PORT CLEVELAND

Global Reach. Local Benefit.

Irishtown Bend
Conditions and Remedial Actions

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Background-

Problems with the hillside along ITB are documented over the past 40 years.

The 31 acre site has 25 parcels held by a variety of 14 public, non-profit and private sector landowners.

Complex ownership patterns for the hillside limited any efforts to develop a comprehensive analysis and suite of corrective actions.

Several individual studies by engineers addressed specific properties but no overall site analysis.

Historic Conditions

Irishtown Bend, 1921
Photo: Cleveland Union Terminal Collection
Cleveland State University Library Special Collections

Background, continued

A federal earmark was provided in 2009 to USACE to develop a corrective plan to stabilize the hillside from further slippage. USACE looked solely at the previous studies.

No new data was developed.

The USACE plan called for a series of 3 massive bulkheads (each 80 feet deep and 2500 feet long, projected to cost a total of $240 million) to hold the hillside from the River to W.25th Street.

Port Study-

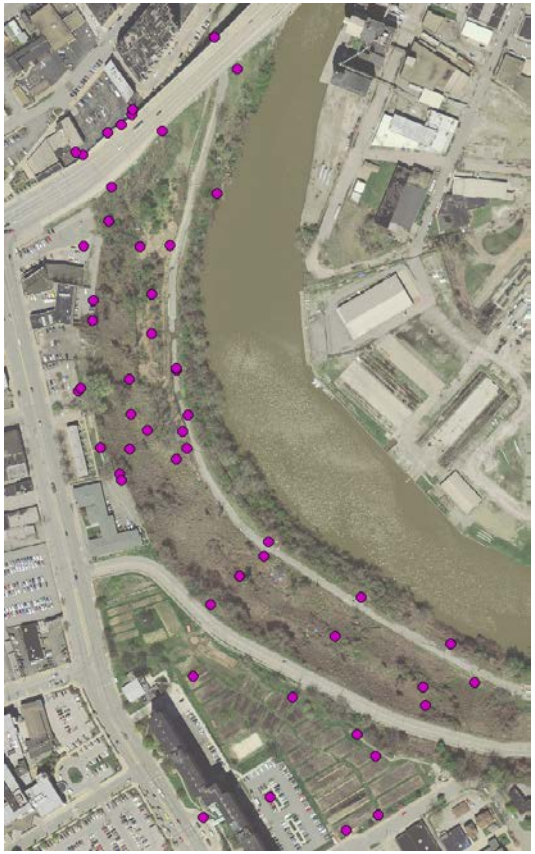
In 2012 the City's Harbor Master duties were (mostly) transferred to Port Authority. Since then, the Port Authority has been leading an extensive analysis and restoration planning effort as part of our Strategic Plan.

The Port's principle objective has been to identify remedial actions could be implemented to assure there would be no interruptions to maritime traffic transiting the ship channel.

Port retained Barr and Prevost to implement a 16 month study and plan which commenced in June 2013.

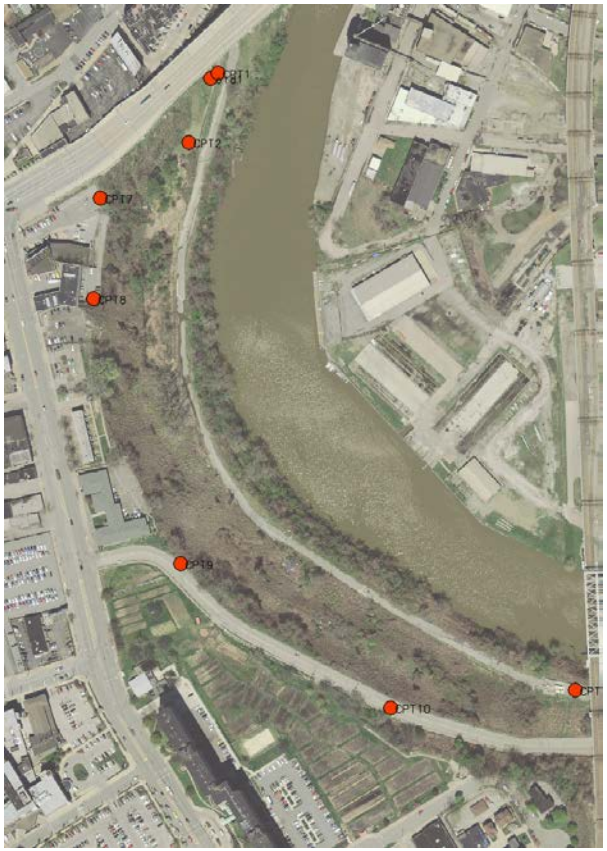
The Port's study included several additional new geotechnical borings, and substantial detailed site investigations.

Subsurface Investigation



COMPILATION:

- Over 40 borings
- 100+ Samples Collected
- Ten Independent Investigations



SUPPLEMENT:

- CPT Method
- Strategic Locations
- Continuous Sampling
- Accurate results

Stakeholder Engagement

At the commencement of the effort we met with key stakeholders and mutually developed a list of key restoration priorities:

- Stabilize the hillside from further slippage and mitigate risk which could obstruct navigation;
- Protect existing NEORSD assets;
- Provide bulkheads along the shoreline;
- Create pedestrian and bike trail access across the site;
- Integrate green storm-water management practices;
- Provide for low impact agricultural use of re-graded hillsides, such as for hops and or grapes;
- Integrate with other stakeholder plans for adjacent areas in Ohio City.

Key Findings

Barr and Prevost identified numerous site problems which have definable, cost effective and sequential remedial actions.

The problems on the site are not the effect of a deep seated geologic slip plane- but rather the result of a series of correctable spot problems.

The site conditions are a result of very old infrastructure, out of date engineering practices, unusual groundwater elevations and complicated, uncertain stewardship responsibilities.

Key Findings, continued

There remains a risk of catastrophic hillside failure if water conditions and slope toe stability on the north end of the site are not addressed.

A series of specific remedial actions can restore the currently unusable site as a viable and unique community asset.

The needed remedial actions are projected to cost around $48 million; which is almost $200 million less than proposed in 2010 by USACE.

After right of way and environmental clearance, the construction duration would be approximately 1 year.

Slope Stability Analysis

Factor of Safety (FOS):

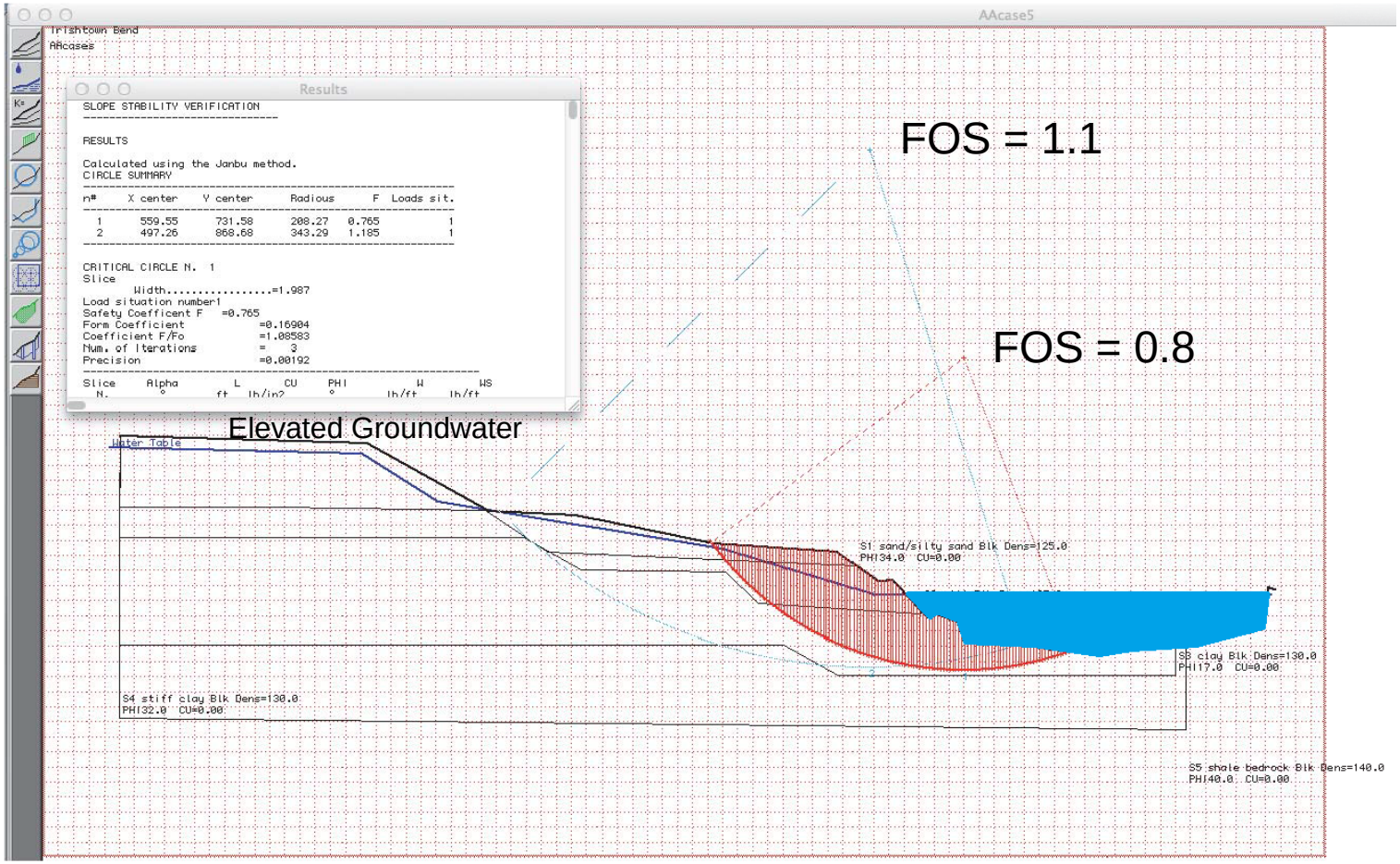
FOS < 1 ~ Unstable

FOS = 1.1 ~ Marginally Stable

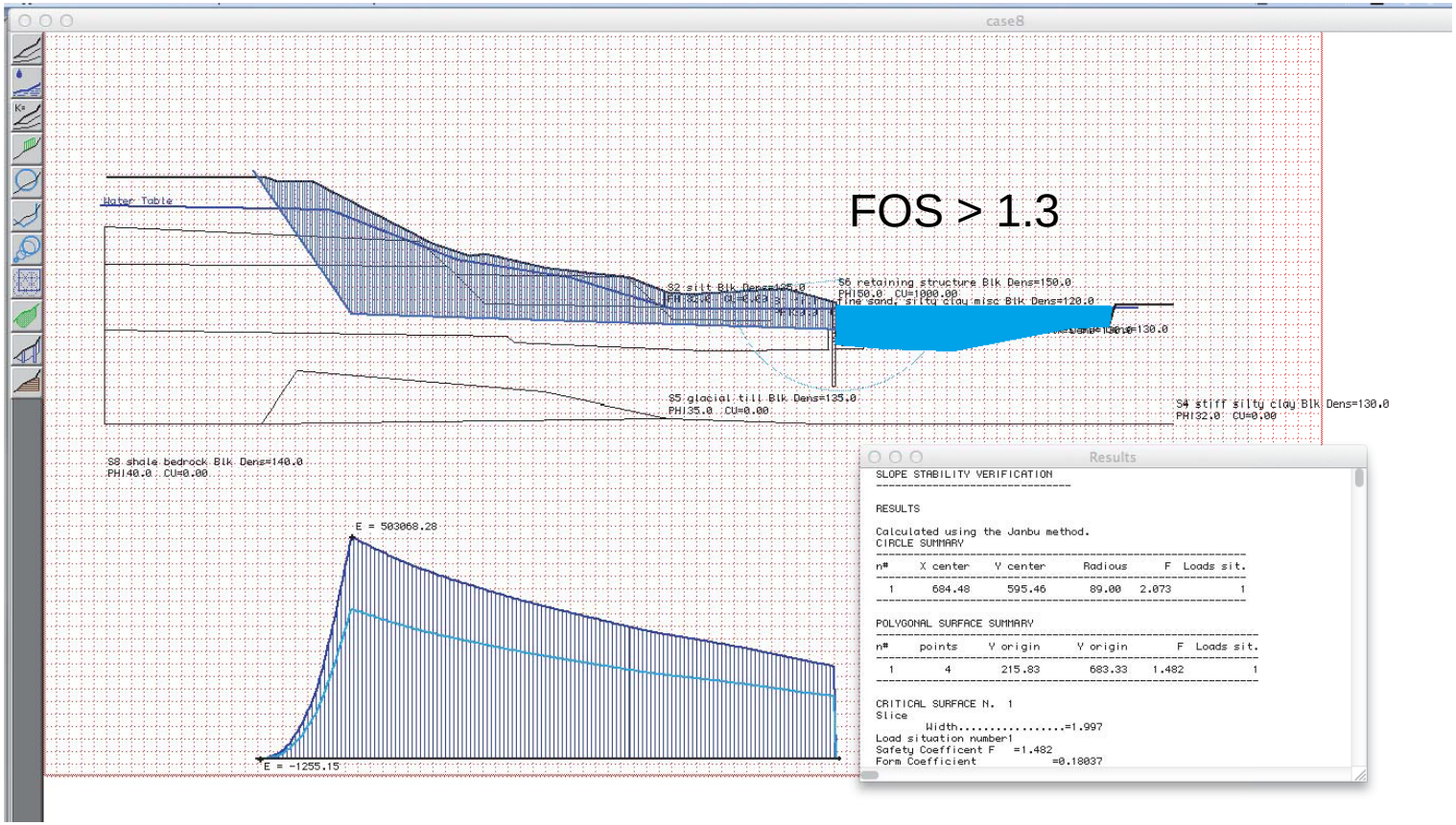
FOS = 1.3 ~ Acceptable Slope

FOS = 1.5 ~ Ultimate Design

Slope Stability Analysis



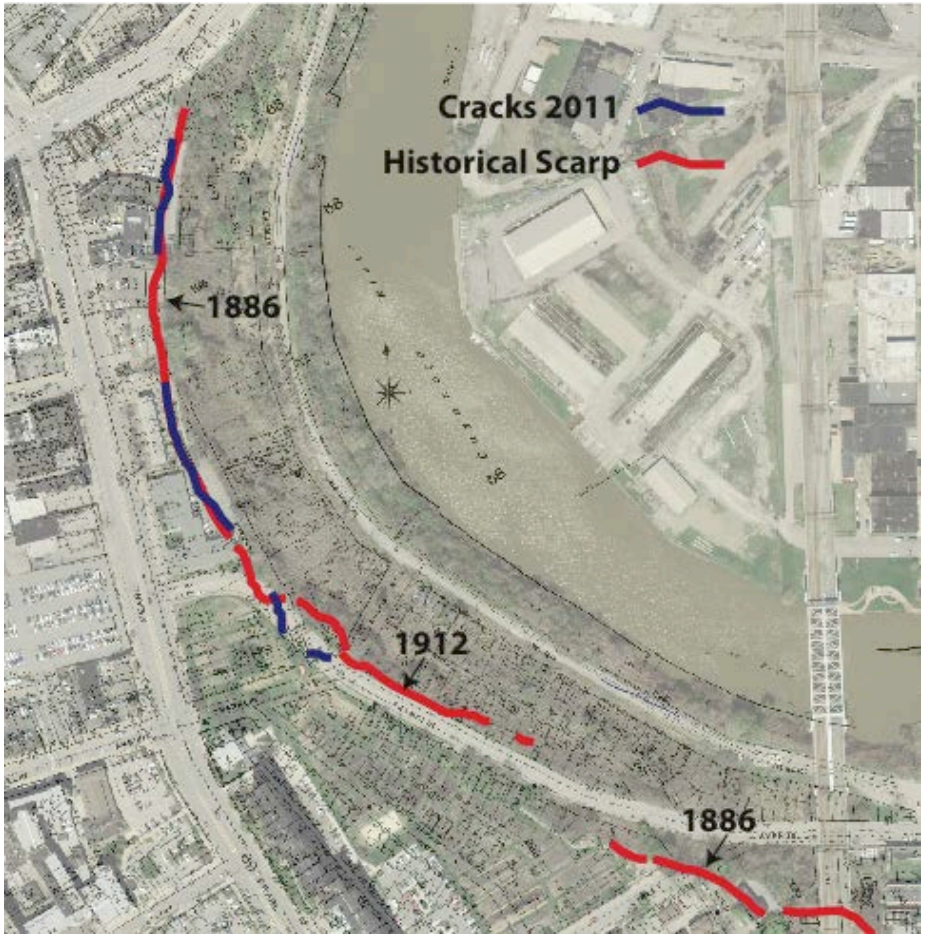
Slope Stability Analysis



The issues that need to be corrected:

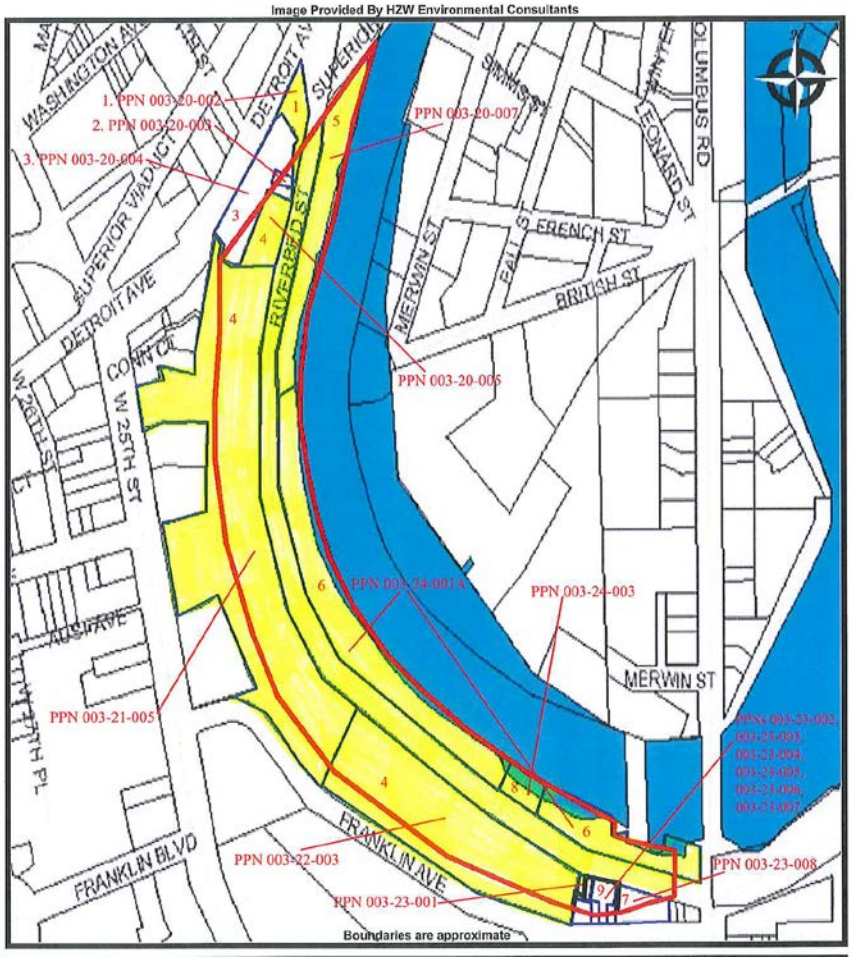
- **Unmanaged water that perpetually weakens the hillside**
- **River edge bulkheads need to be installed to create important edge strength and stability**
- **Sections of site grading that cross escarpment lines along the upper lip of the valley; and are too steep and need to be re-graded;**
- **Street repairs and possible realignment along with embankment strengthening;**
- **Sewer line repair;**
- **Environmental remediation requirements which may need to be addressed for each element of the restoration effort;**
- **Trail and green space development as part of the final site restoration**

Mapped Escarpment



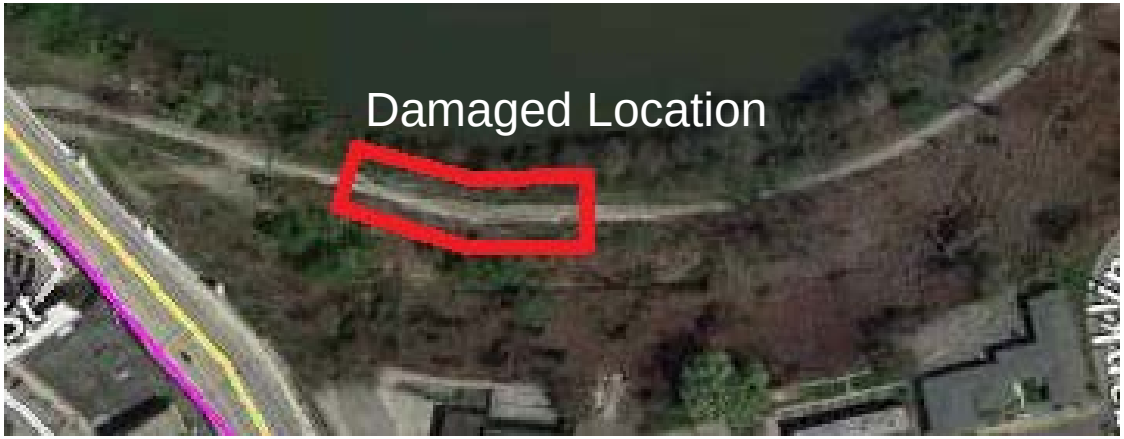
- Sanborn Insurance mapped Scarp in 1886
- Scarp along Franklin Ave was mapped in 1912
- Fill was pushed over the rim of the Scarp in the 1960's

Environmental Conditions



PARCEL NO.	ASSESSMENT WARRANT
1	Hydrocarbons, lead & arsenic
4	USTs & hazardous materials
5	Coal dump, metals & hydrocarbons
6	Coal transportation docks
8	Coal transportation docks

Westerly Low Level Interceptor



31: Deformation at the Bend Sta. 5 + 31.40 – 4/23/12

32: Deformation at the Bend Sta. 5 + 33.70 – 6/28/12

27: Deformation at the Bend Sta. 5 + 25 – 11/9/12

Projected cost by project requirement listed in action sequence

Action sequence	Problem	Remedial action	Estimated cost
1	Excess water weakens hillside. Hillside embankments installed over historic scarp line and building surcharge at top of slope	**Water Source elimination & Re-grade hillside, road reconstruction**	$ 9,910,000
2	No bulkheads, per requirement of City Ordinance, which weaken toe of slope causing instability	**Bulkhead Installations 3238 feet**	$ 16,310,000
3	Displaced 74 year old sewer line	**Sewer Line Repair 835 feet**	$ 750,000
4	Portion of Franklin Ave reconstructed over historic scarp line	**Franklin Ave Rehabilitation and edge retaining walls**	$ 6,000,000
5	Inaccessible property, Unusable roadway	**Trail and green space**	$ 2,000,000
*	Remnant brown field remediation	**Contingency for Site clean-up and Environmental Remediation**	$ 14,000,000
		TOTALS	$ 48,970,000

Next steps

Port presentations of findings to key stakeholders

Assist collaborations to implement remedial actions