Fox River cleanup

James Hahnenberg

Sediment Remediation Course
Chicago
November 30, 2005

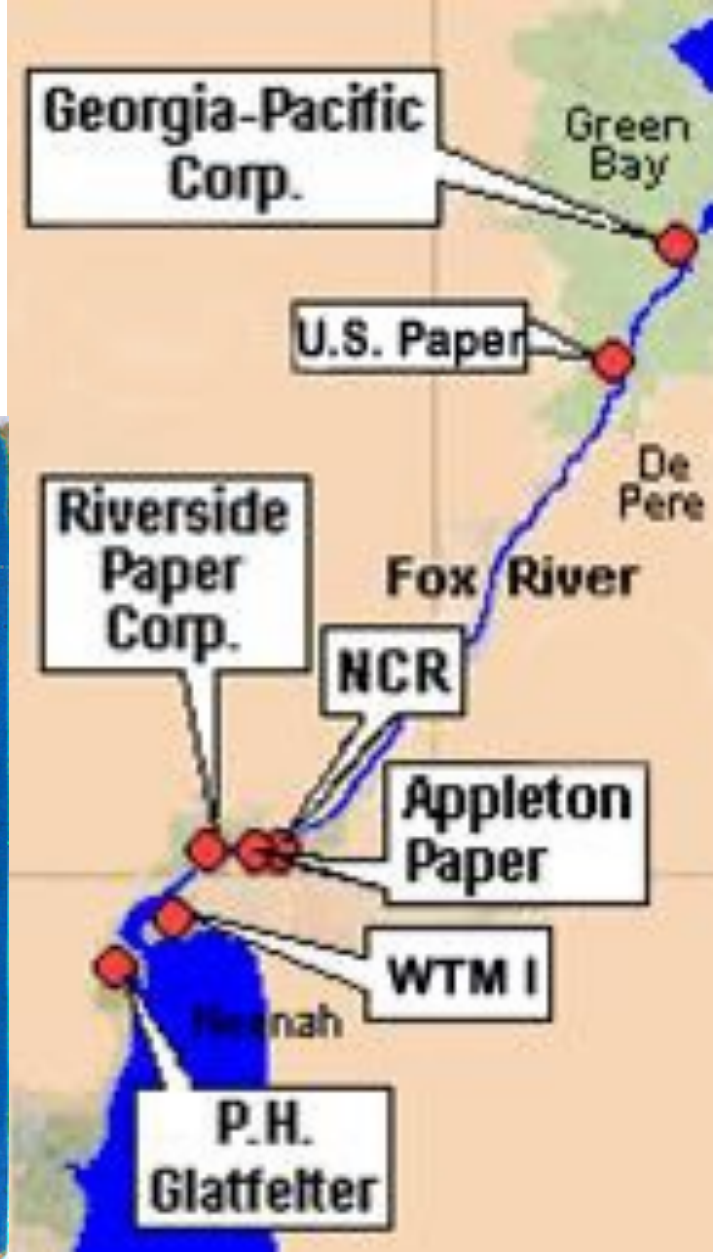
Fox River

1. The problem

2. Decisions (i.e., RODs)

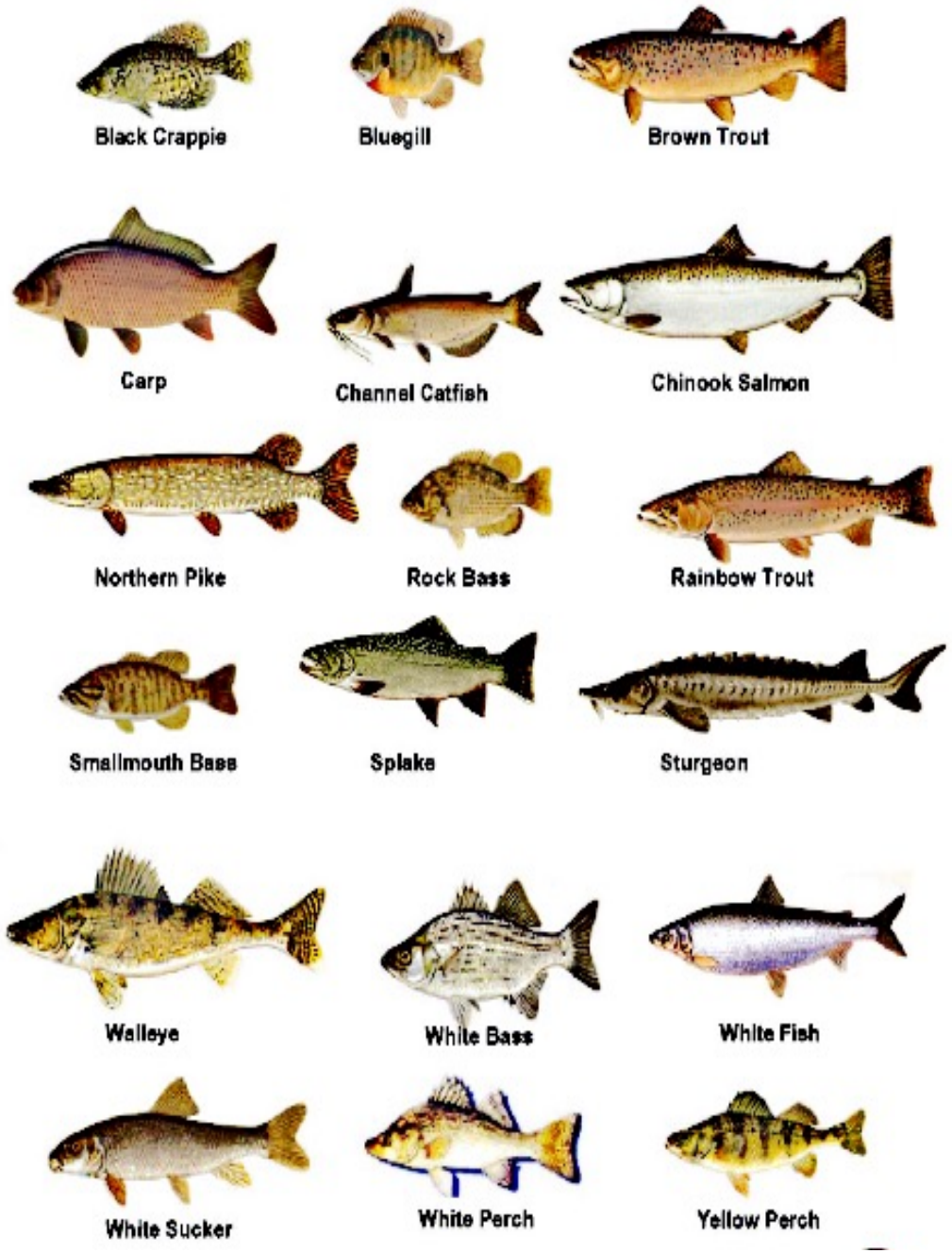
3. Work
   a. Dredging projects and lessons
   b. Contractors advice

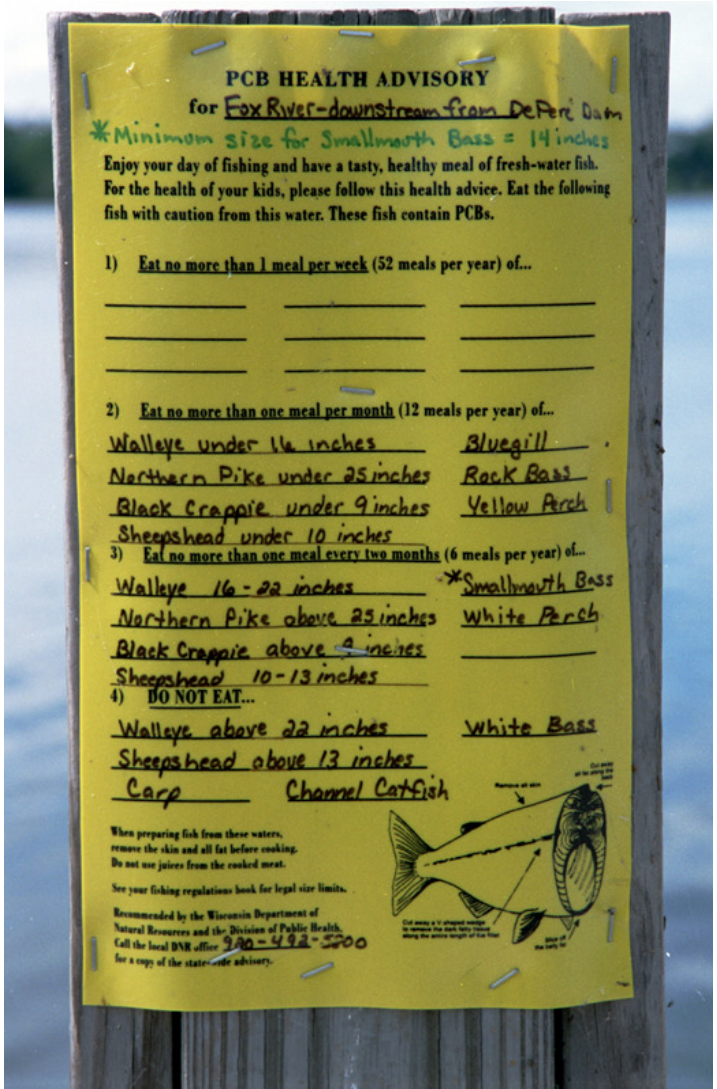
Fox River PCBs: from papermills



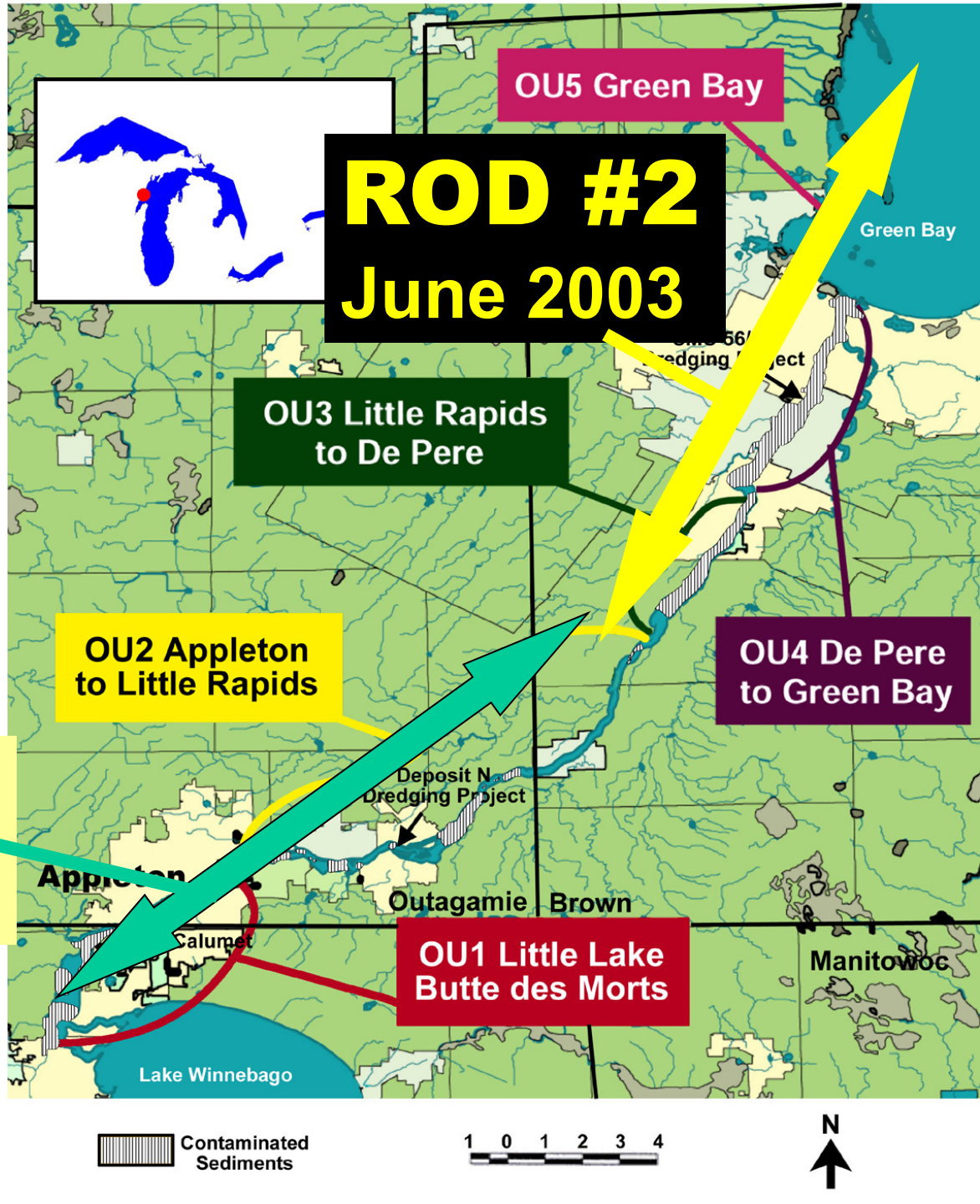
Modified from Green Bay Press Gazette

PCB fish consumption advisories



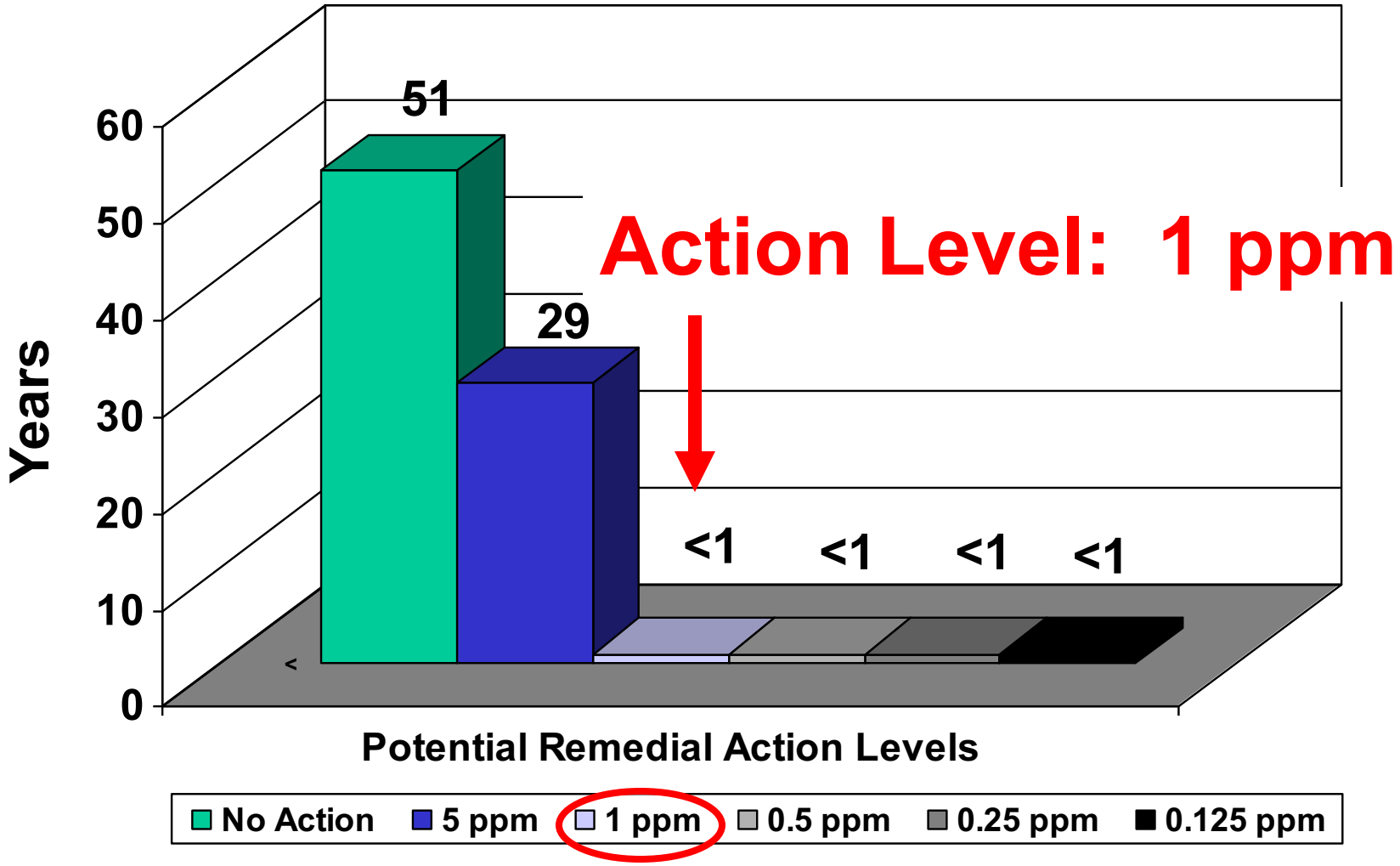


Fox River decisions



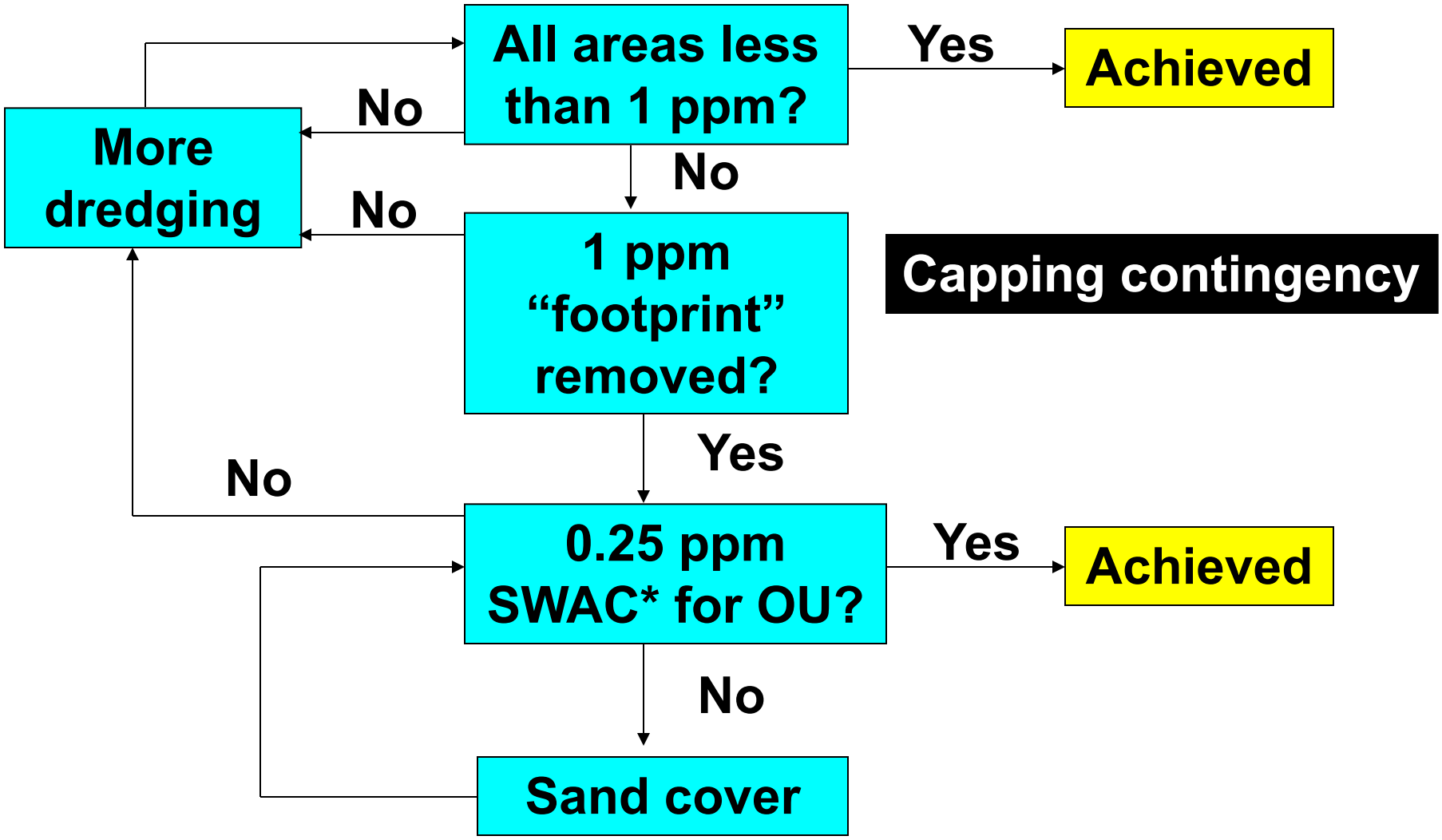
ROD #1
December 2002

Cleanup level & time to Acceptable Fish Tissue Levels* for OU 1



* For unlimited fish consumption for young-of-year fish

Fox River PCB cleanup goals

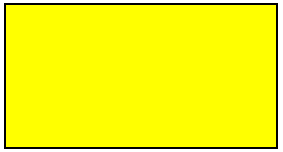


*Surface Weighted Average Concentration

Dredging versus Capping

	Dredging	Capping
Short-term releases	Small	Smaller
Contaminant disposition	Mostly removed to landfill	Contained* in river
Habitat	Altered/disrupted (eventual recovery)	Permanent change

Preferred



*Assumes long-term stability

Dredging versus Capping

	Dredging	Capping
Construction impacts	Larger “footprint”	Smaller “footprint”
	Some noise, traffic, odors	Less noise, traffic, odors
Monitoring & maintenance	Limited monitoring	More monitoring & institutional controls
Cost	High	Moderate
Water depth	Increased	Decreased

Preferred

Post-dredging residuals

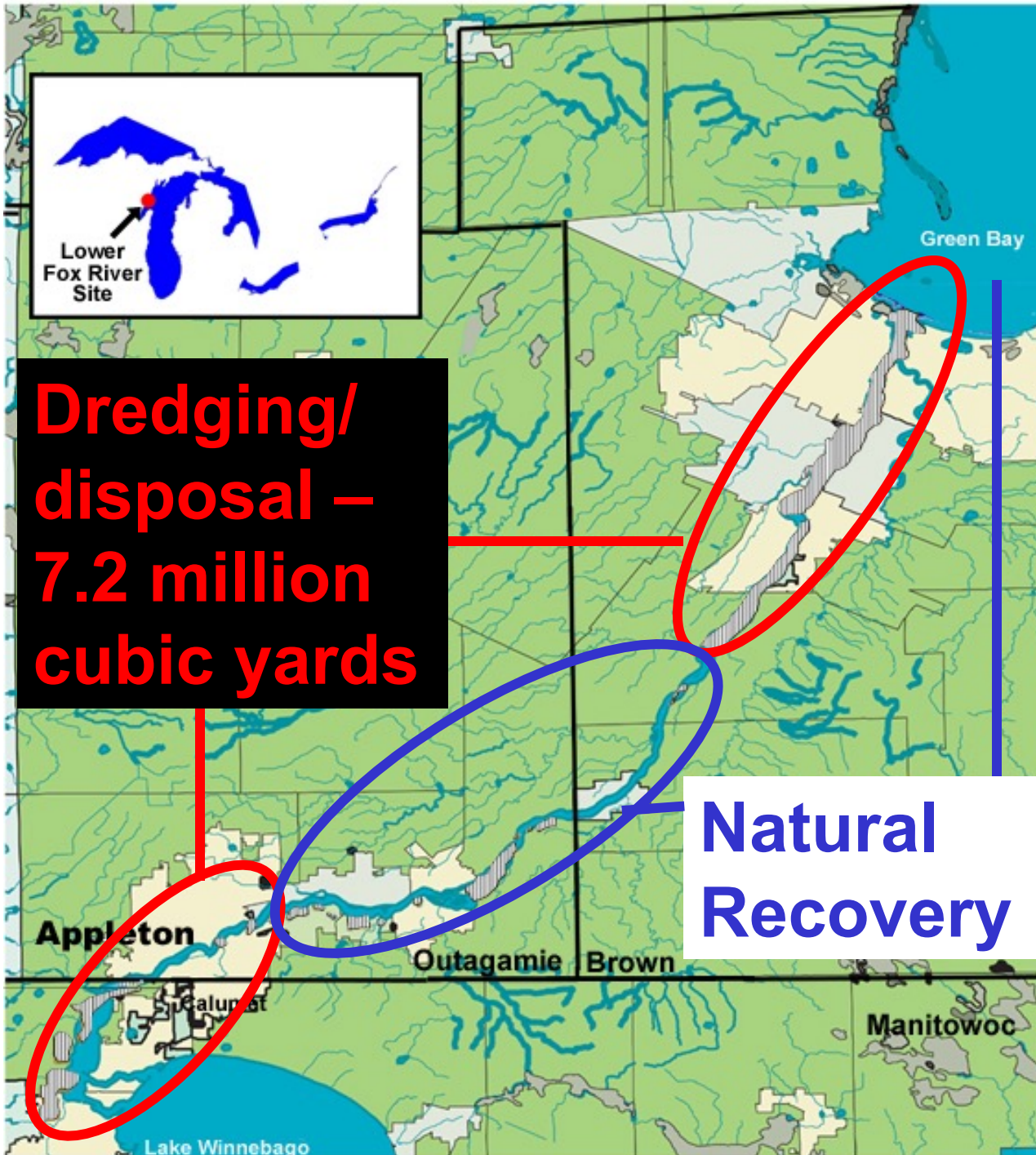
Project	Contaminant	Average % Reduction
Grasse River	PCBs	79*
GM Massena	PCBs	99*
Cumberland Bay	PCBs	97*
New Bedford	PCBs	97*
Marathon Battery	Cadmium	92*
Lake Jarnsjon	PCBs	99*
SMU 56/57 (Fox)	PCBs	96
AVERAGE		94

*** From: Hudson River Record of Decision, Responsiveness Summary White Paper (312663), Post-Dredging PCB Residuals**

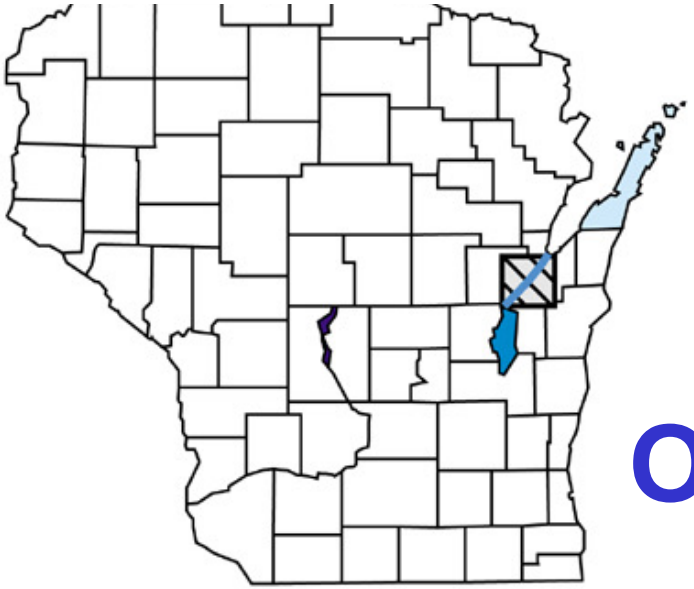
Remedy Decisions (2003-2004)

Total cost: $400 million

- **Dredging: $350 million**
- **MNR $50 million**



OU 1 and OU 2 December 2002 ROD



OU 4

OU 3

OU 2

OU 1

Appleton

Winnebago

Calumet

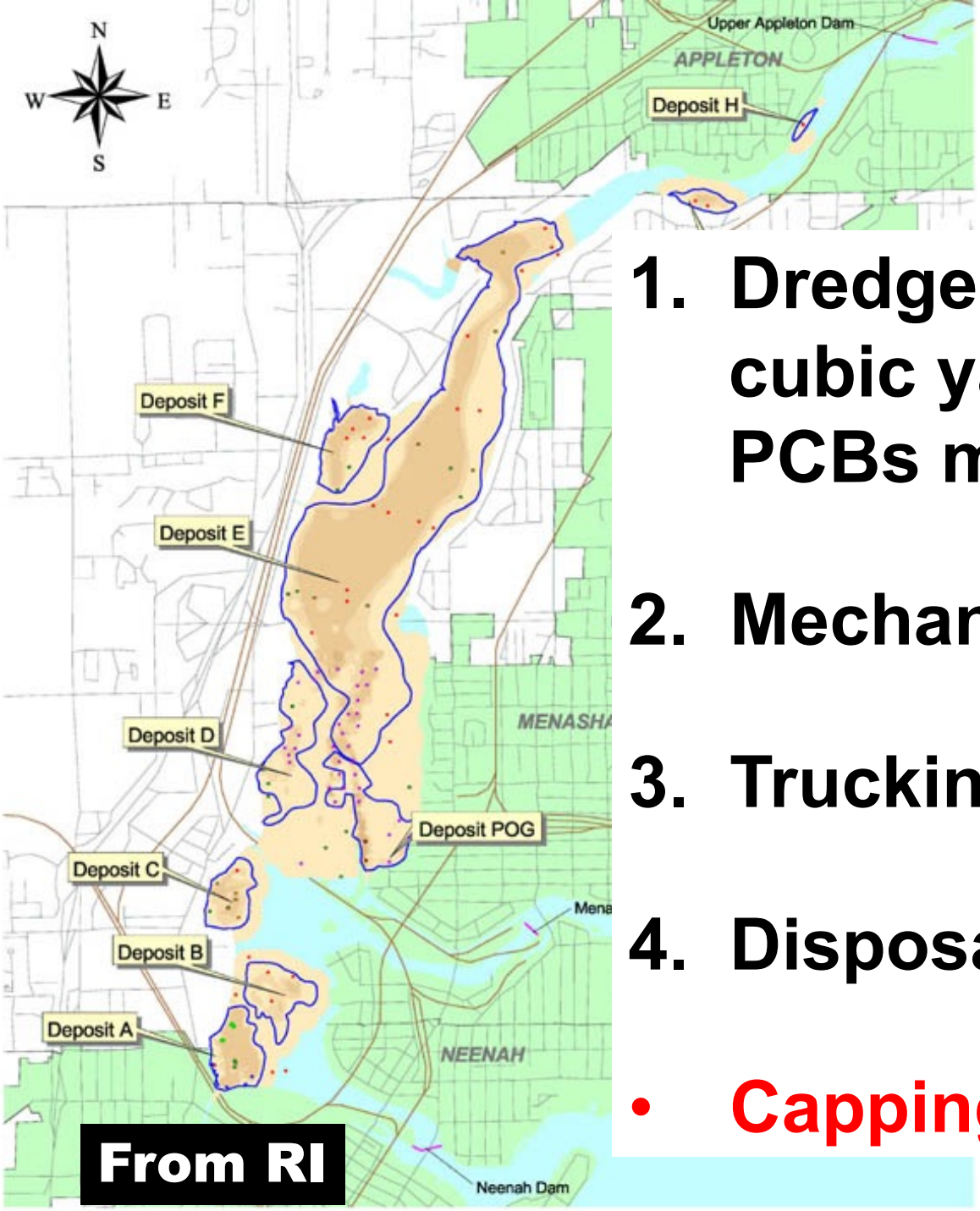
Manitowoc

Lake Winnebago

Contaminated Sediments

N

1 0 1 2 3 4

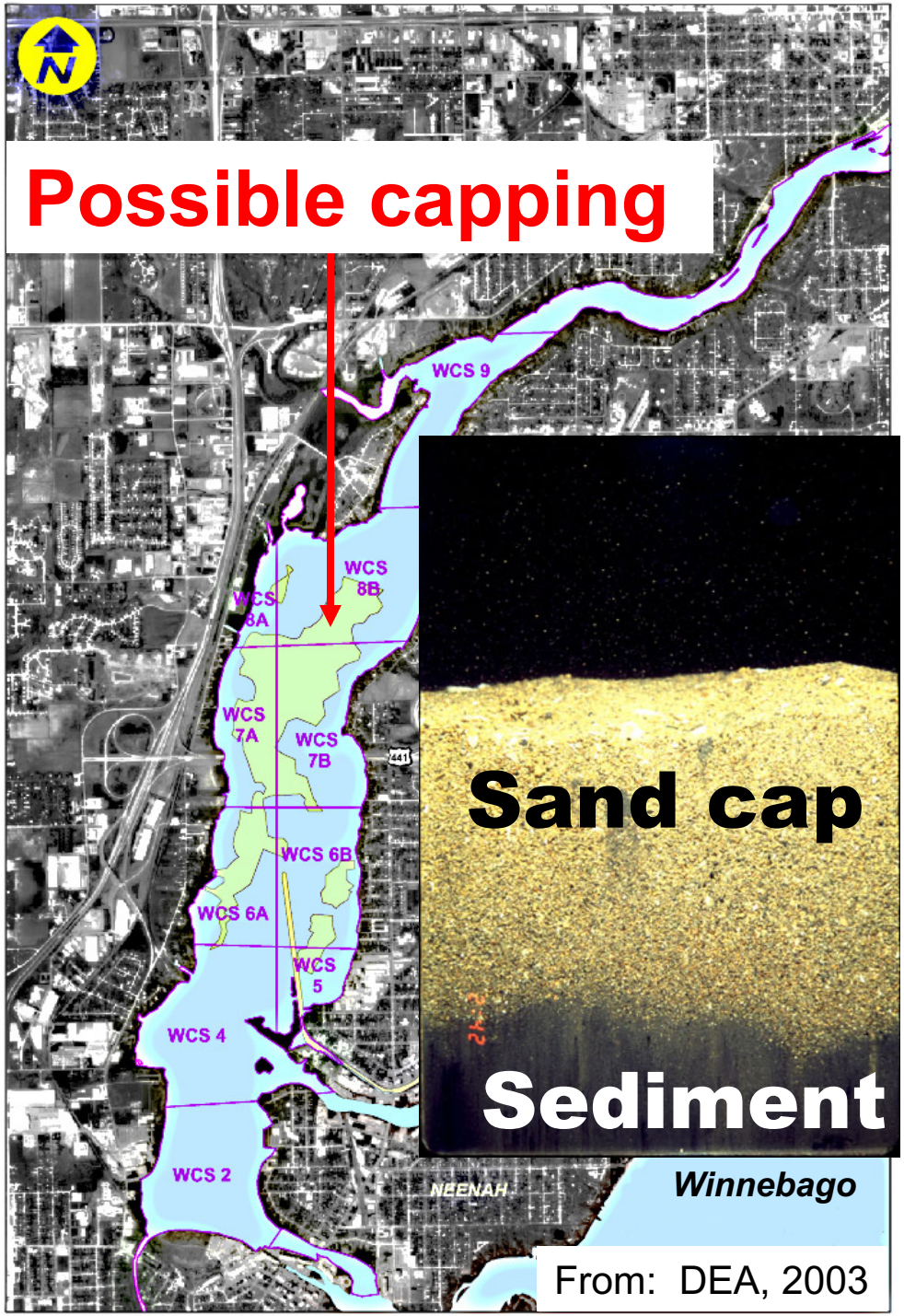


OU 1

1. Dredge 800,000 cubic yards with PCBs more than 1 ppm
2. Mechanical dewatering
3. Trucking
4. Disposal

- Capping contingency

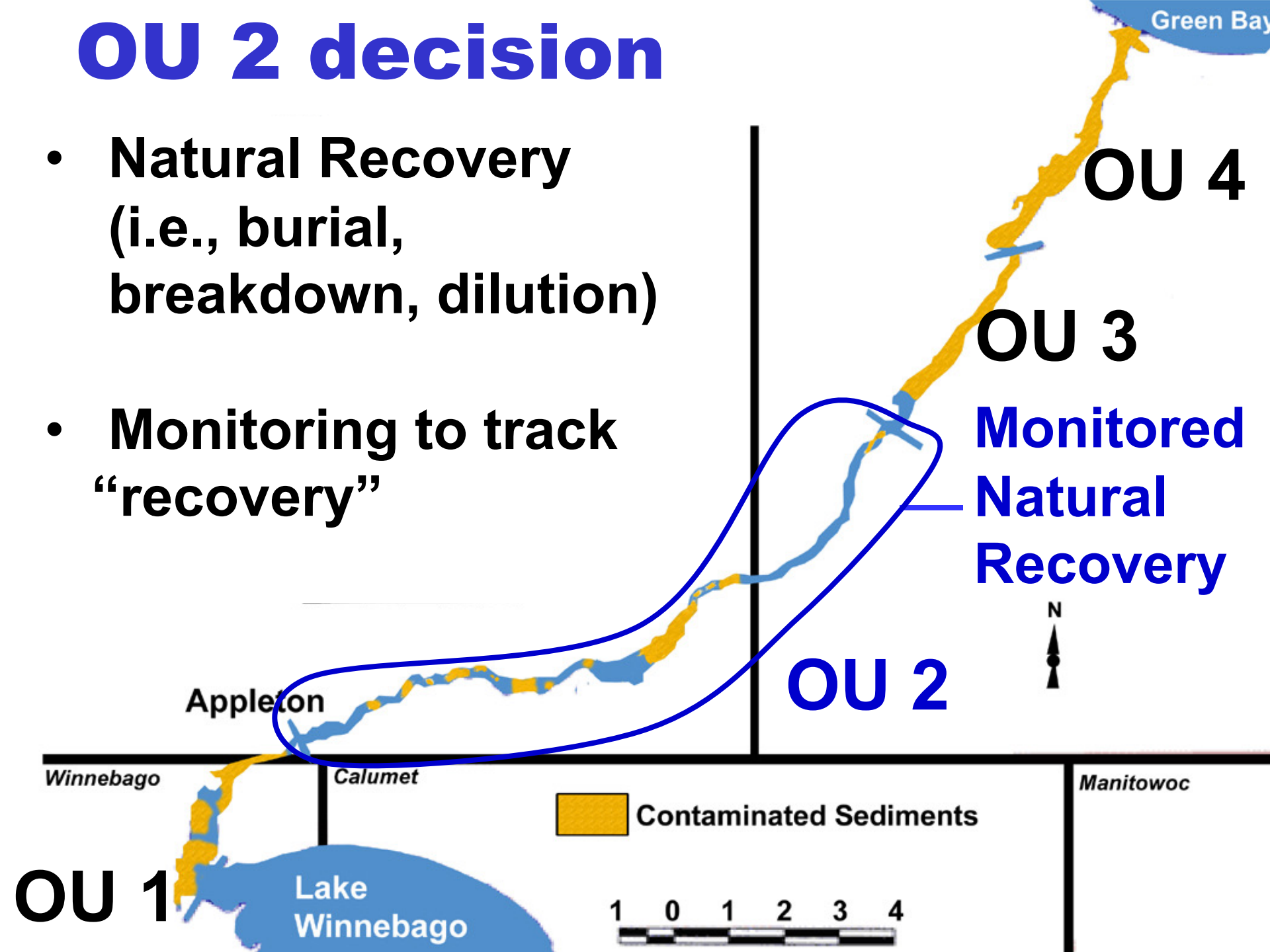
Capping: possible dredging supplement



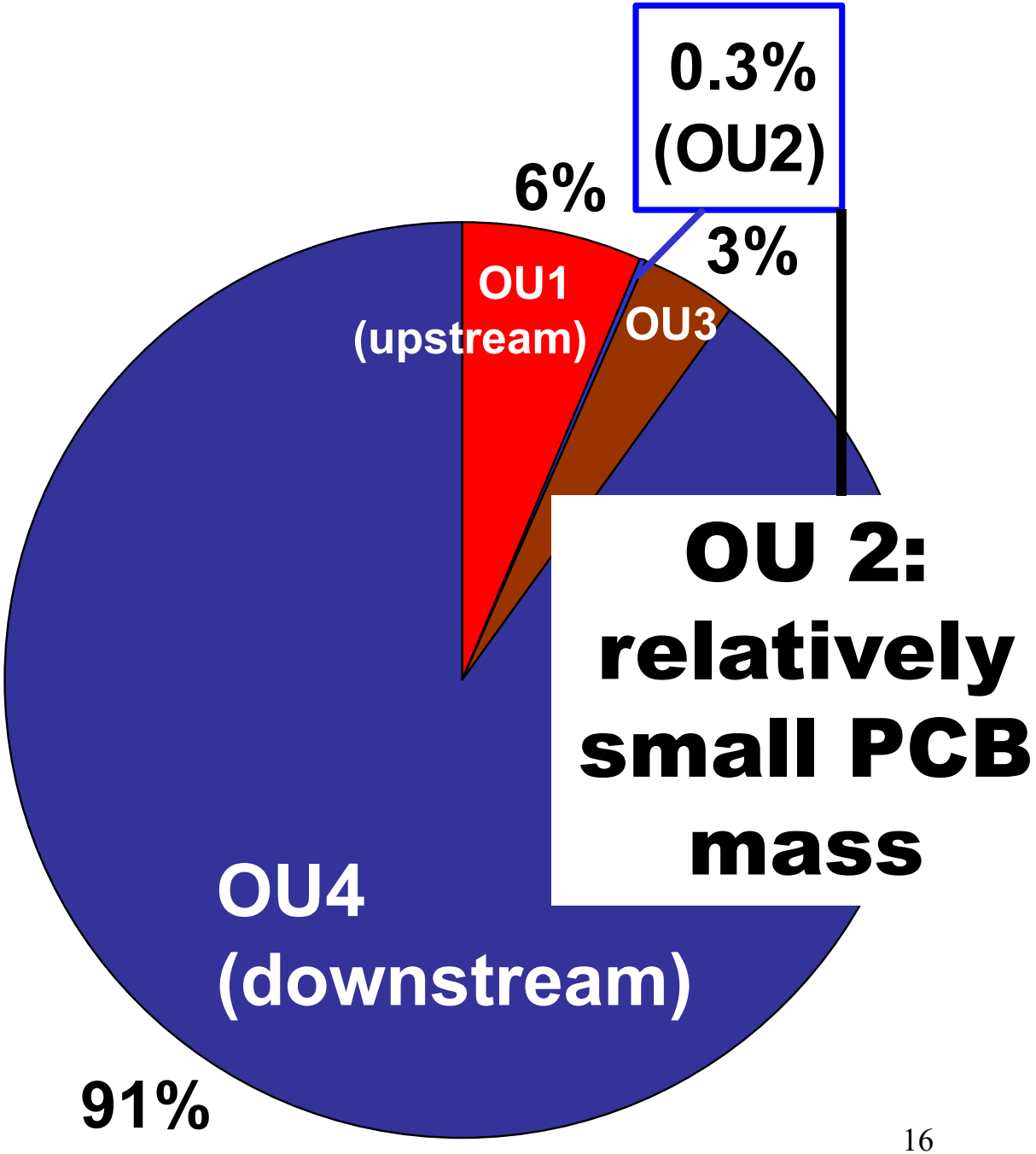
1. **Post-capping water depth 3-feet+**
2. **Not in navigation channel**
3. **Avoid pipelines, utilities, etc.**
4. **PCBs less than 50 ppm**

OU 2 decision

- Natural Recovery (i.e., burial, breakdown, dilution)
- Monitoring to track "recovery"



PCBs by river segment (pounds)



OU 2: relatively small PCB mass

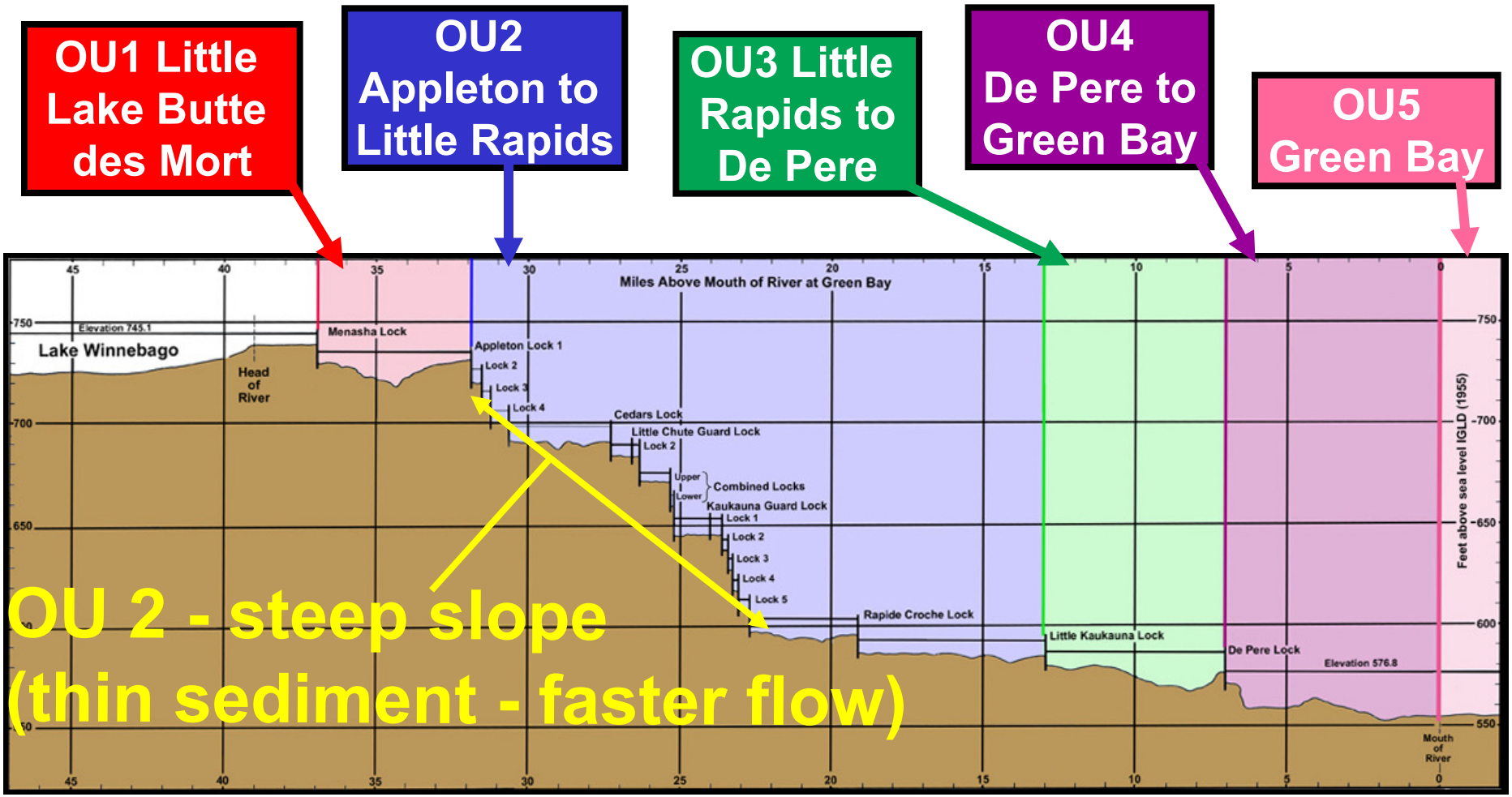
Fox River PCB concentrations

Media		Operable Unit			
		1	2	3	4
Sediments (ppm)	Average[1]	15	5	5	20
	Surface average	3.7	0.2	2.1	3.0
Water (ppt)	Average	28	17	41	61

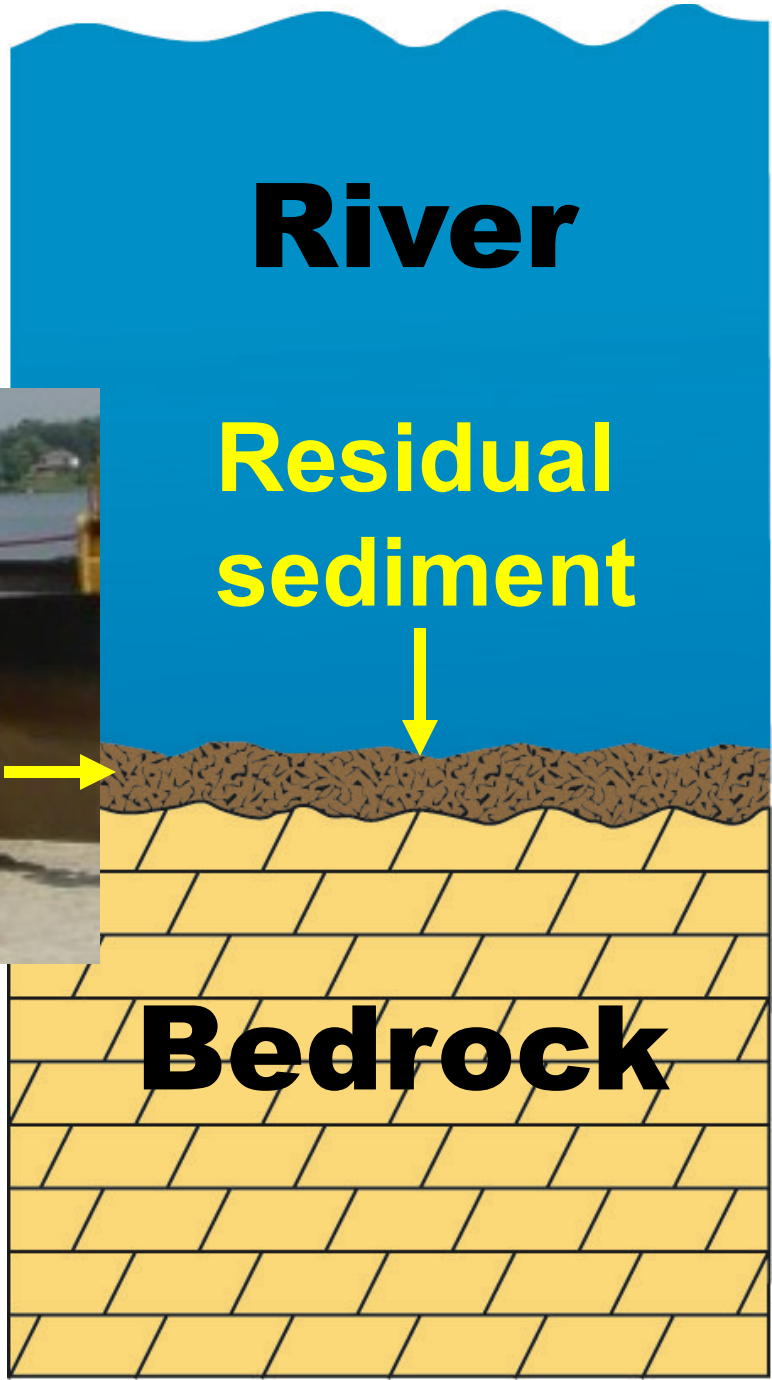
[1] All depths

Sediment goal: 0.25 ppm

Lower Fox River profile (side view)



Bedrock under contaminated sediments



Can't "over-dredge" remaining thin layer

Photo courtesy of WDNR

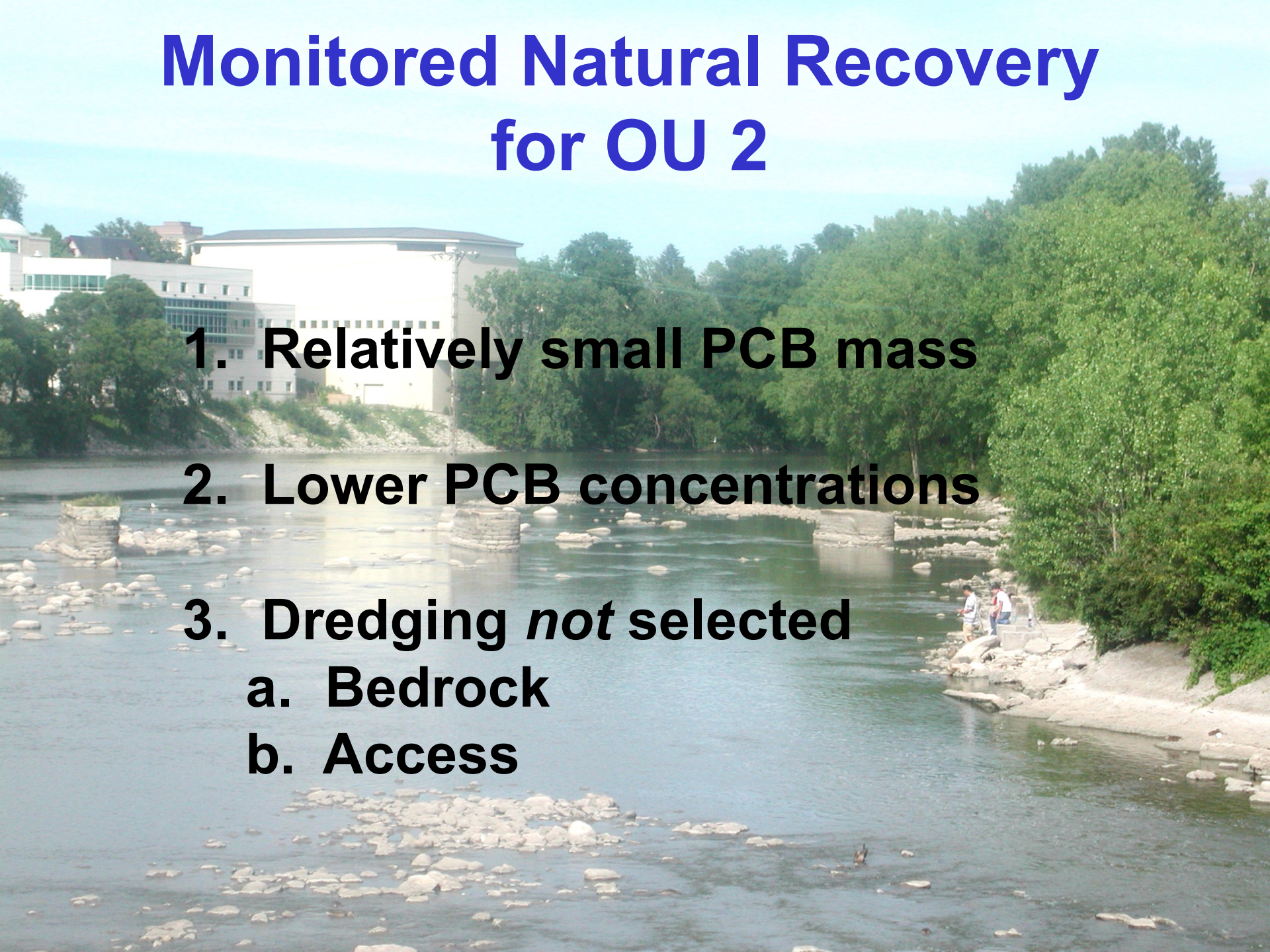
Difficult conditions for dredging

Project	Site conditions		
	Underlying bedrock	Debris	
		Wood	Rock
Manistique	x	x	x
Grasse River			x
Deposit N	x		


Wood debris
Manistique River, MI

Rock debris
Grasse River, NY

Monitored Natural Recovery for OU 2

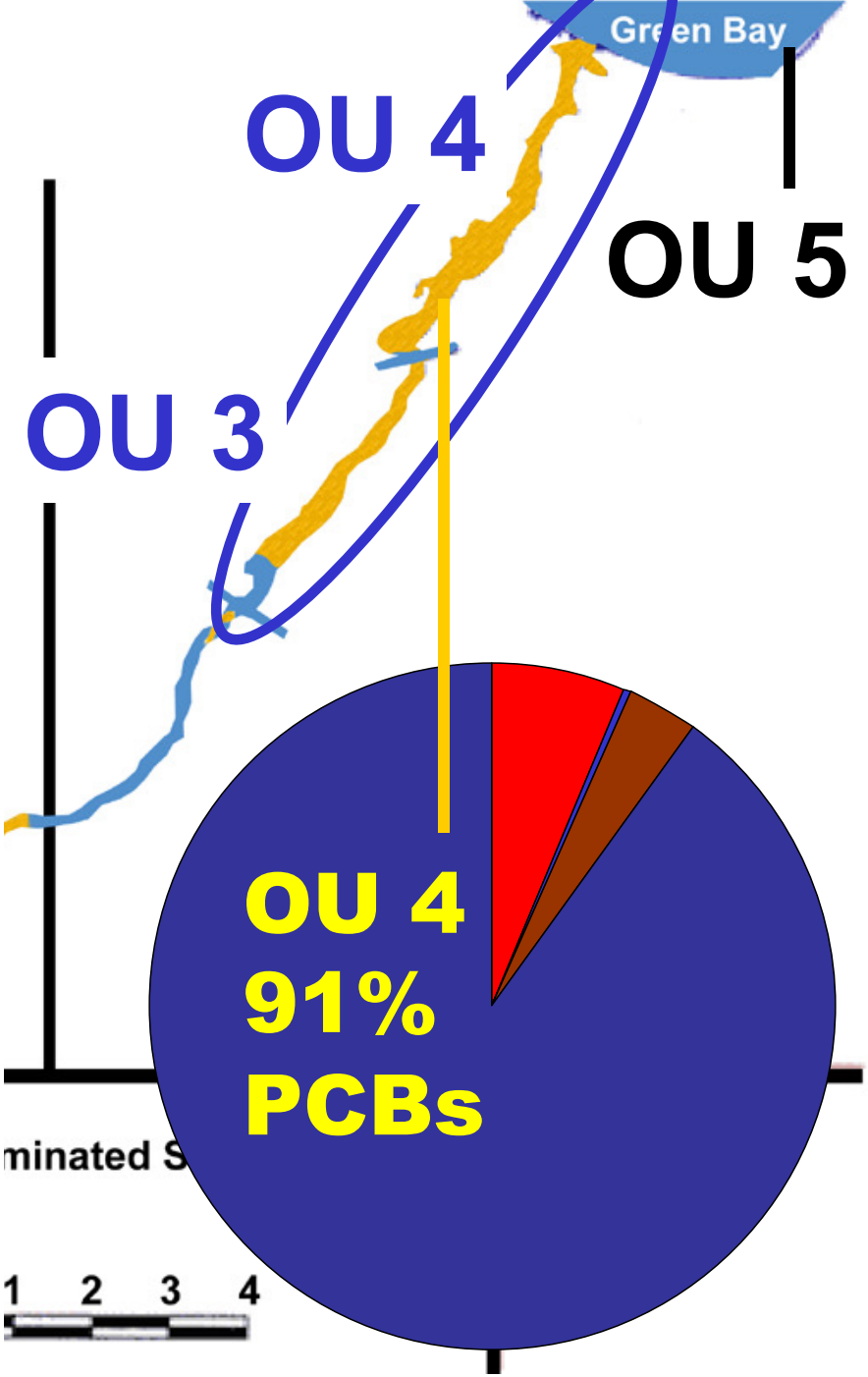


1. Relatively small PCB mass
2. Lower PCB concentrations
3. Dredging *not* selected
   a. Bedrock
   b. Access

OU 3, OU 4 Decision

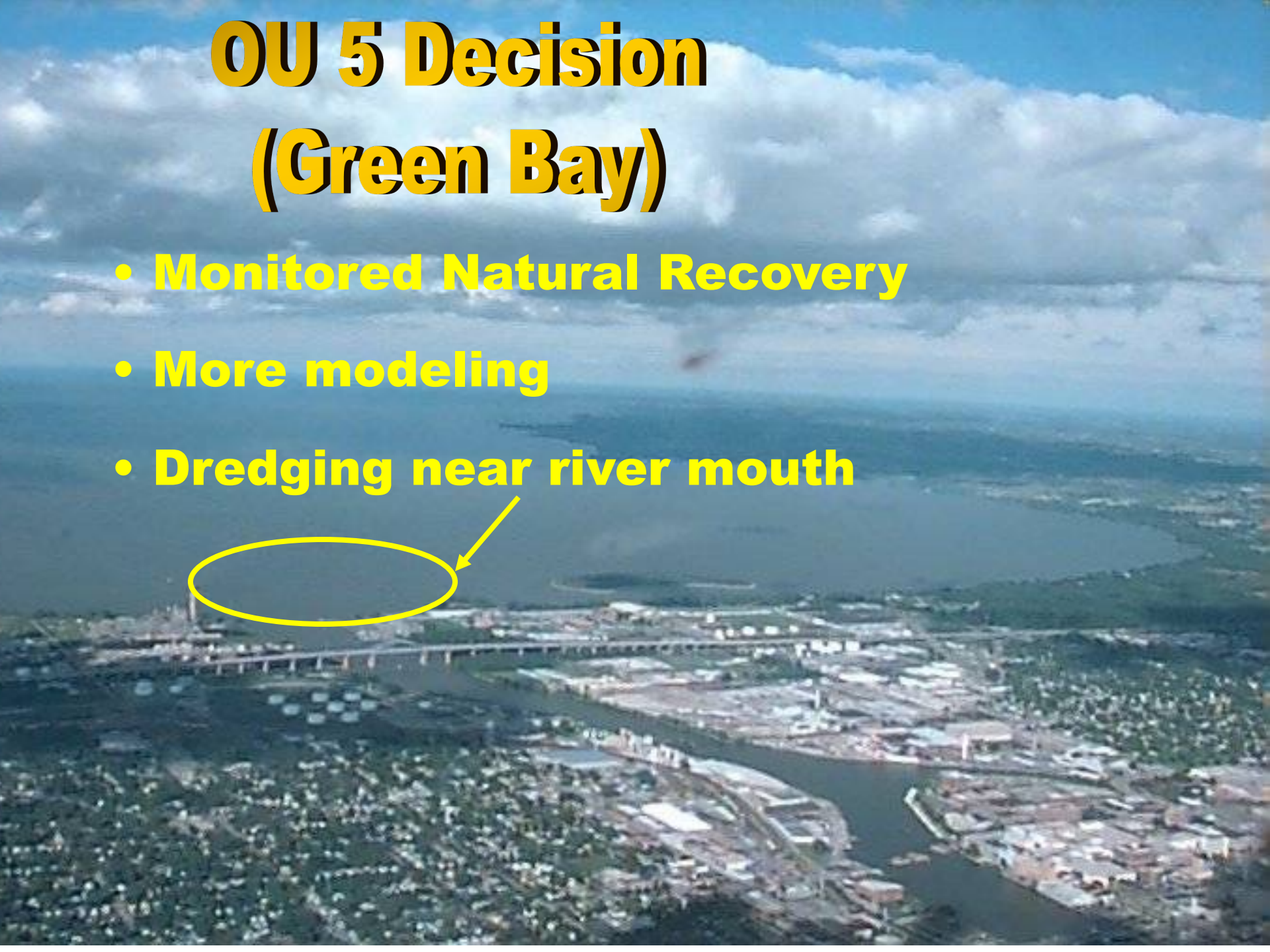
1. Dredge 6.5 million cubic yards with PCBs greater than 1 ppm
2. Pipeline to settling basins and landfill
3. Passive Dewatering
4. Landfill disposal

- Capping Contingency



OU 5 Decision (Green Bay)

- Monitored Natural Recovery
- More modeling
- Dredging near river mouth



Green Bay and Fox River contamination levels

Media		Fox River	Green Bay
Sediments (ppm)	Mean[1]	11	0.3
	SWAC[2]	2.6	0.2
Water (ppt)	Mean	37	7
Walleye (ppm)	Mean	1.4	1.6

Sediment goal: 0.25 ppm

[1] All sediments, all depths

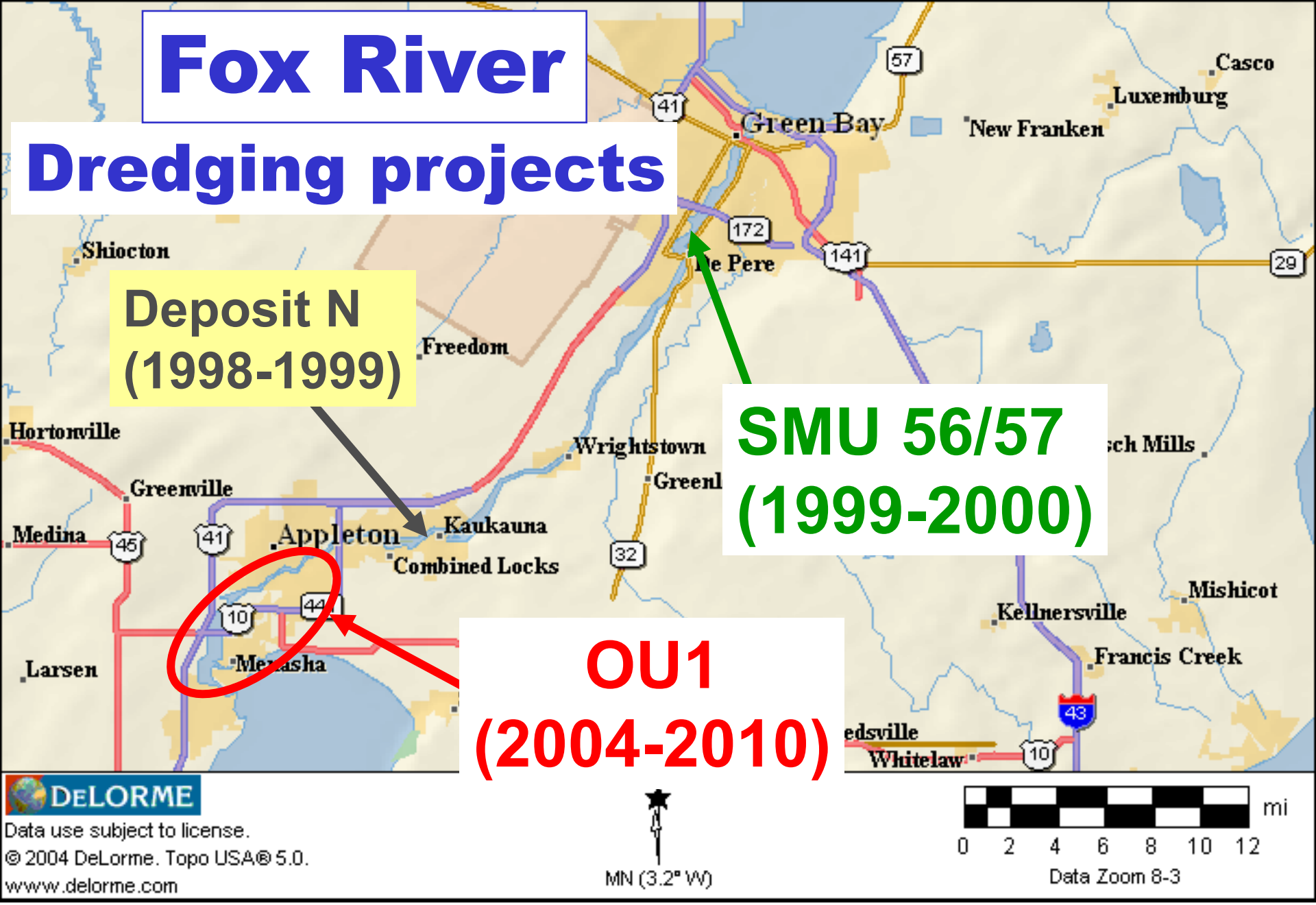
[2] Surface Weighted Average Concentration

Green Bay decision rationale

- **Large volume – disposal “impracticable”**
- **Relatively low concentrations**
- **Removal of highest concentrations near river mouth**

Remedy considerations Summary

- Risk reduction: concentrations and mass
- Results on Fox River and other dredging projects
- Site conditions (e.g. bedrock)


Fox River
Dredging projects
Deposit N
(1998-1999)
SMU 56/57
(1999-2000)
OU1
(2004-2010)
Green Bay
New Franken
Casco
Luxemburg
Shiocton
Freedom
Hortonville
Greenville
Medina
Appleton
Kaukauna
Combined Locks
Wrightstown
Larsen
Kellnersville
Mishicot
Francis Creek
Whitelaw
DeLORME
Data use subject to license.
© 2004 DeLorme. Topo USA® 5.0.
www.delorme.com
MN (3.2° W)
mi
0 2 4 6 8 10 12
Data Zoom 8-3

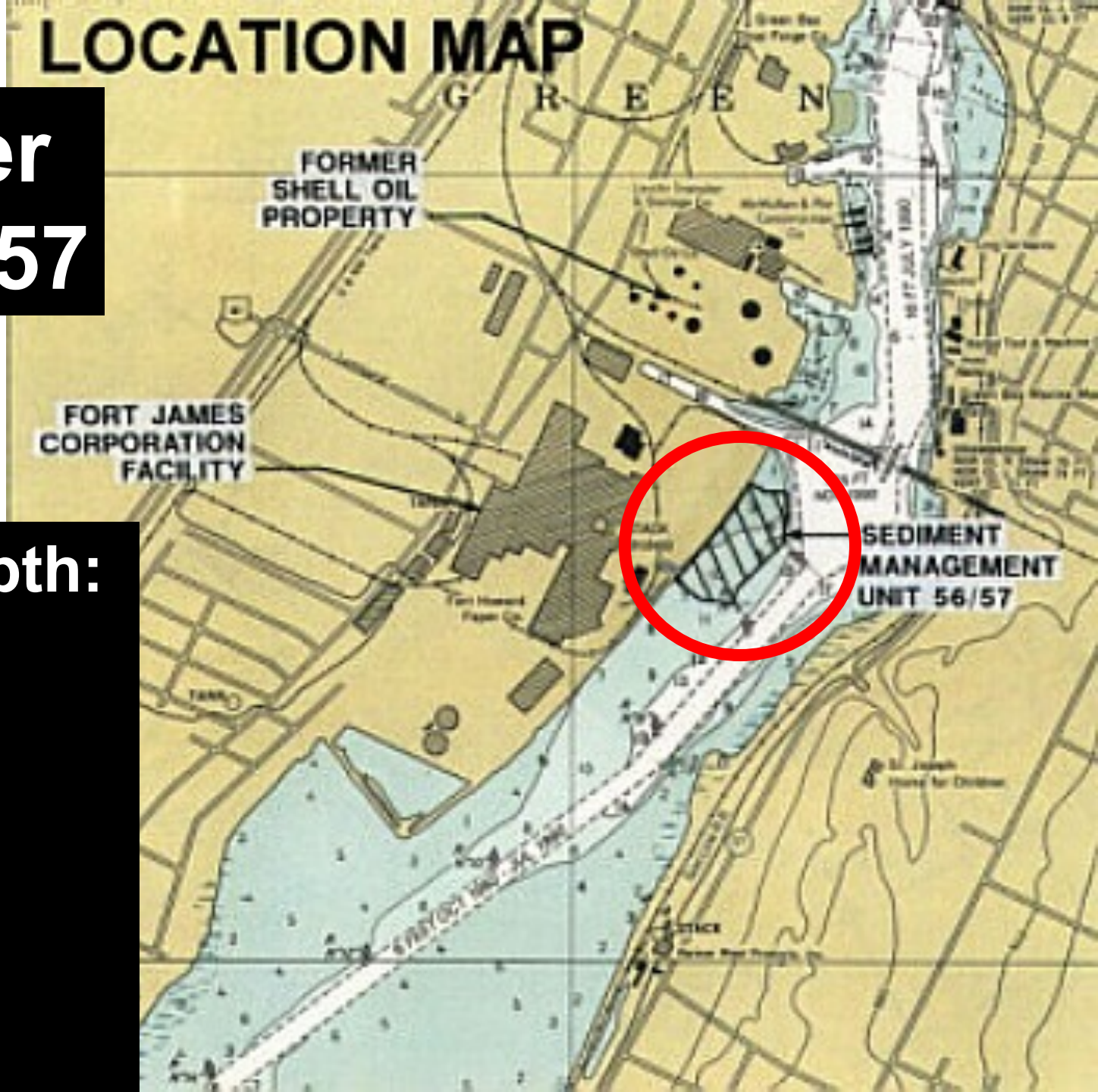
Fox River dredging projects

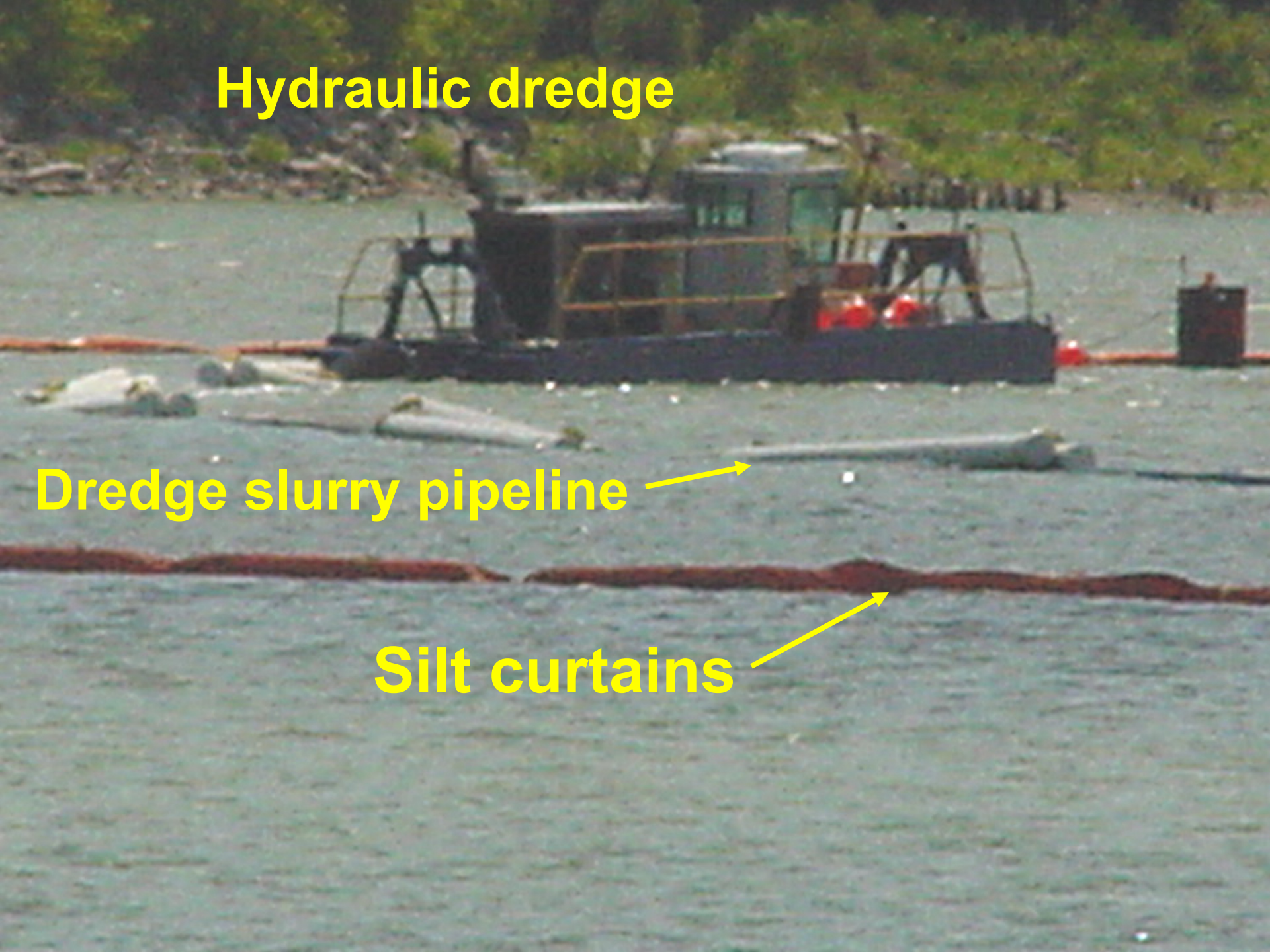
Downstream

	OU 1	Deposit N	SMU 56/57
Years	2004-2010	1998-1999	1999-2000
Volume - CY	800,000	8,000	80,000
Costs	$60 million (estimate)	$4 million	$17 million
Cost/CY	$75	$500	$340

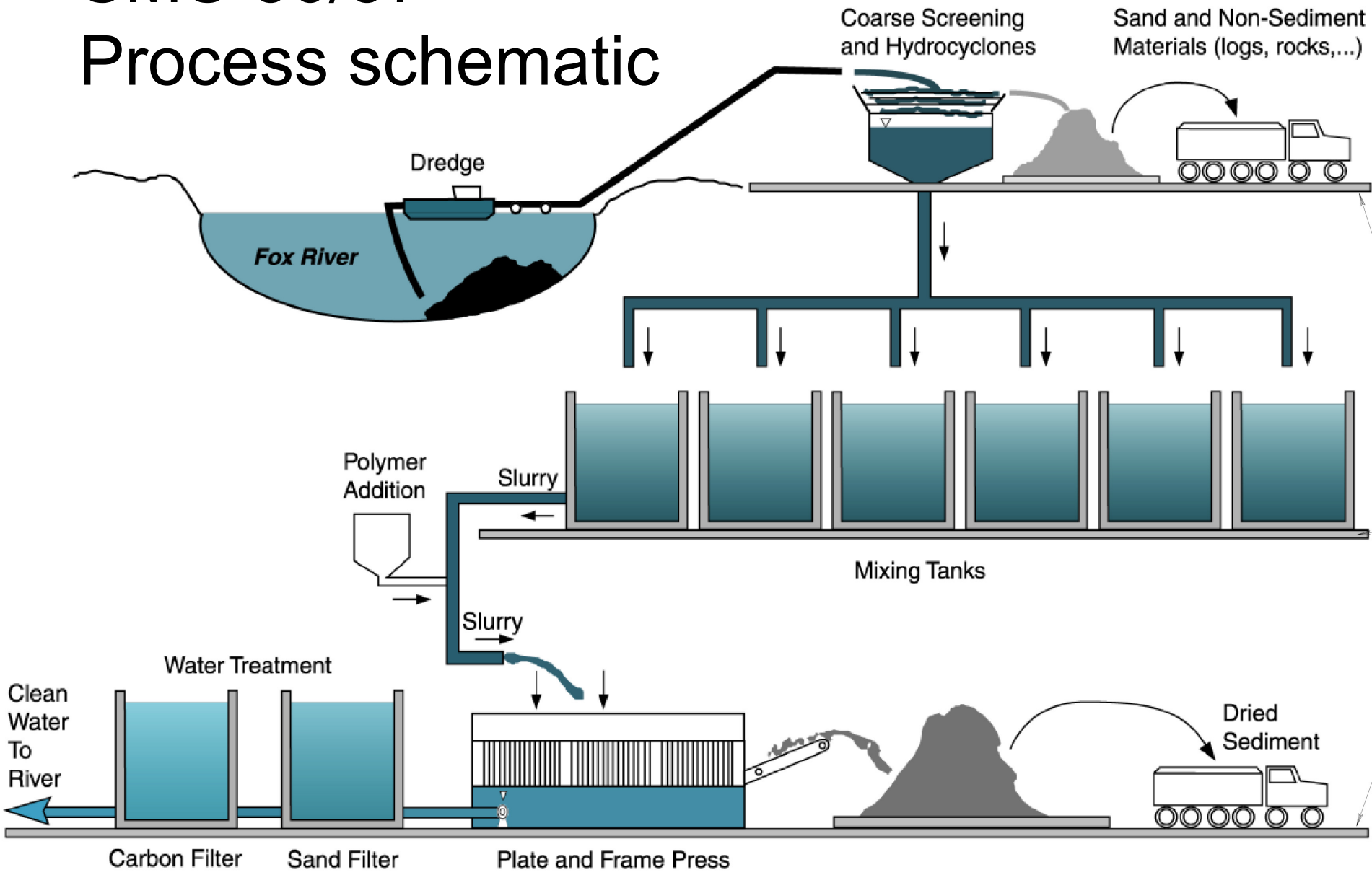
Fox River SMU 56/57

- Water depth: 10 – 20’
- 6.5 acres
- PCBs




Hydraulic dredge
Dredge slurry pipeline
Silt curtains

SMU 56/57
Process schematic



From: Ft. James Corp., 2001 Final Report, 2000 Sediment Management Unit 56/57 Project

SMU 56/57 Dewatering

OBJECTIVES ACHIEVED

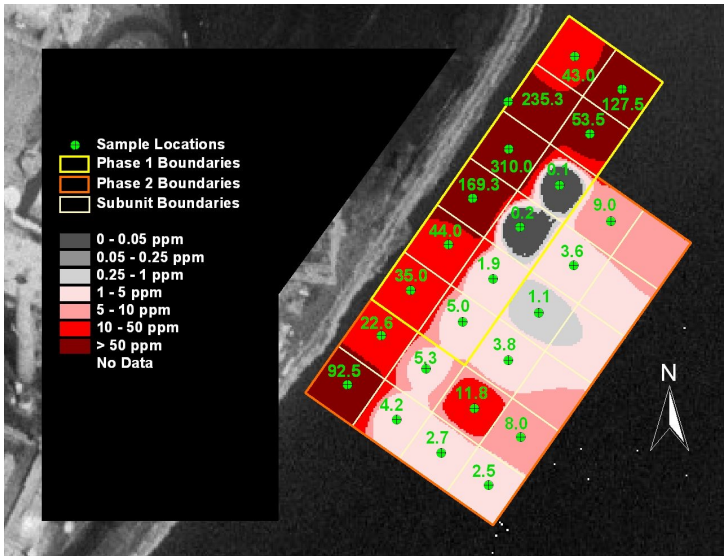
- Met cleanup standards
- 2000: removed 50,000 cubic yards (670 lbs PCBs)*
- Completed on schedule (69 days)

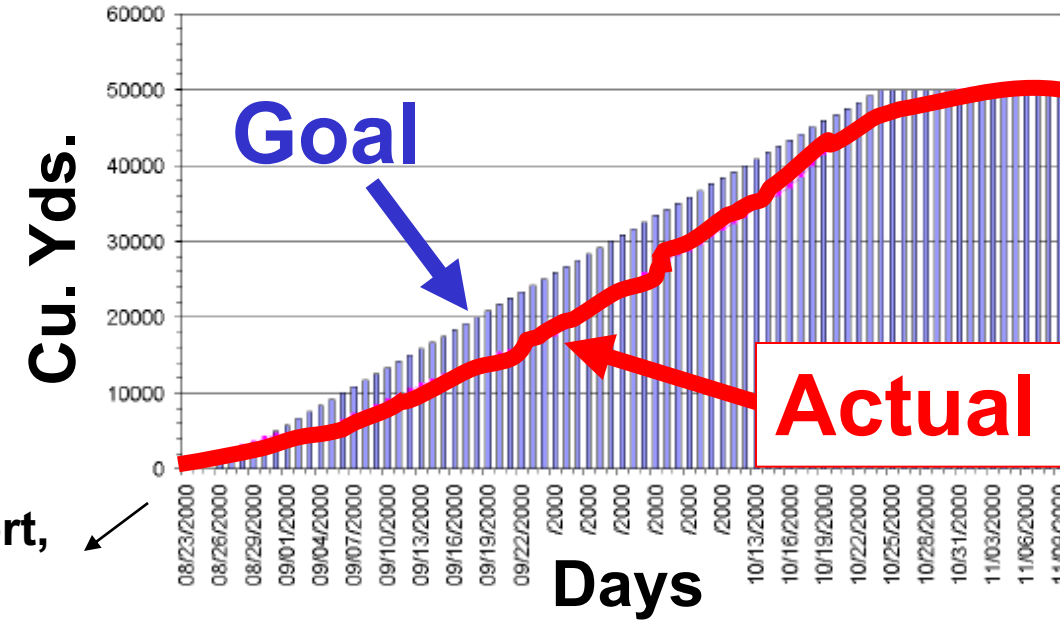
*Total removal for 1999-2000 dredging: 80,000 cubic yards and 2,111 pounds PCBs

Things that worked

1. Clear goals and flexibility in *how* to achieve

2. Production objectives & schedule





From: Ft. James, et al, Final Report, SMU 56/57, January 2001.

Things that worked

3. Daily meeting with company, agencies and contractors
   a. Issue identification
   b. Problem resolution

3. <u>One</u> contractor for most work
   a. Equipment flexibility
   b. Proven dredging experience

Things that worked

5. Over-design treatment capacity relative to dredge

Water treatment

6. Extra dredges

Things that didn't work (1999 dredging)

1. No "meeting of the minds" between agency and companies doing work

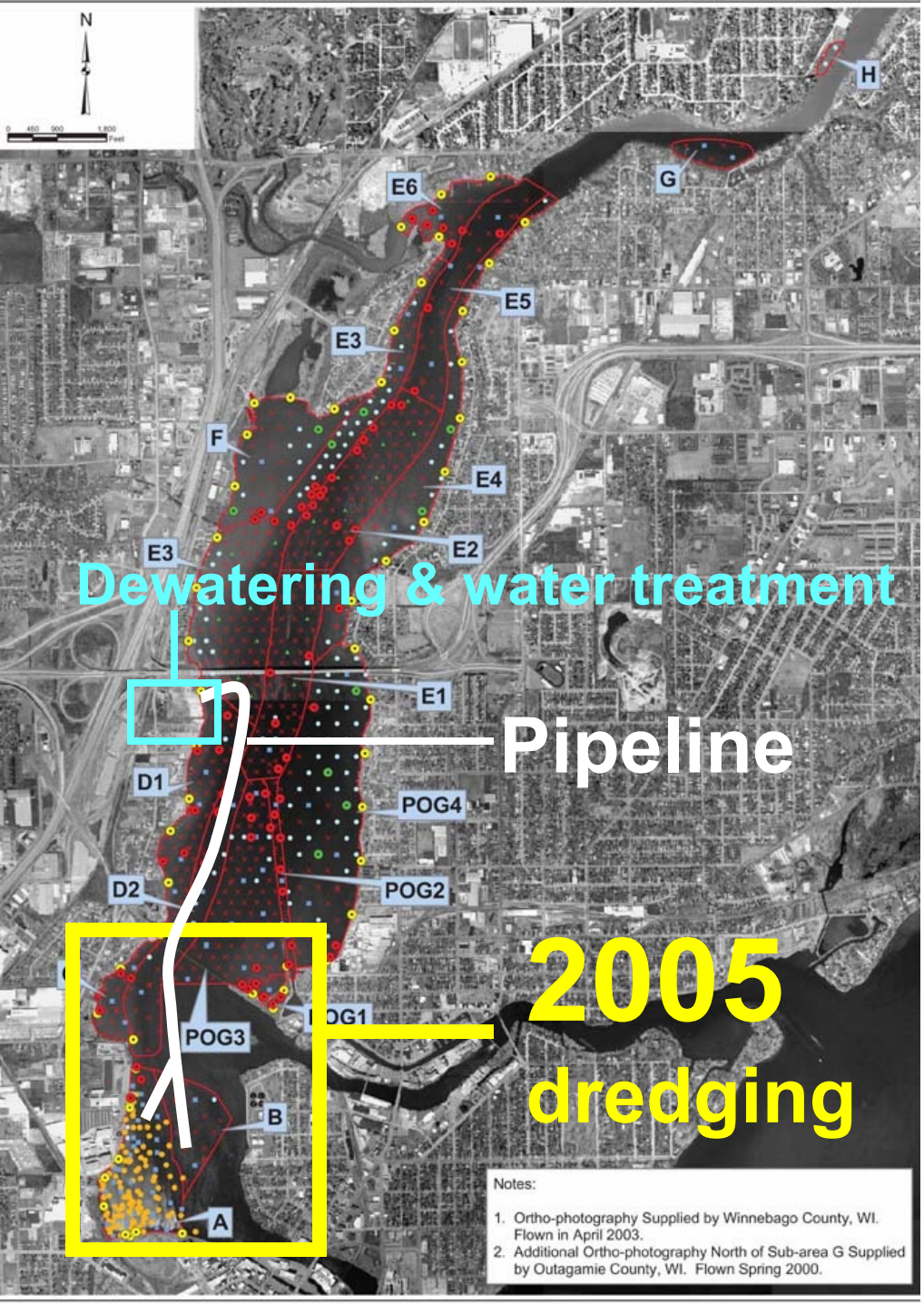
2. Multiple contractors

Fox River

OU 1 dredging

OU 1 dredging

1. Dredge sediments
   (800,000 cubic yards)
2. Dewater sediment
3. Treat dredge water
4. Dispose at landfill



Hydraulic Dredge

- “8-inch”
- Swinging ladder
- Spud barge
-

Photo courtesy of WDNR

2005
2 hydraulic dredges
(no silt curtains)

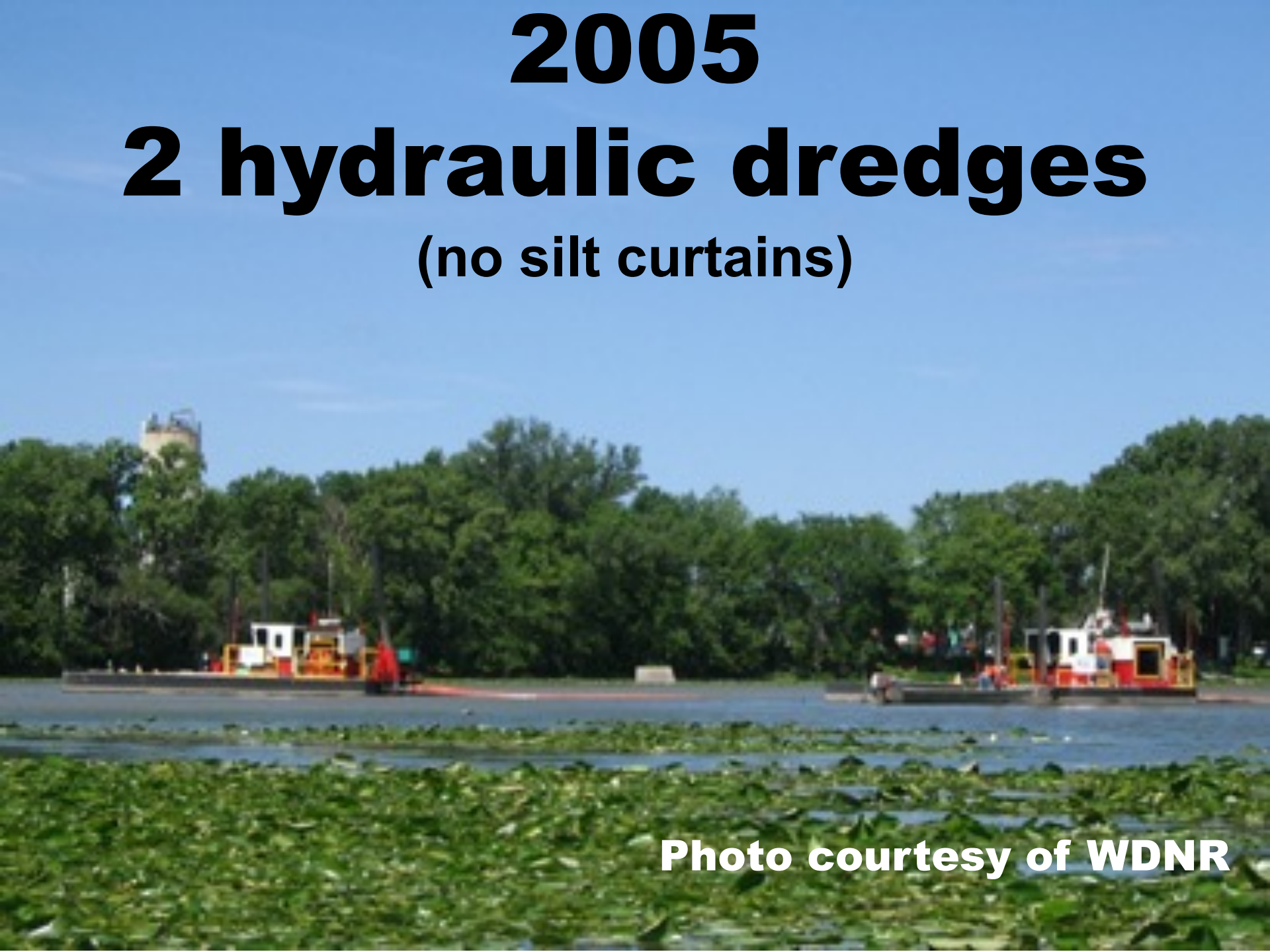
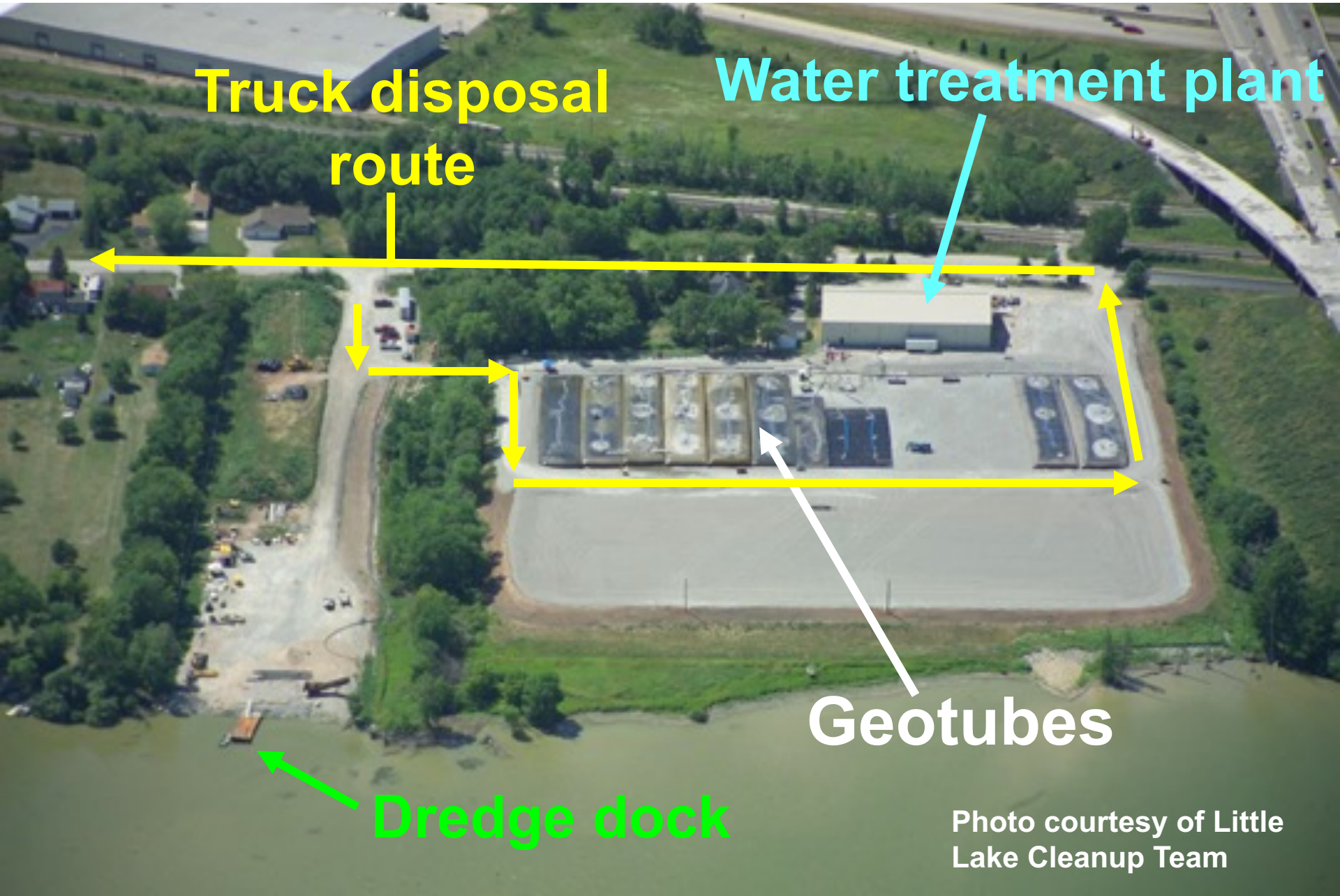


Photo courtesy of WDNR

Cutterhead cleaning

Photo courtesy of Boldt

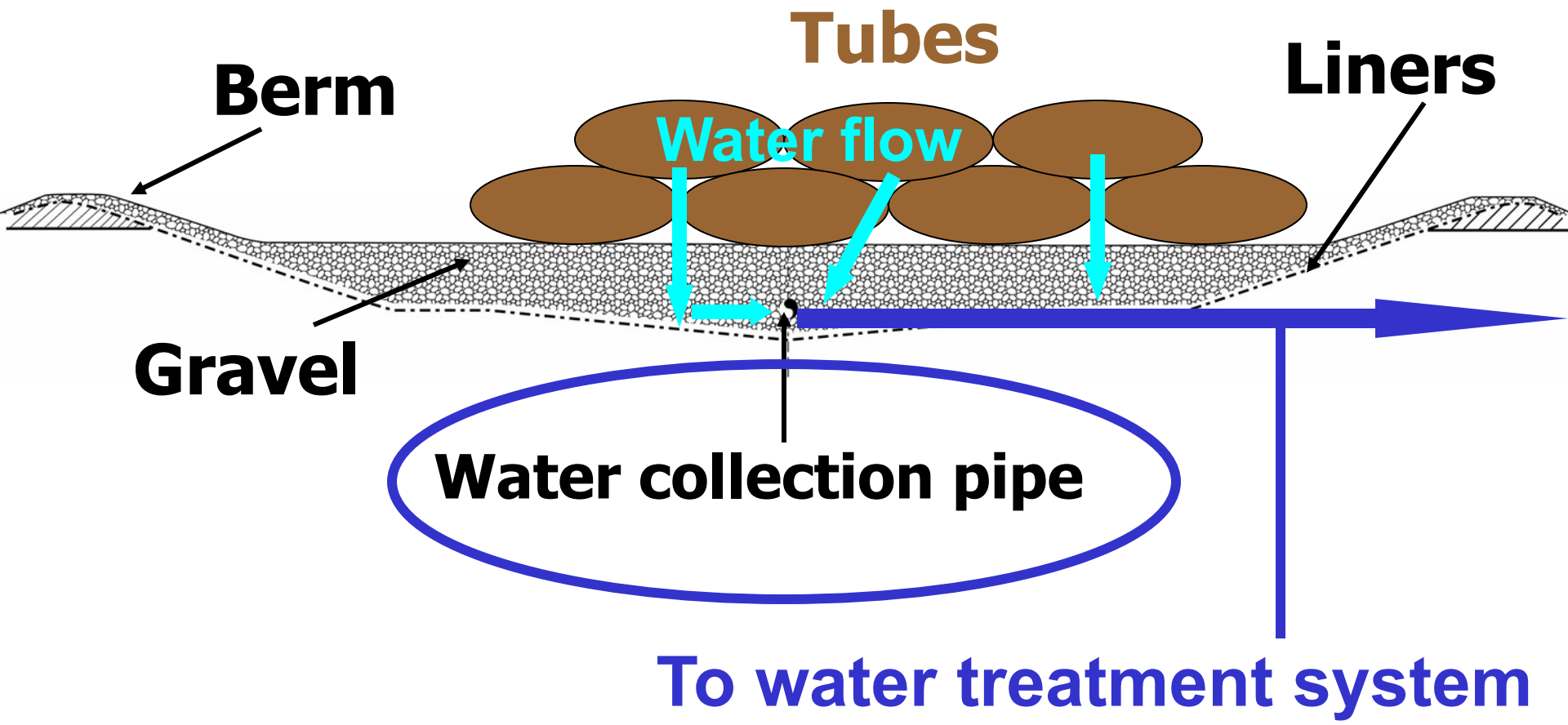
Sediment processing facility - 2005



Geotubes for dewatering dredge slurry

- Gravity drainage – collect and treat water
- Reduces overhead costs
- “Decouples” dredging & dewatering
- Less potential air release

Storage pad for geotextile tubes



From: Little Lake Cleanup Team


Solids captured
& water drains
out

Geotube dewatering assistance

Photo courtesy of Boldt

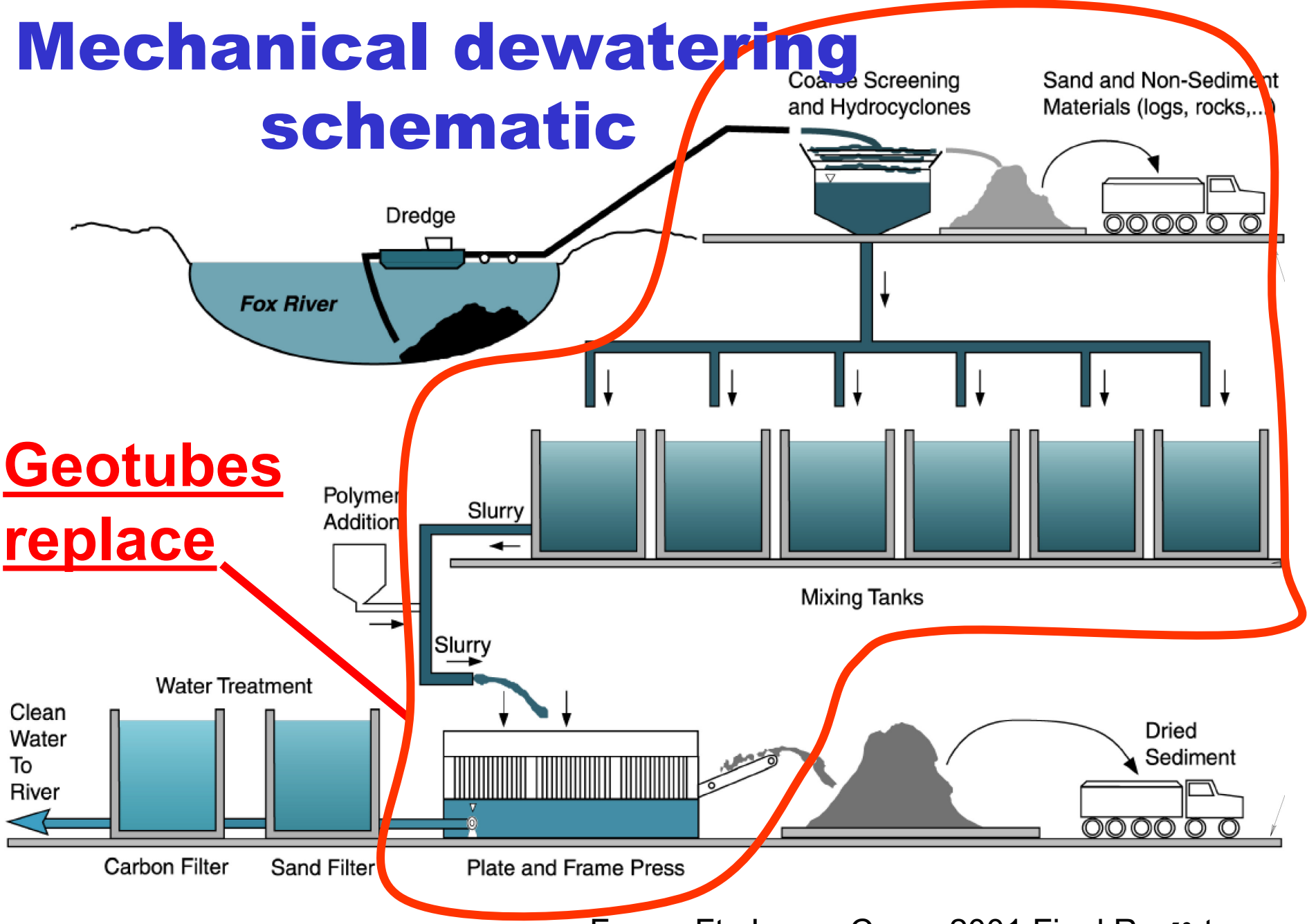
Geotube dewatering assistance

Geotubes: they're big

- 200 feet long
- 80 foot circumference
- Contains 1600 cubic yards

Stacked tubes

Mechanical dewatering schematic



Geotubes replace

From: Ft. James Corp., 2001 Final Report, 2000 Sediment Management Unit 56/57 Project

Geotube problems

1. Breakage
2. “Blinding” of pad
3. Space
4. “Workability” issues – increase disposal costs


Tube break

Possible causes for geotube breaks

- Added ports
- Hole burned by vibration
- Layout and stacking
- Overfilling bag


Pad blinding


Pad blinding

Water treatment

- Carbon filters
- Air flotation
- Sand/gravel filters

From: WDNR webpage

Water treatment plant operating panel

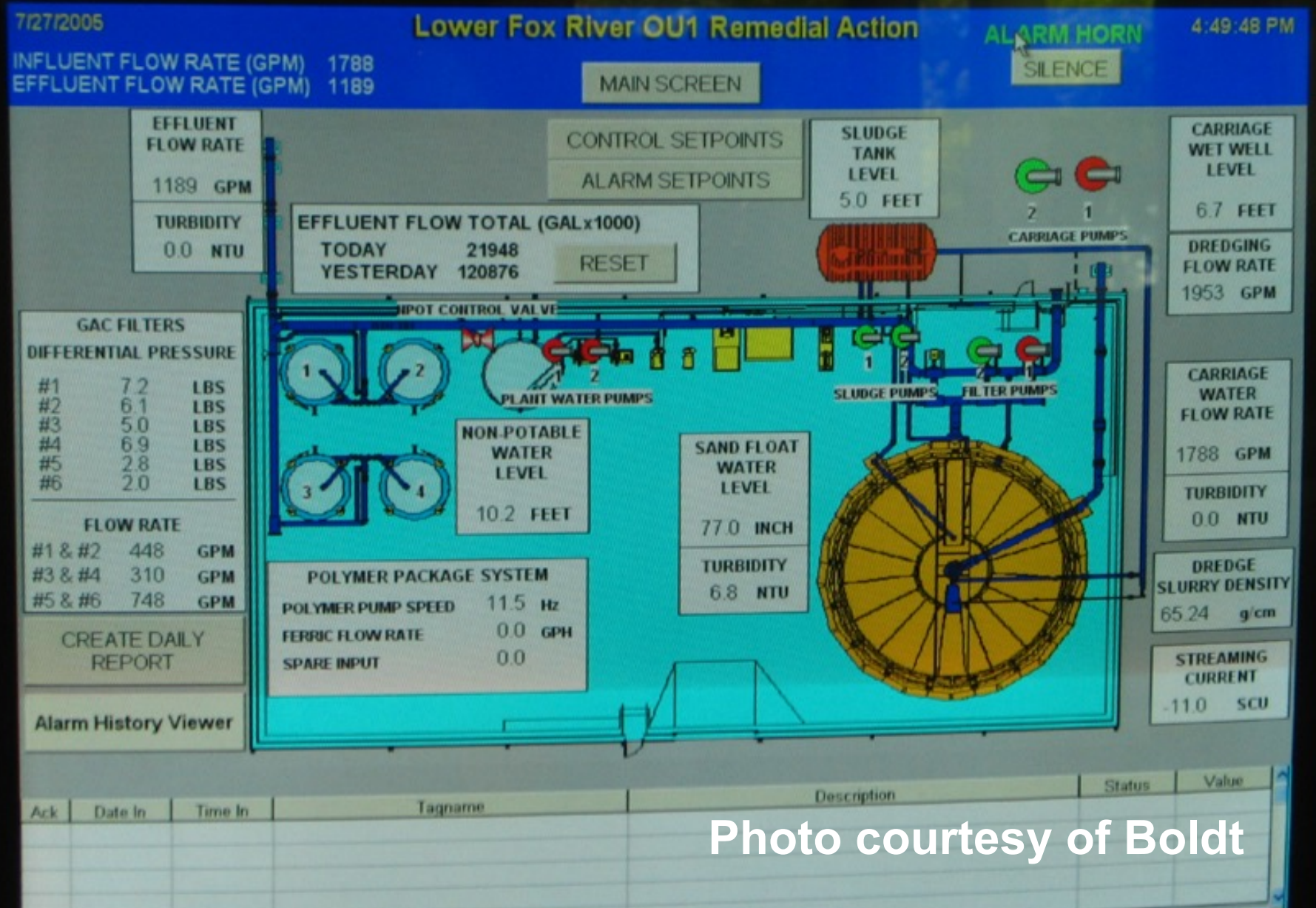


Photo courtesy of Boldt

Loading

Landfill disposal*

From: Little Lake Cleanup Team

* Engineered for contaminant containment

Things that worked

1. Geotubes

2. ***Multiple*** contractors

3. Property purchase

Things that worked

4. Full scale test in 2004

5. Agency flexibility in *how* to achieve cleanup standards

6. Cooperative relationship

Fox River dredging projects

	OU 1	SMU 56/57
Contractors	Multiple	One
Dewatering	Geotubes	Plate and frame presses
Dredges	Two operating	One operating & backup

THE POST-CRESCENT

LOCAL NEWS

Posted Sept. 24, 2004

PCB dredging a smooth operation

Little Lake Butte des Morts cleanup surpasses expectations

By Duke Behnke
Post-Crescent staff writer

TOWN OF MENASHA — Engineers and contractors are all smiles three weeks into the six-year, $62 million cleanup of PCBs from Little Lake Butte des Morts.

A high-tech hydraulic dredge has

Clean up at a glance

Who: The Little Lake Cleanup Team consists of GW Partners and its contractors. Representatives can be reached at 920-912-5065 or by e-mail at littlelakecleanup@execpc.com.

Lessons from contractors:

- Enough data & the "right" data
- Practical cleanup objectives

….gives better bids (i.e. lower cost)

Detailed Evaluation of Alternatives Report

Lower Fox River and Green Bay Wisconsin

Prepared by:

The RETEC Group, Inc.
22 N. Carroll Street, Suite #370
Madison, Wisconsin 53703

RETEC Project Number: WISCI-15933-121

Prepared for:

Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, Wisconsin 53702

and

United States Environmental Protection Agency
Region 5
77 W. Jackson Boulevard
Chicago, Illinois 60604

Senior Authors:

Grant Hainsworth, P.E. Project Engineer
Greg Hartman, P.E., Dalton, Olmsted & Fuglevand, Ltd.
Dr. Michael Palermo, P.E., Corps
Bob Paulson, Senior Environmental Scientist
Frederick M. Swed, Jr. P.E., Senior Engineer
Tim Thompson, Senior Environmental Scientist

Technical Review by:

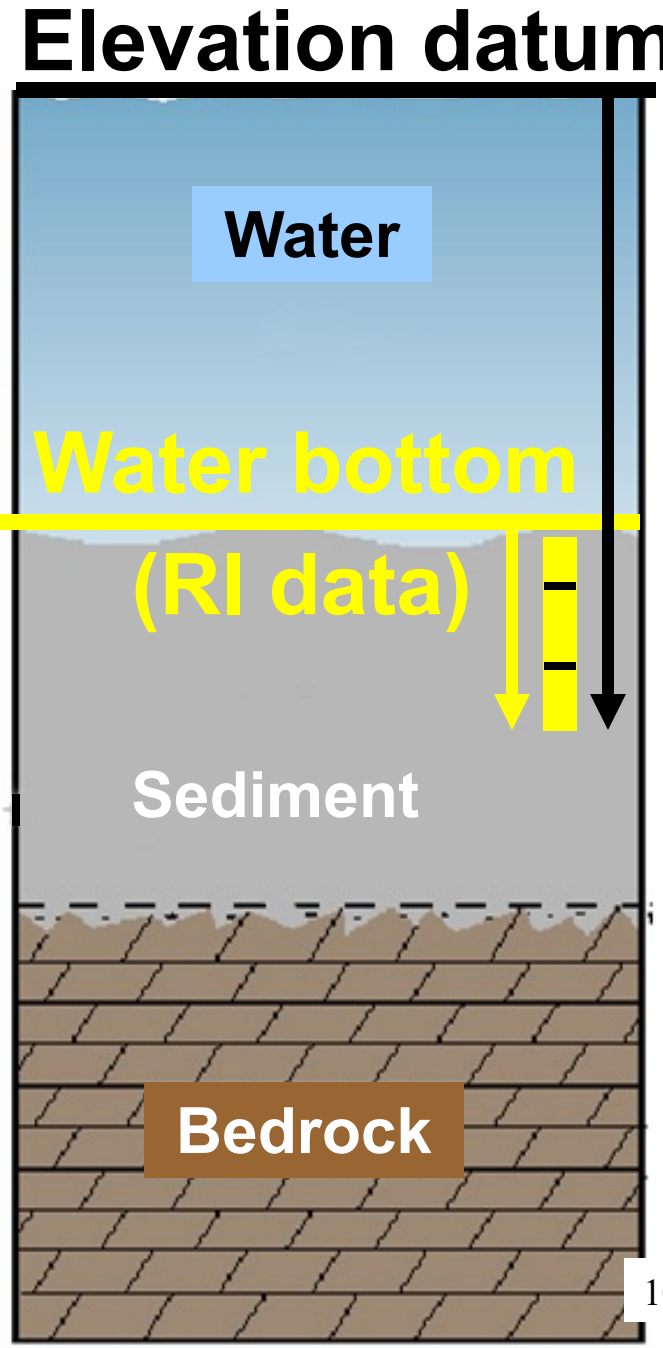
Tom Kreutz, P.E., Senior Engineer

November 2003

F:\PROJECTW\WDNR\15933\Docs\DEA\DEA.doc

Sampling lessons

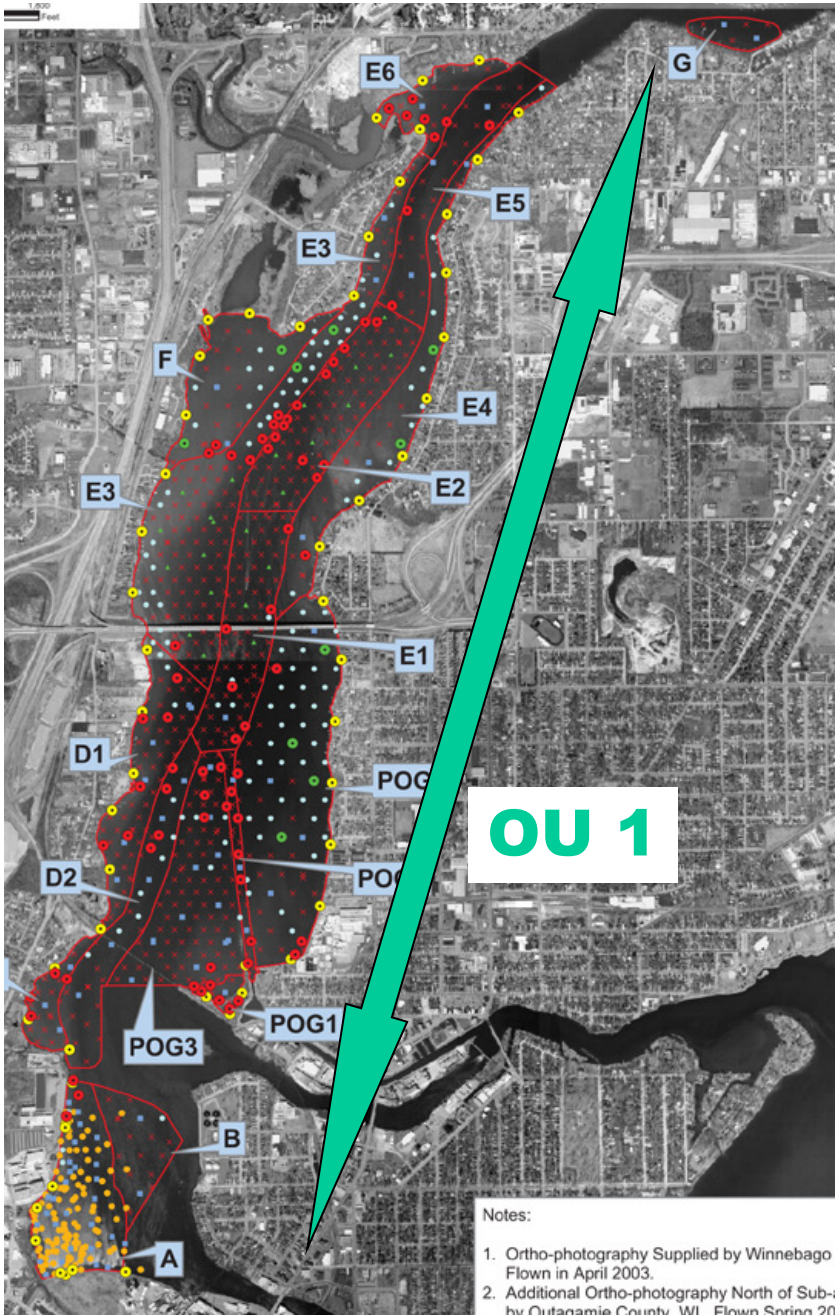
- RI Cores were tied to water bottom (mistake)
- Dredgers need elevation
- Get engineering data early

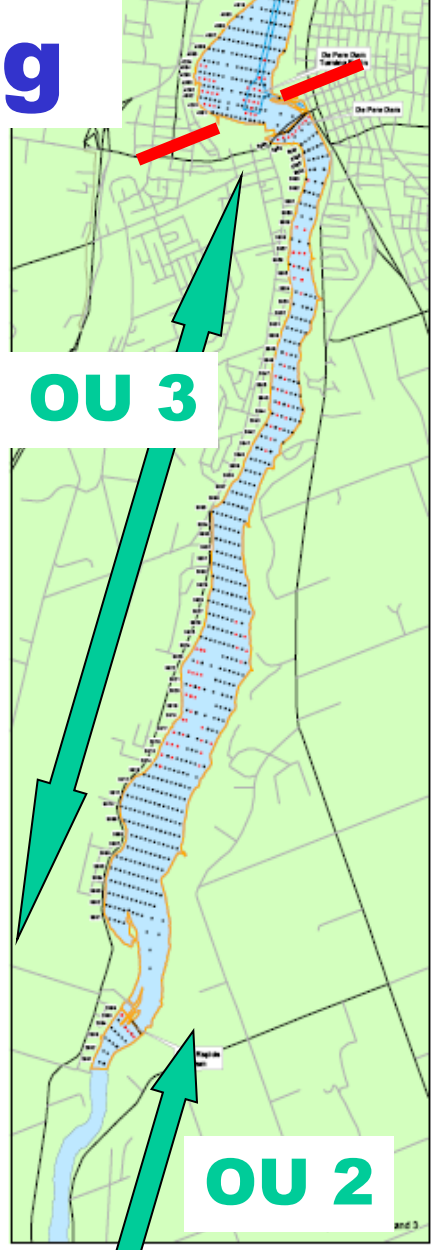


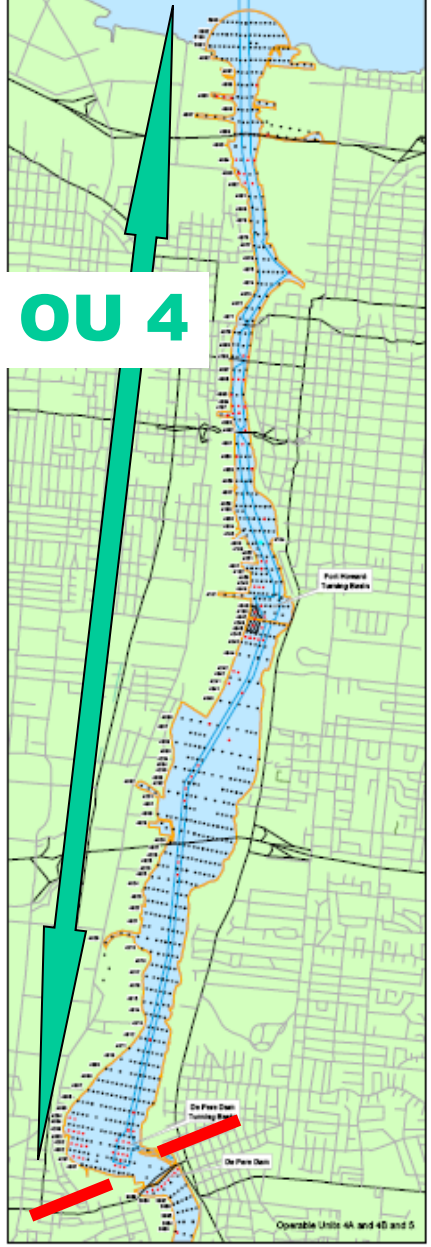
Sampling lessons (continued)

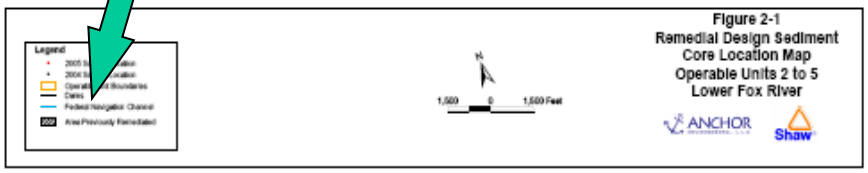
- Get engineering data early
- Money for lots of data is "money well spent" (to reduce dredging footprint)

Pre-design sampling









Pre-design sampling

		OU 1 (upstream)	OU 2- 5 (downstream)
River length (miles)		6	12
Horizontal sample density		1 sample every 1 – 2 acres	1 sample every 1.5 – 6 acres
Vertical interval		every 6 inches	
Number of samples	PCBs	5800	9700
	Geotechnical	550	780


Photo from Ann Schell