PORT CLEVELAND

Global Reach. Local Benefit.

# SEDIMENT CHOREOGRAPHY

4/15/2016

# Maritime and the Regional Economy

**The Port of Cleveland spurs job creation and helps our region compete globally by connecting local businesses to world markets through the most cost-effective, method of freight transportation in the region.**

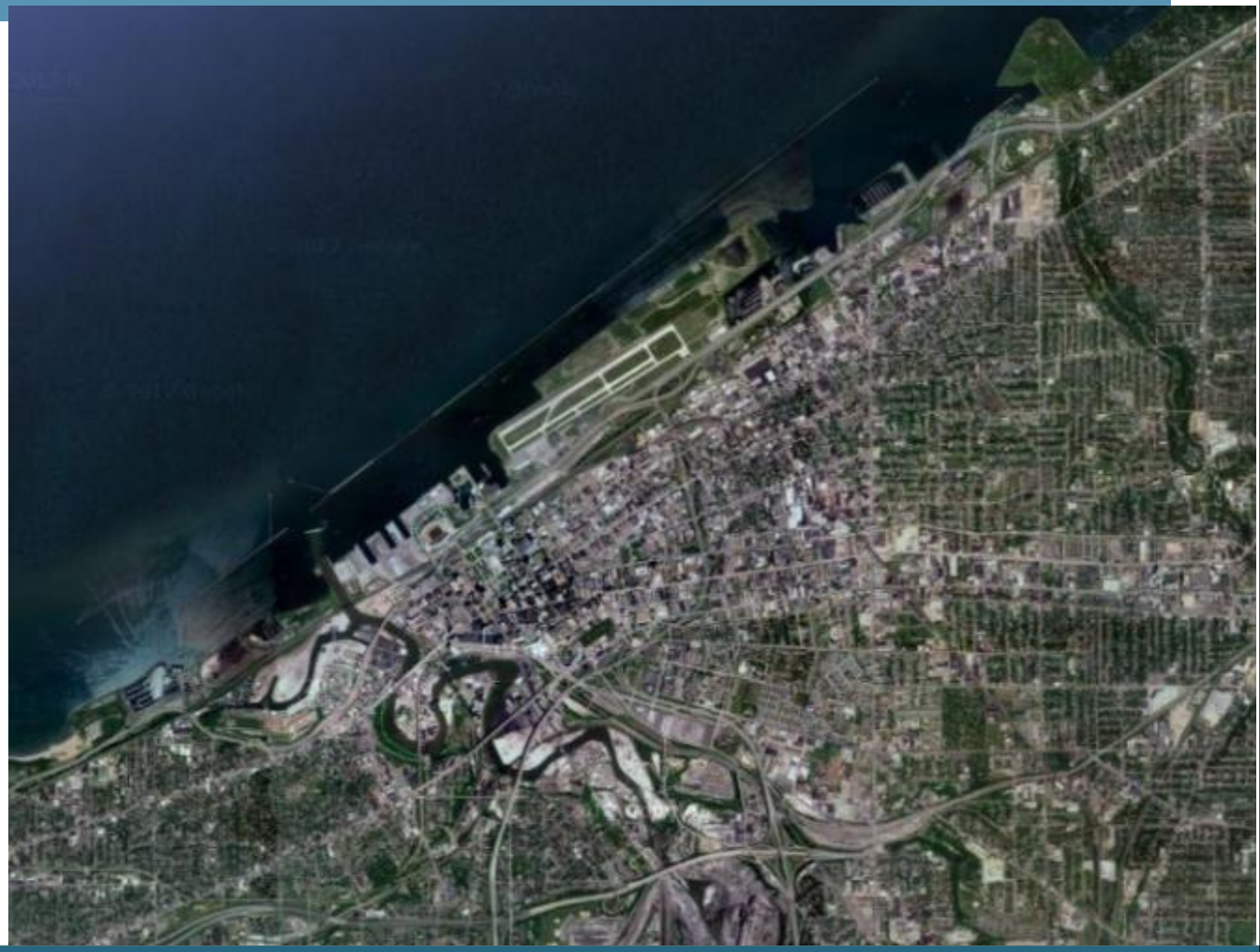

- 13 Million tons of cargo
- 18,000 jobs
- $112 million in annual local/state taxes
- $1.8 billion in annual economic activity

# Cleveland Harbor

**6 miles of breakwater**

**5.9 mile Ship Channel on the Cuyahoga River + 1 mile on the Old River Channel**

**Depths of 28 feet in outer harbor and 23 feet in the River**



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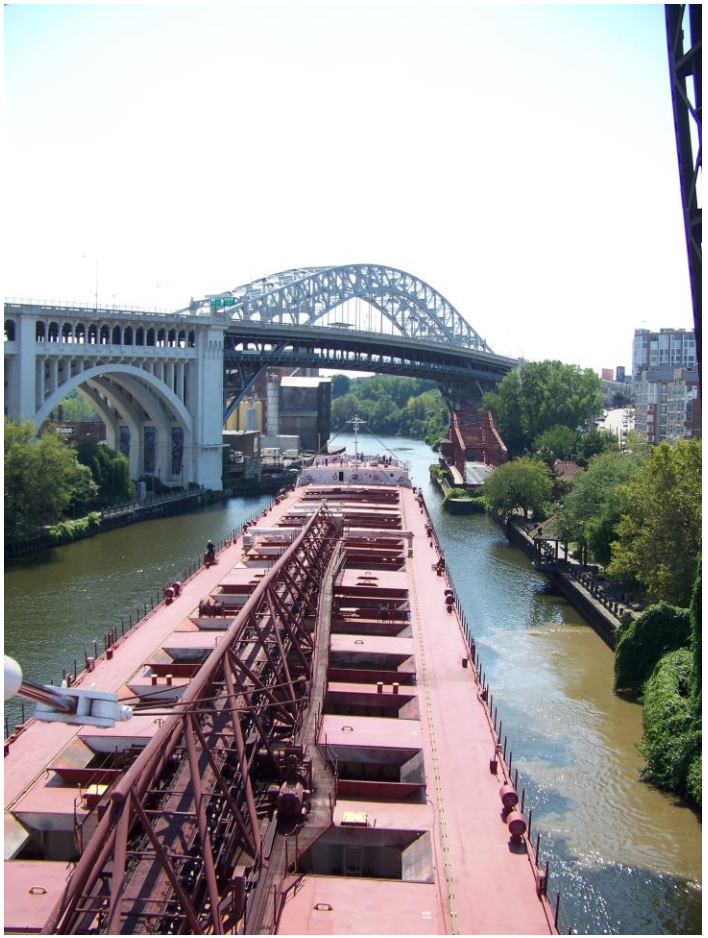
# Sediment Management is critical for our regional economy

- 800 -900 freighter trips on the river  per year average from a fleet of 14 “river-class” cargo vessels.
- Average length of 630-711 ft.
- 12.5 – 16 million tons of cargo delivered up river / Primarily iron ore, limestone, aggregate, cement, salt
- Dredged depth of 23 ft. allows 15,000-23,000 tons per delivery
- **Ship channel acts as a natural sediment settling area**
- **1” in loss of draft = 110 tons of cargo**



# Adapting to changing weather patterns

**More frequent peak precipitation events**

- **More erosion and sediment production**
- **More sediment processing and capacity**
- **More storm flow flushes more pollutants into river**

# Cuyahoga River flow in equilibrium

# Bank Erosion in Cuyahoga Valley National Park

**Extreme weather patterns affect river shape and conditions**

**Cuyahoga River expanding its size**

**Bank erosion,**
**Flood plain expansion,**
**Sediment mobilization.**

# Sediments become impacted by prolonged contact with urban run-off and CSOs

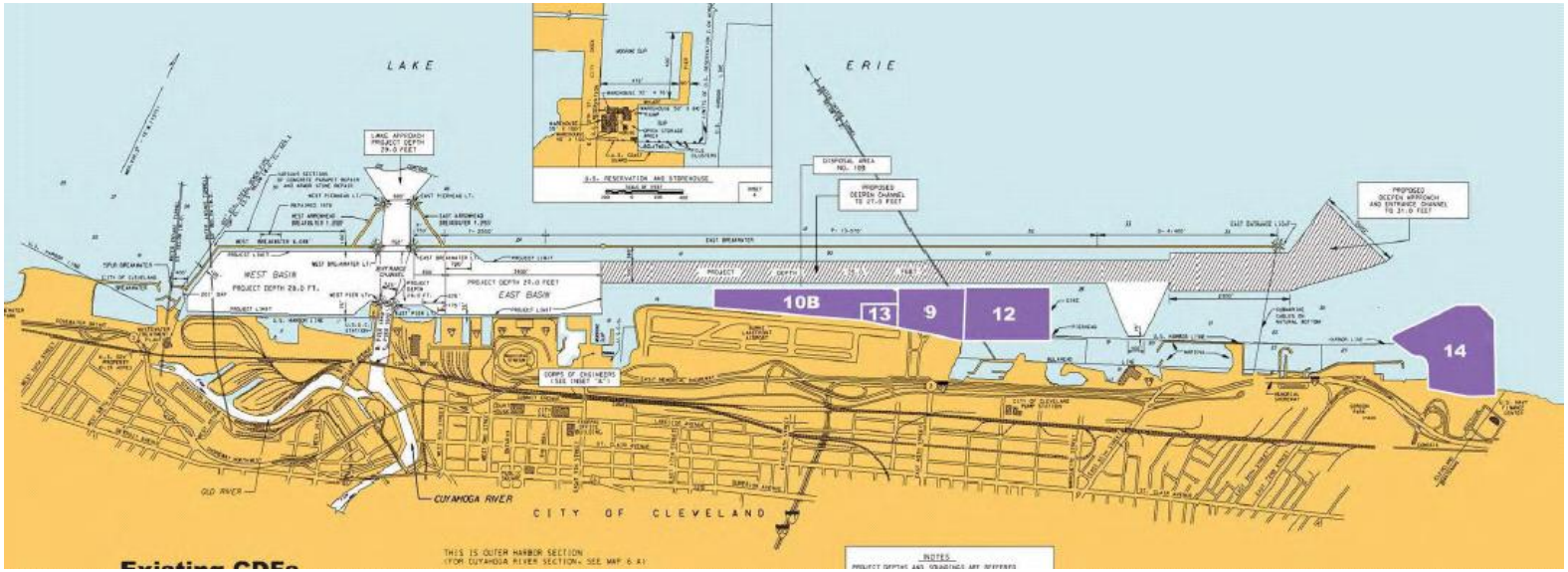
Visible storm debris at Combined Sewer Outfalls (CSOs) in the Ship Channel

**Effects of urban run-off require placement of dredged sediments in CDFs**

# Dredging

- Each year 200,000 to 250,000 Cubic yards must be dredged.
- Effects of urban run-off and associated latent toxicity has required that sediments be placed in Confined Disposal Facilities (CDFs)
- CDFs are nearing capacity and new ones are prohibitively costly to develop.
- New alternatives for managing sediment needed to be developed

# Confined Disposal Facilities for Cleveland harbor

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# Port's Approach to Sediment Management

Data driven

Systems based

Promote Innovation and New Technology

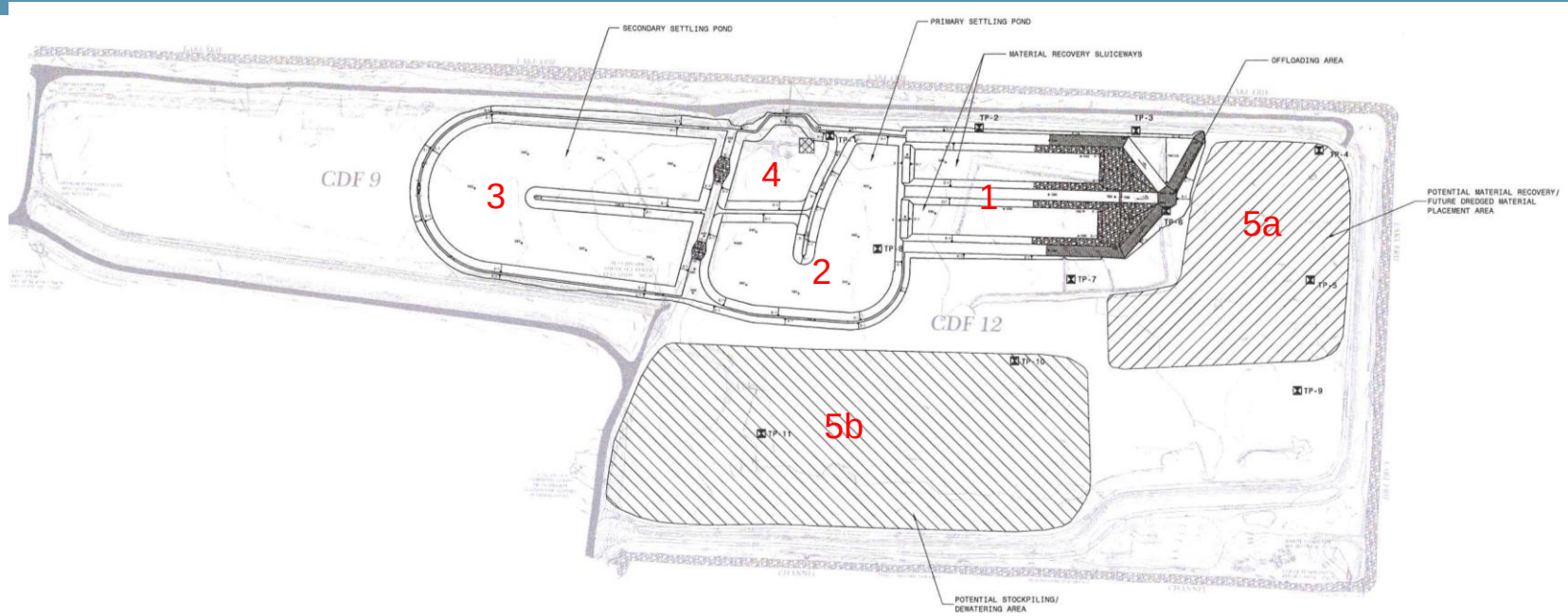
Asset Management

## Sediment Choreography:

I. Rely on the natural, physical characteristics of water and sediments;

II. Treat sediments as commodity with value: Harvest and market usable material .

# Pre-planned system to capture marketable sediments: how It works




1. 2 sluiceways settle coarse material
2. Silts settle in secondary basin
3. Water clarifies in 3rd basin
4. Recycling basin for water for scows
5. Areas for (a)stockpiles and (b) compost

# Port's Sediment Processing Center

**< North sluiceway ready for material**

**Hydraulic delivery underway >**
**Sluiceways allow coarse material to drop out for harvest**

# 62,000 CYs delivered to Port's Center in 2015

Filled sluiceway- end of June

Dewatering trough
End of July

**OEPA approved, harvested material stacked for load out- Mid August**

# Sediment Choreography: Reduce dredging by Bed load Interception

**Sediment migrates downstream as *suspended* or as *bed load***

- **Suspended Sediments-** very small particles (fines) and organics.

  Moves mostly during higher discharge periods

  Evidenced by murky, yellow water after storms

- **Bed Load** – heavier material / larger grain sized / tumbles along the bottom.

  Moves 24 – 7 – 365 / More during high discharge

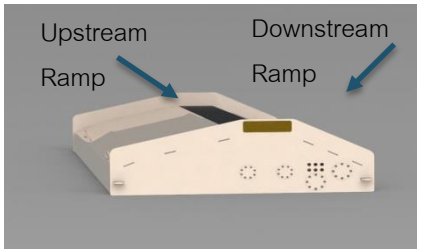
# Bed load Interception

Collects bedload sediments in the natural flowing river before it enters and settles in the ship channel.

Bed load collection:

- Relies on the **natural energy of the river**
- **Patented technology** (Streamside Systems)
- No disruption to stream ecology

# Bed load Collectors: How They Work




Passive Collector System sits on bottom of the River – bed load sediments flow up the ramp and fall into the hopper


Bedload is held in the hopper

<< Collector being installed April 2015

Sediment slurry is then pumped through a pipe and fed to a screw conveyor onshore

Sands fall off the end of the screw conveyor through a sorter where it is stacked and ready for the open market.

# Benefits of bedload interception

Reduces the environmental impact of dredging

Significant cost reduction-
- $1.00 Per yard to harvest bedload
- vs $17.50 to dredge

Reduces dredged quantity by 10 to 15%
- Extends the lifespan of CDFs

Creates a commodity by extracting valuable resources out of current waste streams
- Reuse Applications Include:
  - Structural fill
  - Custom soil blends
  - Raw material aggregate sources
  - Beach nourishment

# Port's plan adds life to existing CDFs

**Port's plan for Sustainable Sediment Management:**

- Dewatering, mechanical unloading and vertical stacking provided 30 years of new capacity
- Harvesting and **beneficial use of material** increases lifespan to 42 years
- Effects of **bedload interception** increases life span to 47 years

**Avoids over $150 million in new CDF costs**

**Protects Lake Erie from contaminants in the sediments**

**Adaptable to variable weather patterns**

# Variable weather patterns

**Lake Level Fluctuations**

- Historic patterns of wide variation- Not a new issue

- Rarely below standard IGLD
  - Heavily influenced by precipitation in the Lake Superior Watershed

- Proper, regular dredging provides adequate navigable depths.

# Variable weather patterns, cont'd

**Shorter winter over-icing periods?**

- **Allows longer shipping season on the upper Great Lakes**
- **Allows longer annual access to global markets through the St. Lawrence Seaway**
- **Creates potential for open Northwest Passage to Asian Markets from the Great Lakes**

# Get Connected with the Port

CONNECT WITH US

Sign up for the Port of Cleveland's eNewsletter to keep up on what's happening On the Docks, Along the Water, and In the Community.

Or visit the Port online at **www.portofcleveland.com**

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