

SUSTAINABLE SOLUTIONS FOR DREDGED MATERIAL MANAGEMENT IN OHIO

Western Dredge Association – Midwest Chapter
Omaha, Nebraska
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James White, Cleveland-Cuyahoga County Port Authority



Maritime and Ohio's Economy

- Ports help Ohio compete globally by connecting Ohio businesses to world markets through the most cost-effective method of freight transportation.
- Nearly 40 tons of bulk commodities that pass through the 8 commercial ports in Ohio generate:
 - \$24.7B annually in business revenue
 - \$3.8B per year in personal income from direct and indirect jobs in the transportation and commodity-related industries

Dredging of Commercial Ports in Ohio

- US ACE responsibility
- Every year for some ports
- Needed to maintain sufficient depths
- About 1.5 million tons of dredged material on average per year

Beneficial Use of Lake Erie Dredged Material

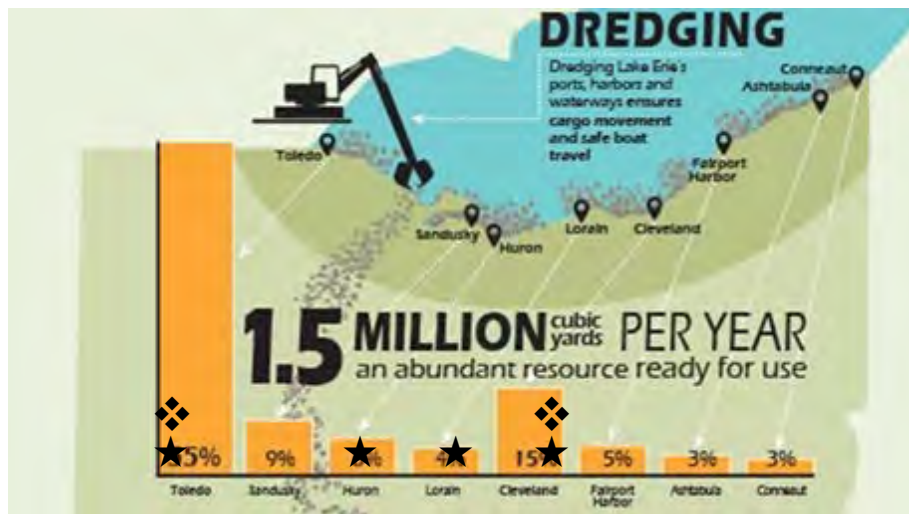
The Size of the Problem-~~Problem~~ Opportunity



Agricultural
Uses



Construction &
Engineering
Uses



Environmental
Enhancement



Product
Uses

70% of the material dredged annually is from Toledo and Cleveland

- ★ Only four harbors have Confined Disposal Facilities (CDFs) where material can be placed and dewatered
- ❖ Two CDFs have material that has been characterized and is available for use

Management of Dredged Material is Critical

- Most dredged material is currently disposed in Lake Erie
- After July 1, 2020, material cannot be disposed in the open waters of Lake Erie
- Only 4 of the 8 ports have confined disposal facilities (CDFs)
- Limited disposal capacity in existing CDFs
- US ACE wants to reserve existing capacity in event material is contaminated
- CDFs are costly to build
- Non-Federal partner must help pay cost of building new CDF
- Without material management options, US ACE may not dredge

Beneficial Use of Lake Erie Dredged Material

Regulatory/Policy

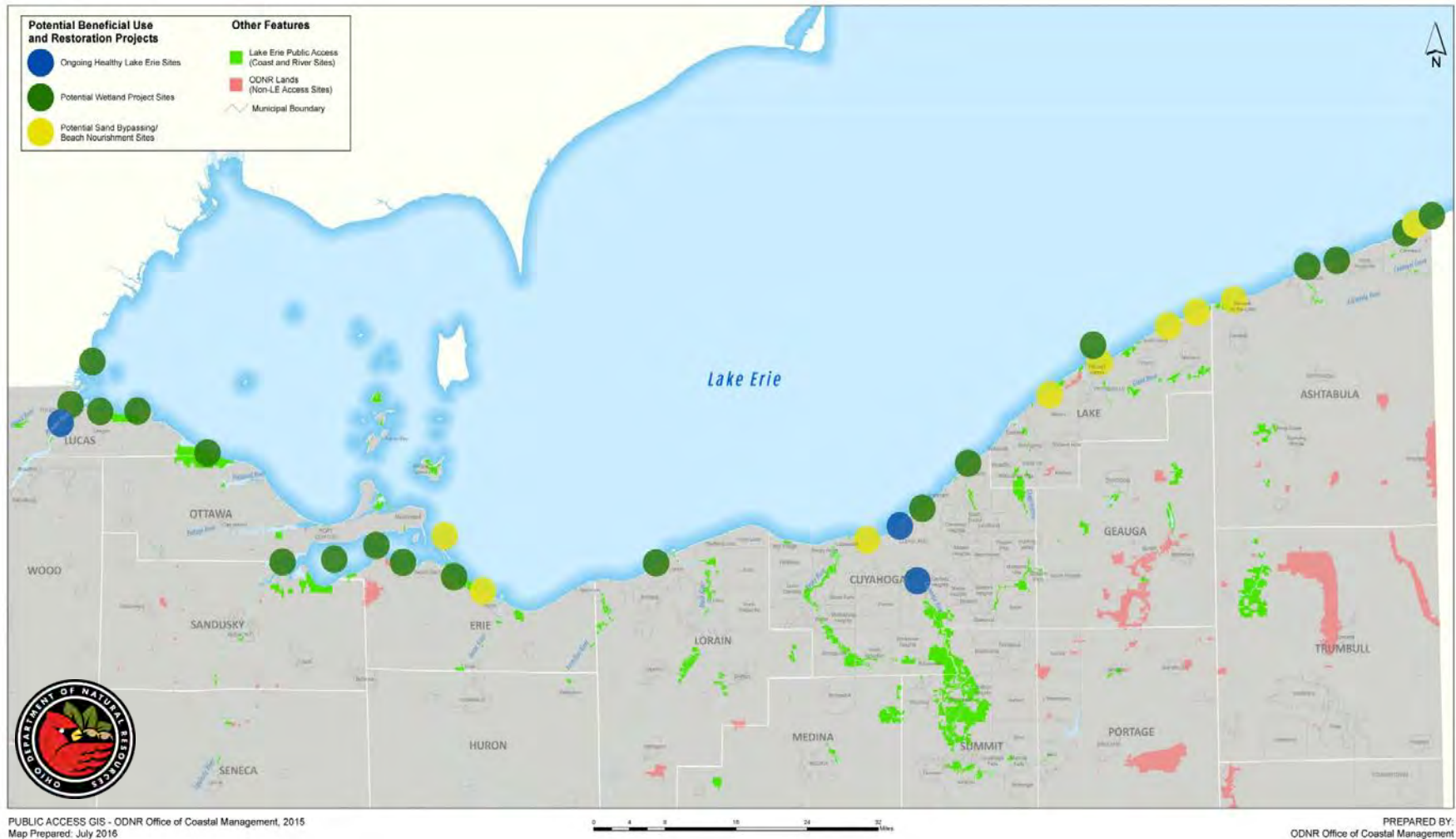
- Developing an easy-to-understand **regulatory framework** for upland and in-water beneficial uses
- Working with stakeholders and the general assembly to **change state law** to make it clear when dredged material would not be regulated as a waste under ORC 3734 and 6111. (Senate Bill 2)
- Working to **identify sustainable funding sources** to support dredged material beneficial use projects
- Collecting **background soil data** for metals in the lakefront counties where dredged material could be used
- Developing **GIS-based based tools** to make it easier to match sources of dredged material with potential in-water uses
- Including dredged material from each of the ports in the **Ohio Materials Marketplace website**

Great Lakes Dredged Material Center for Innovation in Toledo



LAG
landscape affairs group
urban | landscape | design | research

Ohio's Initially Identified Coastal Restoration Sites



Potential Coastal Restoration Sites in Toledo & Oregon





Global Reach. Local Benefit.

SEDIMENT CHOREOGRAPHY

James White, Director, Sustainable Infrastructure

PRESENTATION FOR
WESTERN DREDGING ASSOCIATION – MIDWEST CHAPTER
MARCH 2017

Maritime and the Regional Economy

Created under ORC 4582, 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.



- 13.3 million tons of cargo
- **20,273 jobs**
- \$140.1 million in annual local/state taxes
- **\$3.5 billion in annual economic activity**
- \$1.4 billion in personal income & consumption

2016 Data

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



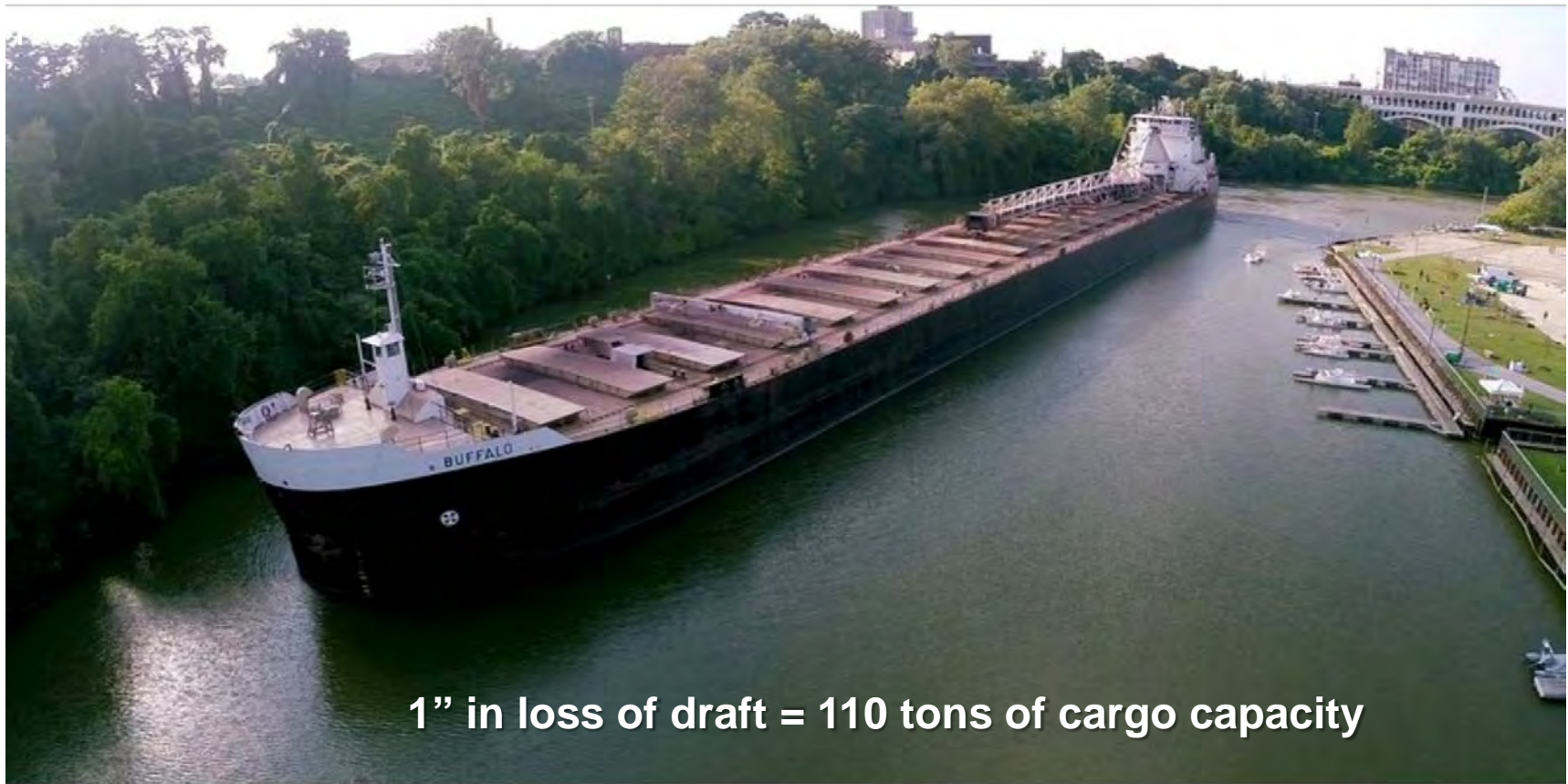
Sediment Management is Critical for our Regional Economy

- 12.5 – 16 million tons of bulk commodity cargo handled
- Primarily: **iron ore, limestone, coal, cement, aggregates, sand, salt, slag**
- Dredged depth of 23 ft. allows 15,000-23,000 tons per delivery
- **Ship channel acts as a natural settling basin**
- **Coarse grains settle out first**



800 - 900 Freighter Trips per Year

“River-class” cargo vessels. Typical length of 630-711 ft.



1" in loss of draft = 110 tons of cargo capacity

Cuyahoga River Flow in Equilibrium



Broad, shallow channel with access to floodplain across stable, vegetated banks

Cuyahoga River is Expanding its Size

Extreme weather patterns and urban sprawl affect river shape and conditions

Bank Erosion in Cuyahoga Valley National Park



**Enlarging meanders.
Flood plain expansion.
Bank erosion.
Sediment mobilization.**

Sediments that settle in the ship channel become impacted by prolonged contact with urban run-off and Combined Sewer Overflows



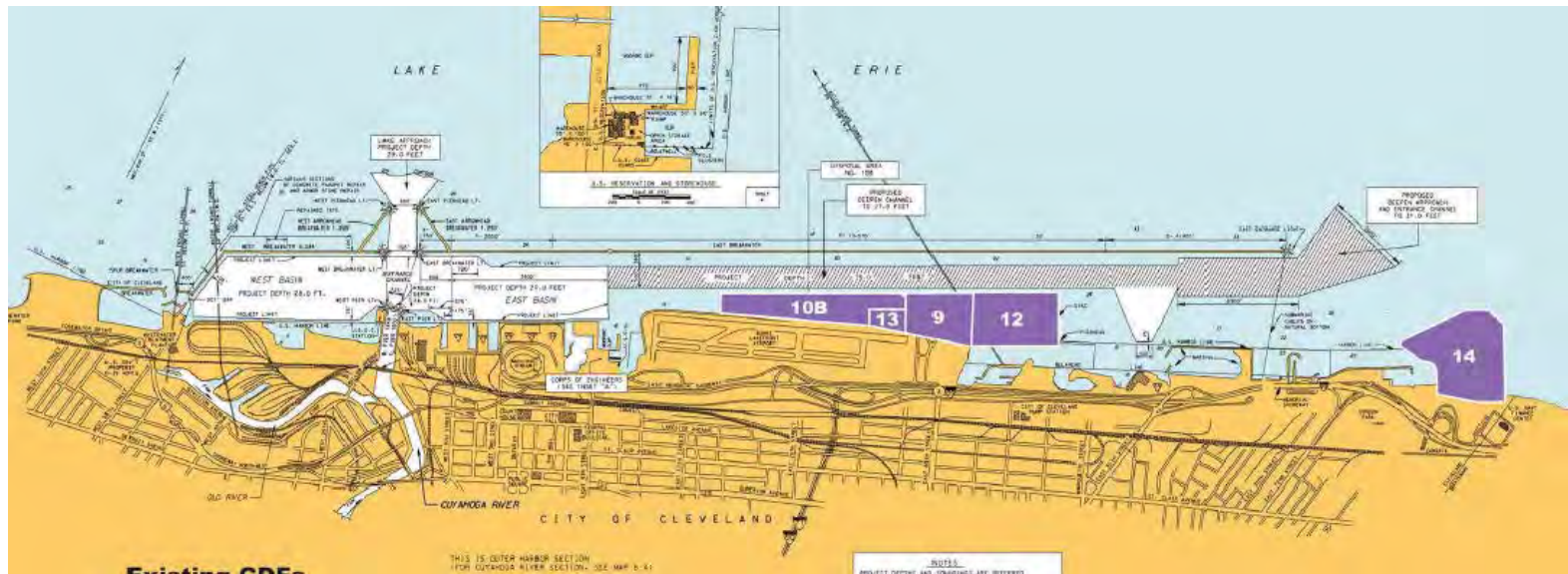
Visible storm debris at Combined Sewer Outfall (CSOs) in the Ship Channel

Effects of Prolonged Contact with pollutants in urban run-off requires placement of dredged sediments in Confined Disposal Facilities

Dredging

- Effects of urban run-off and associated latent toxicity requires that sediments be placed in Confined Disposal Facilities (CDFs)
- CDFs are nearing capacity and new ones are prohibitively costly (>\$150 million).
- Each year, 200,000 to 250,000 cubic yards must be dredged.
- New alternatives for managing sediment needed to be developed.

Confined Disposal Facilities for Cleveland Harbor



Port's Approach to Sediment Management

Data Driven

Systems-Based

Promote Innovation and New Technology

Asset Management

Sediment Choreography

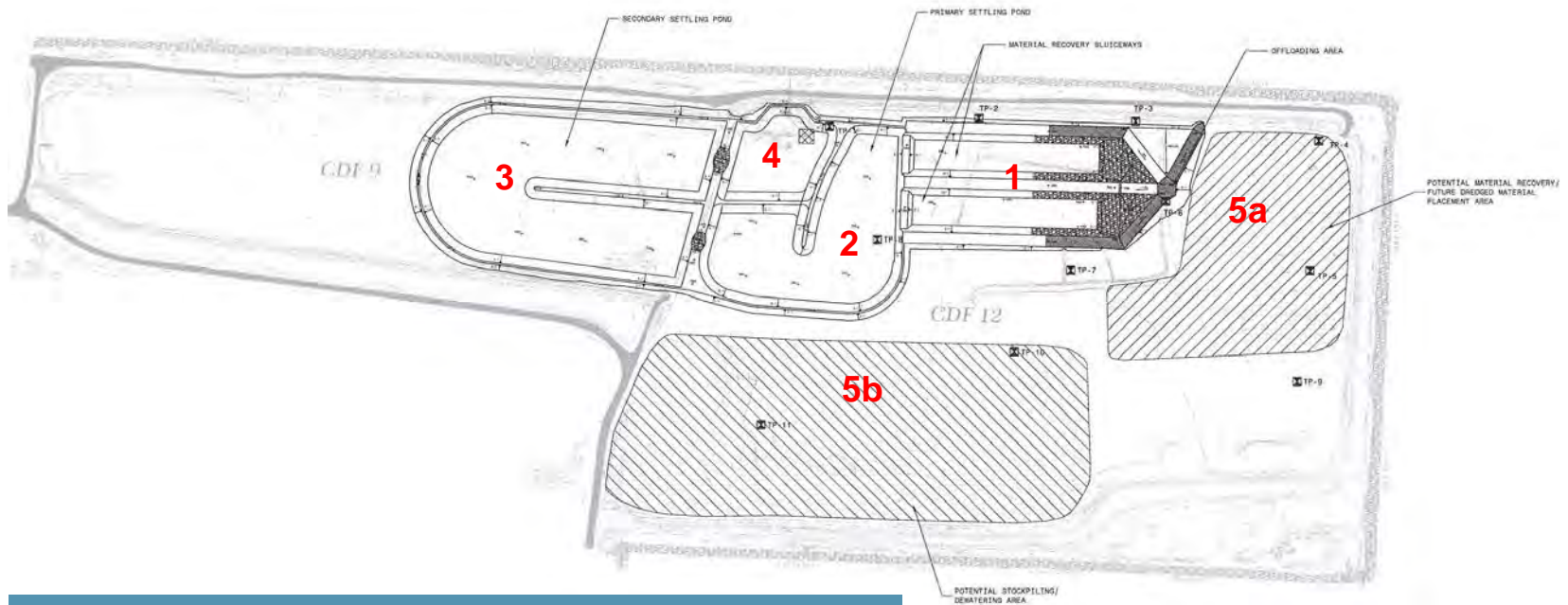
**Rely on the natural physical characteristics of
water, energy and sediments:
Harness natural processes for cost efficiency**

**Treat sediments as a commodity with value:
Harvest and market usable material**

Sediment Choreography I -

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) disposal

Port's Sediment Processing Center - 2015



< North sluiceway ready for material



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

Sediment Processing Center in 2015



62,000 CYs Delivered to Port's Center in 2015

Filled sluiceway - end of June, 2015



Dewatering trough
end of July



**Ohio EPA-approved
harvested material stacked
for load out - Mid August**



Provided soil for
bridge ramp
landscaping.

2016 Capacity Expansion

\$1 million grant from Ohio Healthy Lake Erie Fund

- **Added third sluiceway - 3 sluiceways dedicated for upper channel coarse material**
- **Added water management weirs - more rapid dewatering**
- **Provided for mechanical delivery of silts and clays in permanent disposal area**
- **Allows routine harvest capacity 85,000 CYs per year**

2016 Dredging at ArcelorMittal



2016 Hydraulic Delivery at Port's Sluiceways



2016 Harvest of Upper Channel Coarse Sands



Port received
63,000 CYs in
Nov. and Dec.
for harvest &
marketing

OHIO:
Only Handle It Once

Sediment Choreography II - Why Dredge?

Why not reduce dredging by Bedload Interception?

Sediment migrates downstream as *Suspended* or as *Bedload*

- **Suspended Sediments** – very small particles (fines) and organics.
Slow to settle. Limited value.
Moves mostly during higher discharge periods.
Evidenced by murky, yellow water after storms
- **Bedload** – heavier material / larger grain sizes / tumbles or saltates along the bottom.
High market potential.
Moves 24 – 7 – 365 / More during high discharge periods.

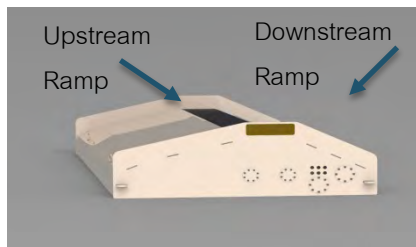
Bedload Interception

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

Bedload collection:

- Self- harvesting / **Relies on the natural energy of the river**
- **Patented technology** (Streamside Systems, Findlay, OH)
- **No disruption** to stream ecology
- Produces **high quality material** with no restrictions on usage

Bedload Collectors: How They Work



Passive Collector System sits on bottom of the river

Bedload sediments flow up the ramp, lose energy, slow down, 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 through a dewatering screw conveyor onshore

Water is recycled

Sands fall off the end of the screw conveyor where it is stacked and ready for market



Benefits of Bedload Interception



Significant cost reduction:

\$ 1.00 per yard to harvest bedload vs.
\$17.50 to dredge and place in CDF.

Goal - Reduce dredged quantity by 10% to 15%:

Reduces the environmental impact of dredging.

Extends the lifespan of CDFs.

Self funding: Harvests a wasted commodity for beneficial market uses:

- Structural fill

- Custom soil blends

- Raw material aggregate sources

- Beach nourishment

Ready for market upon harvest.

Increasing Harvest Capacity

Widely variable precipitation patterns have impacted expected harvest volumes

Port is evaluating the use of **Cross Vanes** to move more bedload material to the collector in the center of flow.

Evaluation will help guide future installations.

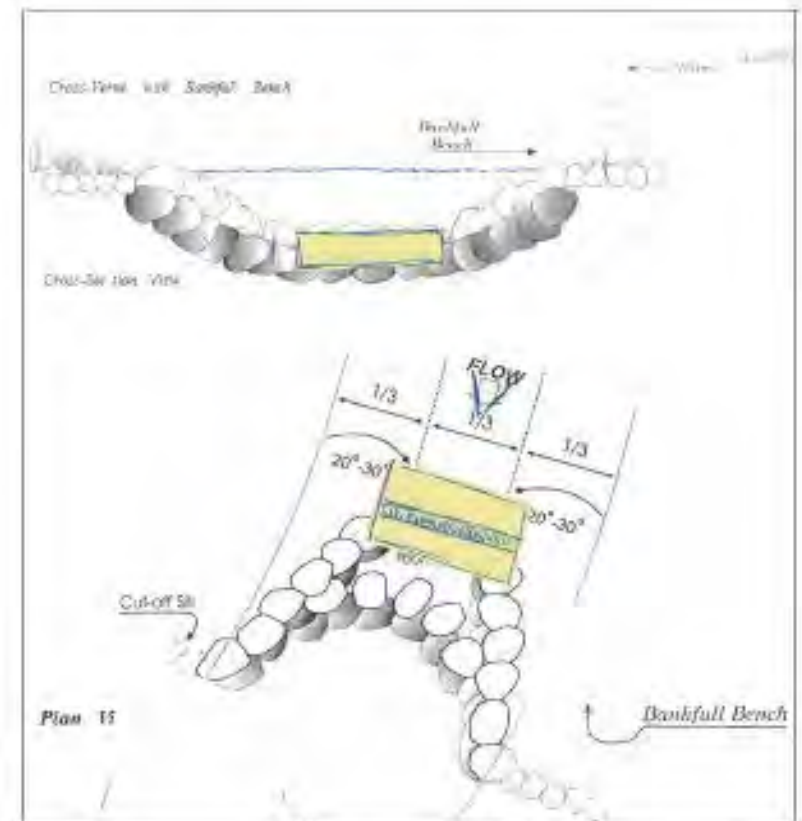


Figure 5: Example of a boulder Cross-Vane and constructed bench

Port's Sediment Choreography Adds Decades of Life to Existing CDFs

- Port's plan for dewatering, mechanical unloading and vertical stacking provides **28 years of new capacity**;
- Implementing **harvesting and beneficial use of material** increases lifespan to **42 years**;
- **Bedload interception** can increase **life span to 46 years**.

Avoids over \$150 million in new CDF costs

Relies on natural forces of water, energy & sediments

Protects Lake Erie from contaminants in the sediment

Provides useful commodity

Get Connected with the Port

CONNECT WITH US



To keep up on what's happening On the Docks, Along the Water, and In the Community, visit the Port online at:

www.portofcleveland.com



The Port of Cleveland is located at 1100 West 9th Street, Suite 300, Cleveland, OH 44113. Phone: 216.241.8004



Global Reach. Local Benefit.

Sustainable Solutions for Dredged Material Management in Ohio

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