slide began without warning.

A hastily mobilized force of 50 police were in charge of emergency lines near the slide, and kept traffic moving in West Carson street and held crowds back beyond the danger zone.

The Duquesne incline, a little more than 100 feet west of the point where the slide began, was permitted to operate after Andrew Frazier, city building inspector, had ridden on it and inspected the damage to the hillside caused by the slide. The slide started on a projection of the hillside about 100 feet above the railroad tracks, and

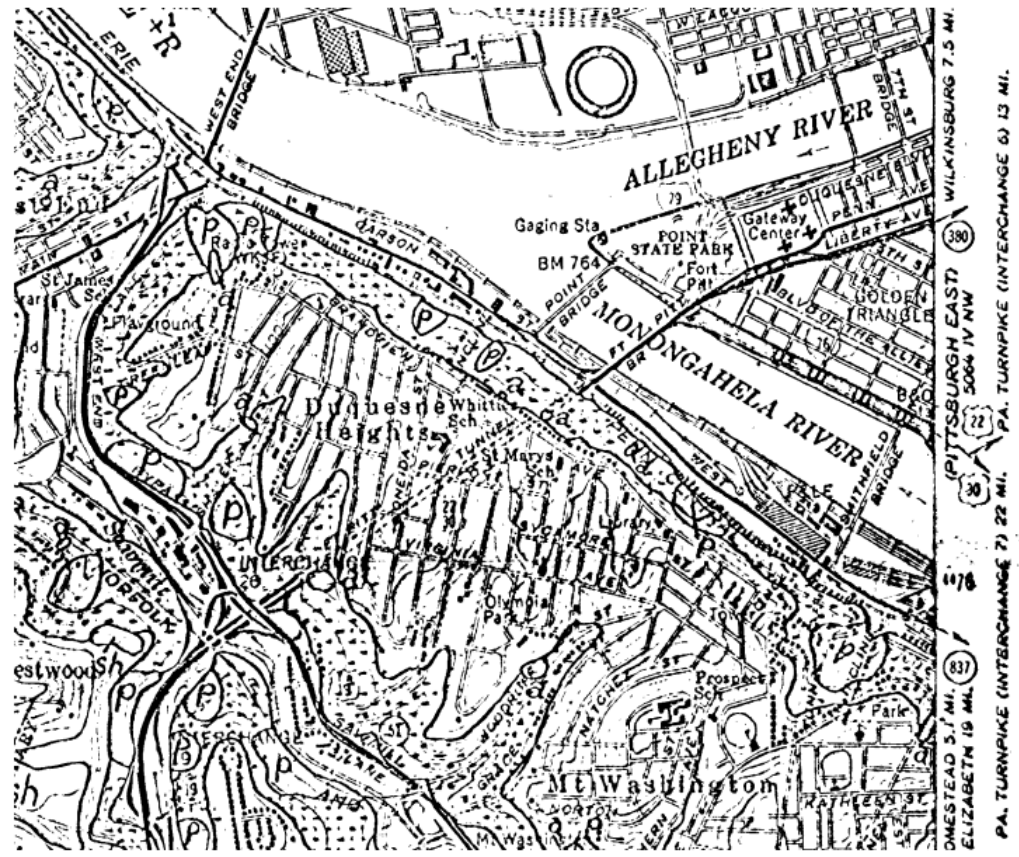
History

The Duquesne incline, a little more than 100 feet west of the point where the slide began, was permitted to operate after Andrew Frazier, city building inspector, had ridden on it and inspected the damage to the hillside caused by the slide. The slide started on a projection of the hillside about 100 feet above the railroad tracks, and did not threaten buildings on Duquesne heights, at the top of the high bluff.

Traffic was halted in West Carson street on either side of the slide as the blasts were fired to bring down all the loose earth and rock so workmen could clear the tracks. The sliding hillside is some distance back from the street, and

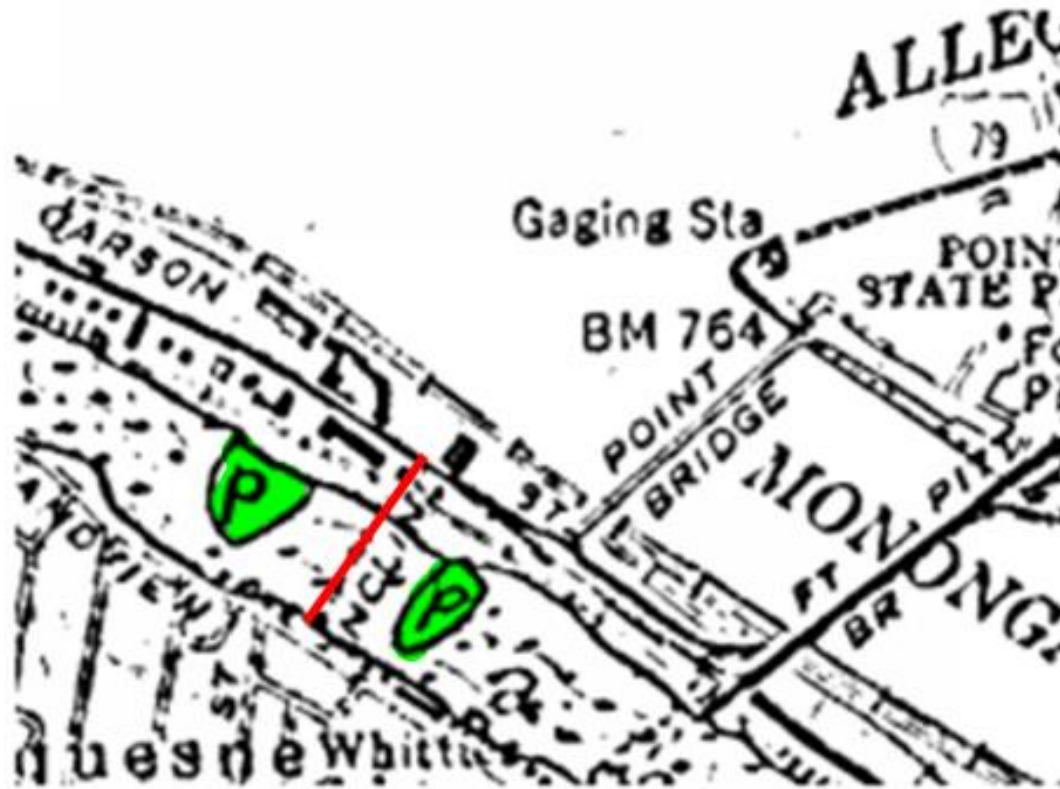
Geology

+ Pomeroy 1978



Geology

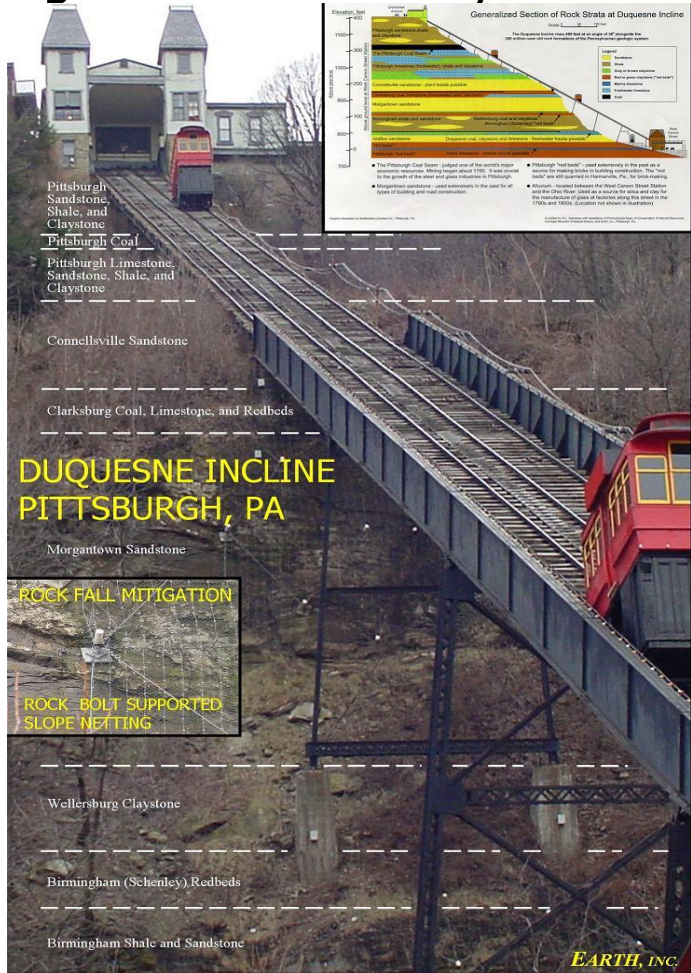
+ Pomeroy 1978



Geology

+ Section Through Incline Courtesy of Earth Inc

Grandview Ave EI 1150



Pittsburgh Coal
EI 1050

Morgantown Sandstone

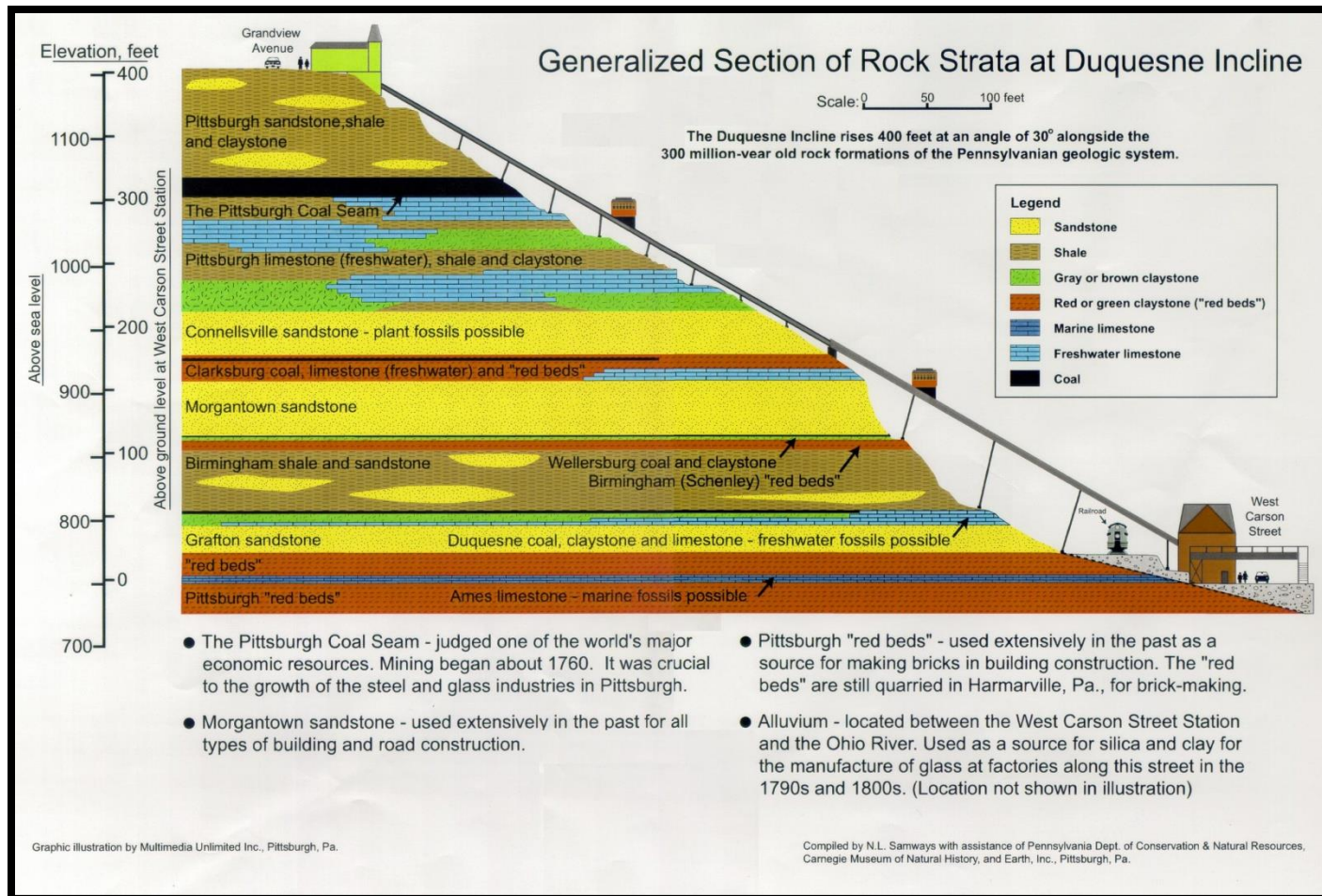
Birmingham Redbeds

Norfolk Southern Tracks EI 750
Monongahela River EI 710

EARTH, INC.

Geology

+ Section



Geology

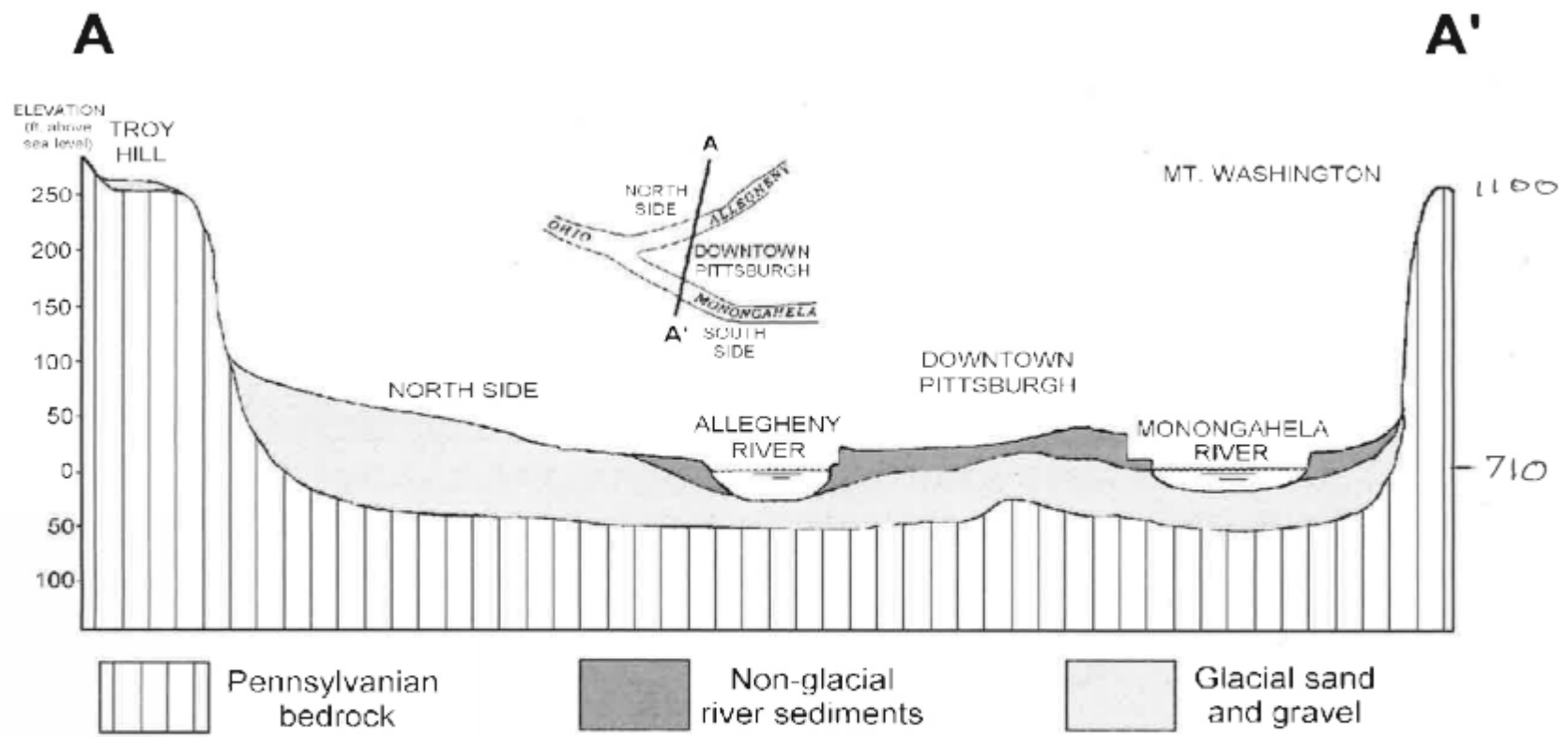


Figure 1. Cross section of the Allegheny and Monongahela river valley across downtown Pittsburgh (modified from Wagner and others, 1970).

Geology

- + Mechanism of Pleistocene Rock Slides Near Pittsburgh Hamel, 1998

Paper 032, Figure 5: Cross-Section with Failure Mechanism

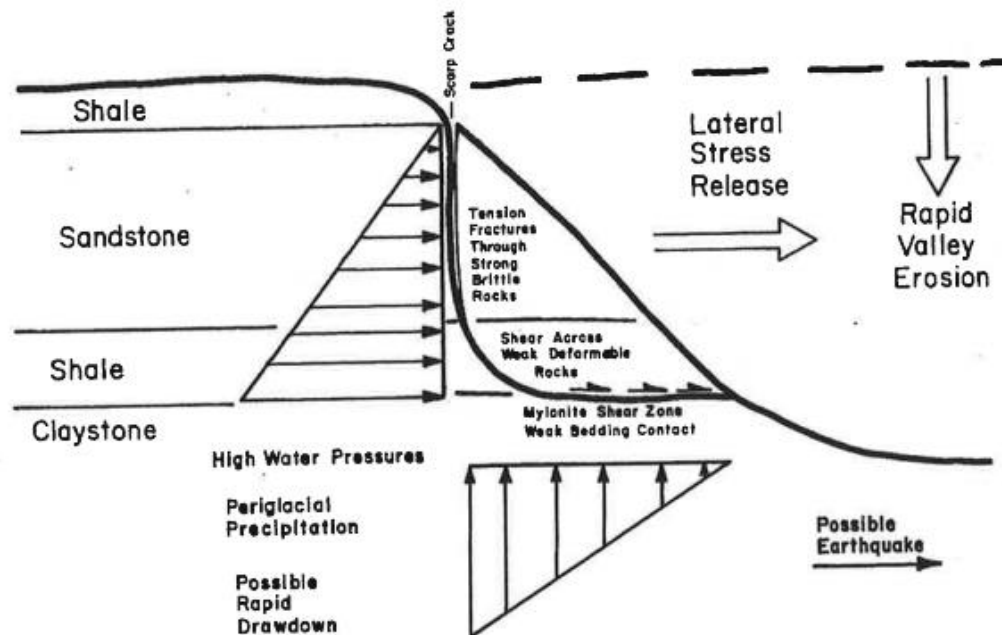


Figure 5: Cross-Section with Failure Mechanism



Mt. Washington Landslide

April 8, 2014

Thanks!



gai consultants

Questions?

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