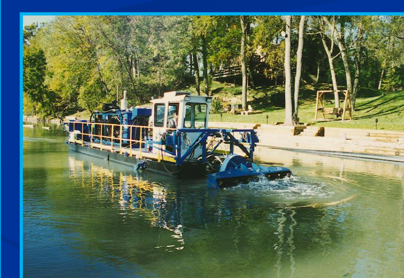
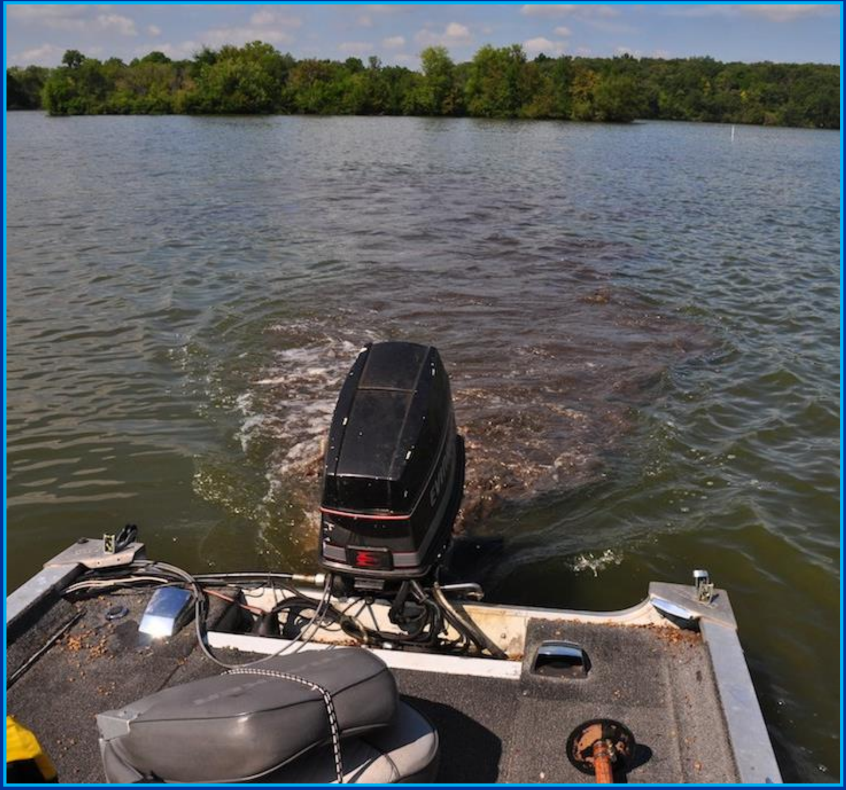
Does My Lake Need Dredging?

by Peter Berrini, PG, CLP





Sometimes it's Easy to Tell!

So Many Questions!

- It’s important to gather the right information to make good planning decisions, such as:

  1) Where are the sediment impaired area(s) of the lake?

  2) How much sediment has accumulated?

  3) What are the physical & chemical characteristics?

  4) How many CY of sediment should be removed?

  5) How do we remove the sediment? (dredging method)

  5) Where can we put the dredged sediment?

  6) About how much will the potential project cost?

  7) If dredging is needed, how can we pay for it?

The Benefits of Lake Dredging

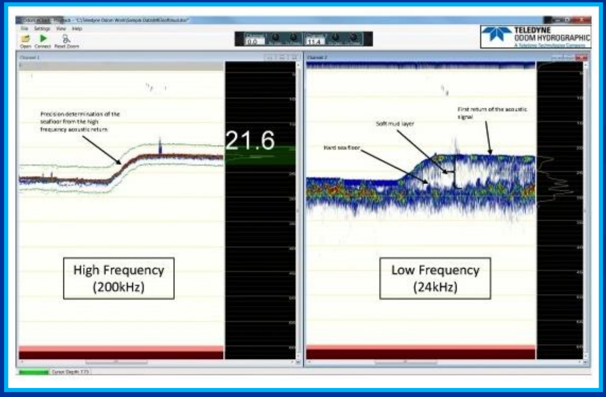
1) Increased water depths and overall storage capacity that has been lost to sediment deposition;
2) Improved and expanded recreational opportunities for safe boating and access;
3) Expanded aquatic habitat and deeper overwintering conditions for fish
4) Improved water quality and clarity, and reduced internal nutrient recycling from re-suspension
5) Water supply reservoirs can increase storage volume to help prevent shortages during drought
6) Increased property values and economic benefits

Preliminary Project Requirements

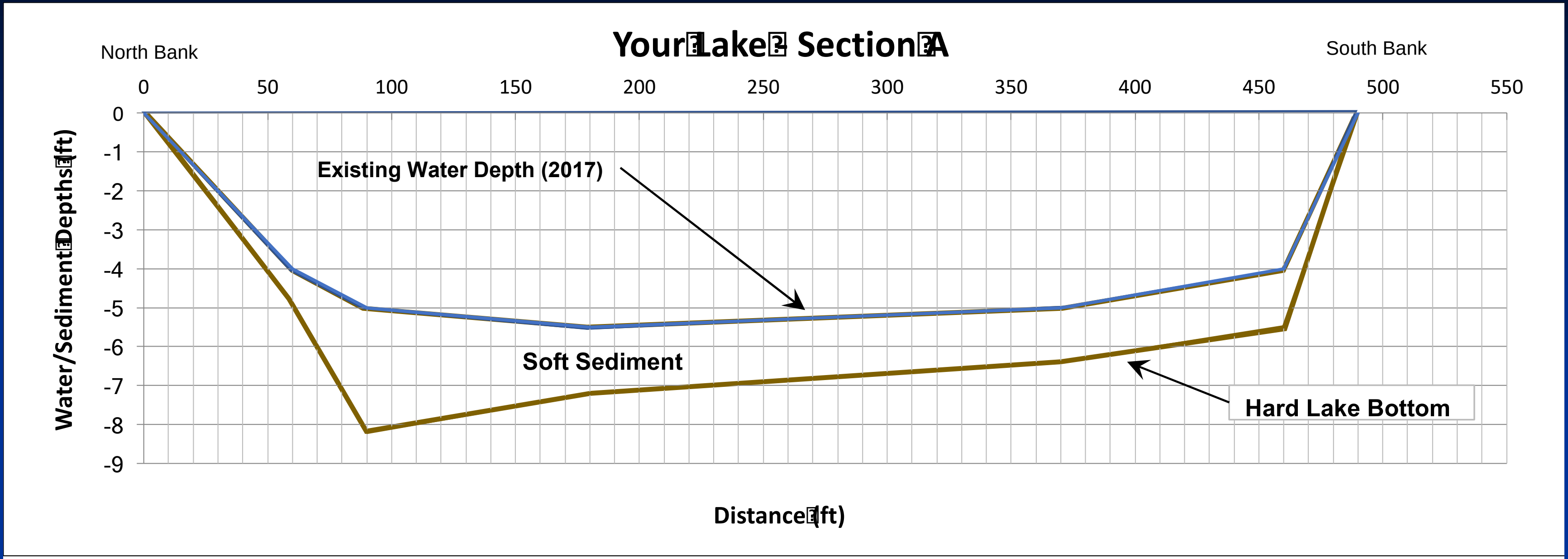
- Complete a Sedimentation Survey that includes water depth and sediment thickness measurements
- Determine optimum dredging limits, target depths and total quantity of sediment to be removed
- Characterize and analyze physical and chemical properties of sediment to be removed
- Determine dredging method(s) - Hydraulic or Mechanical
- Locate site(s) for Sediment Storage and/or Dewatering
- If implemented, obtain Regulatory Permits from Army Corps of Engineers, IDNR, IEPA and Local Agencies

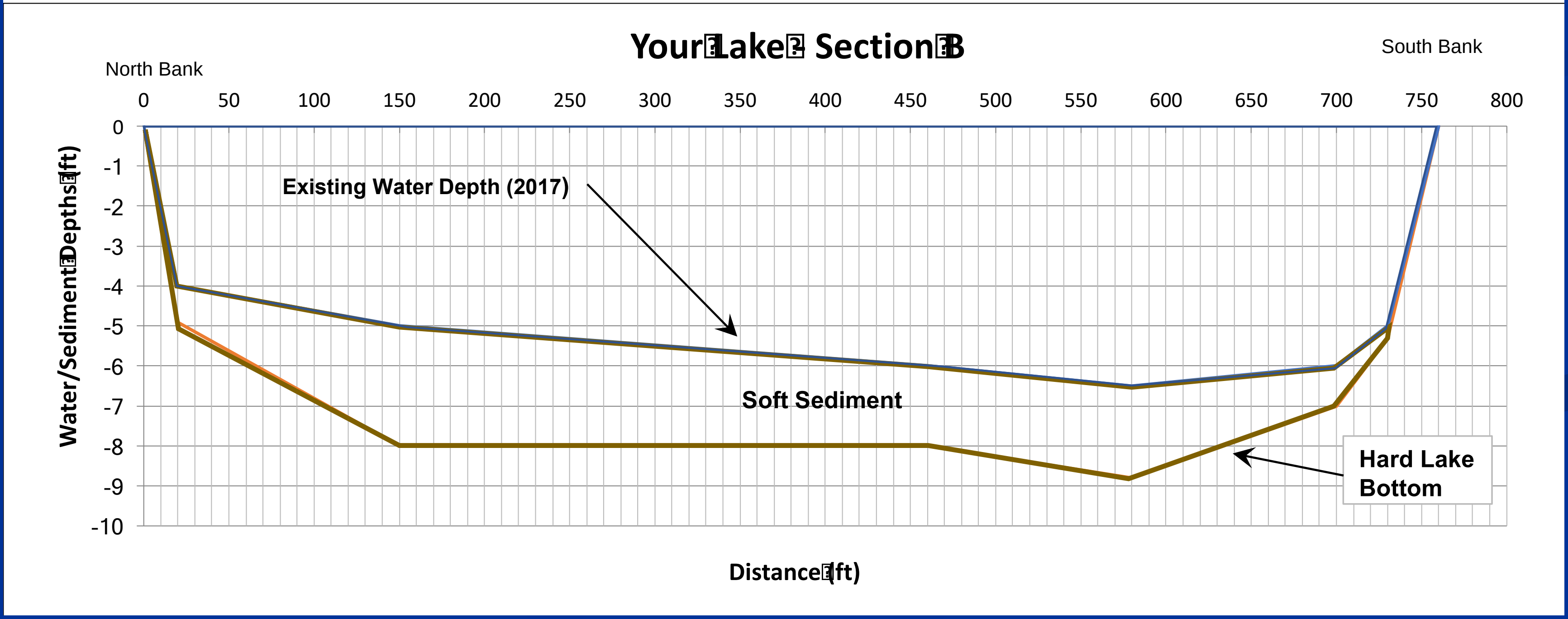
The Sedimentation Survey

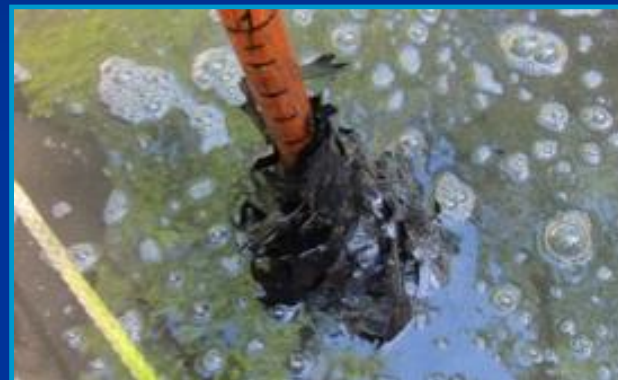
Sediment Measurement Options



Typical Lake Cross Sections

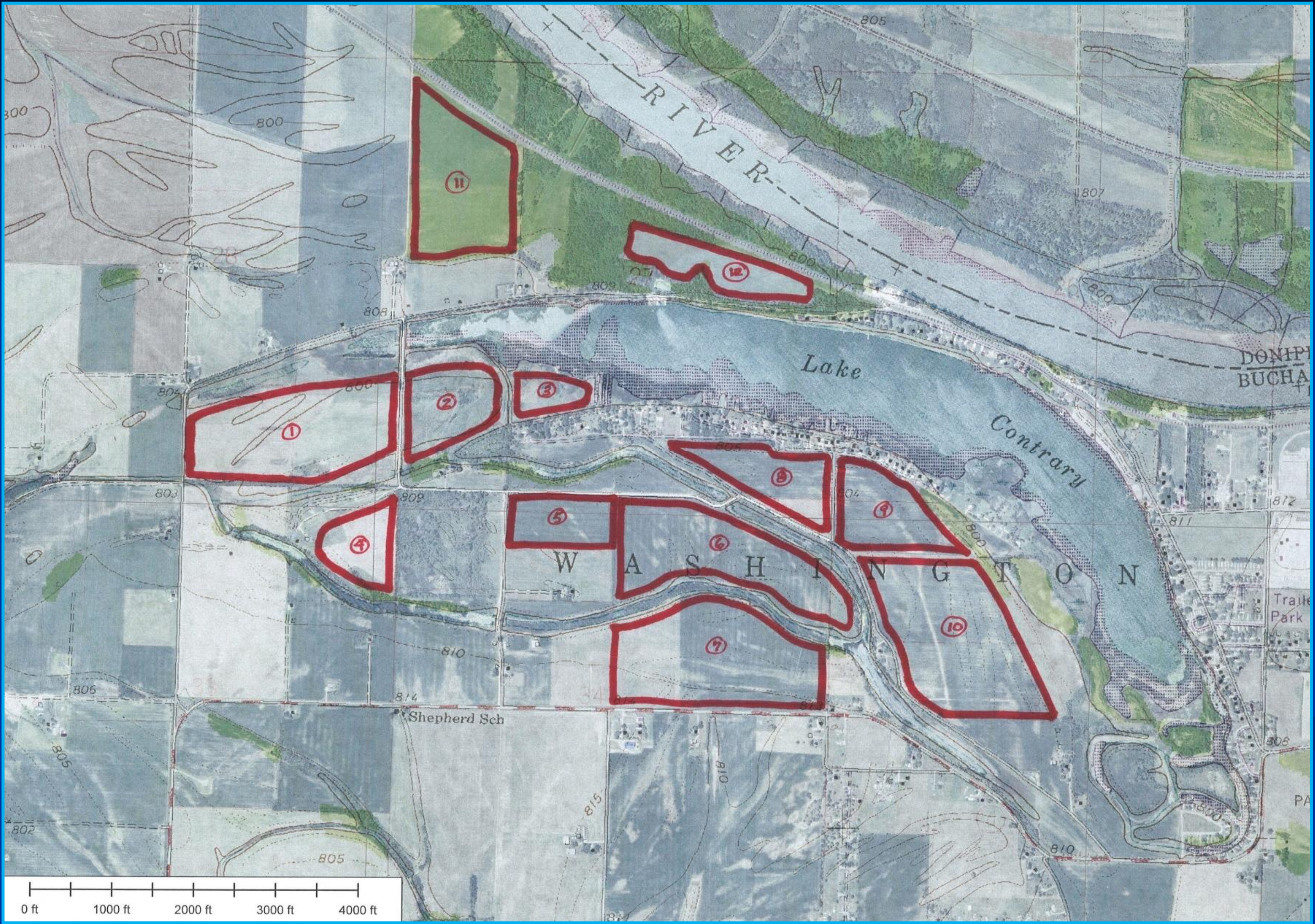






Sediment Samples must be Obtained, Analyzed and Characterized

Identify Potential Sediment Storage and Dewatering Sites



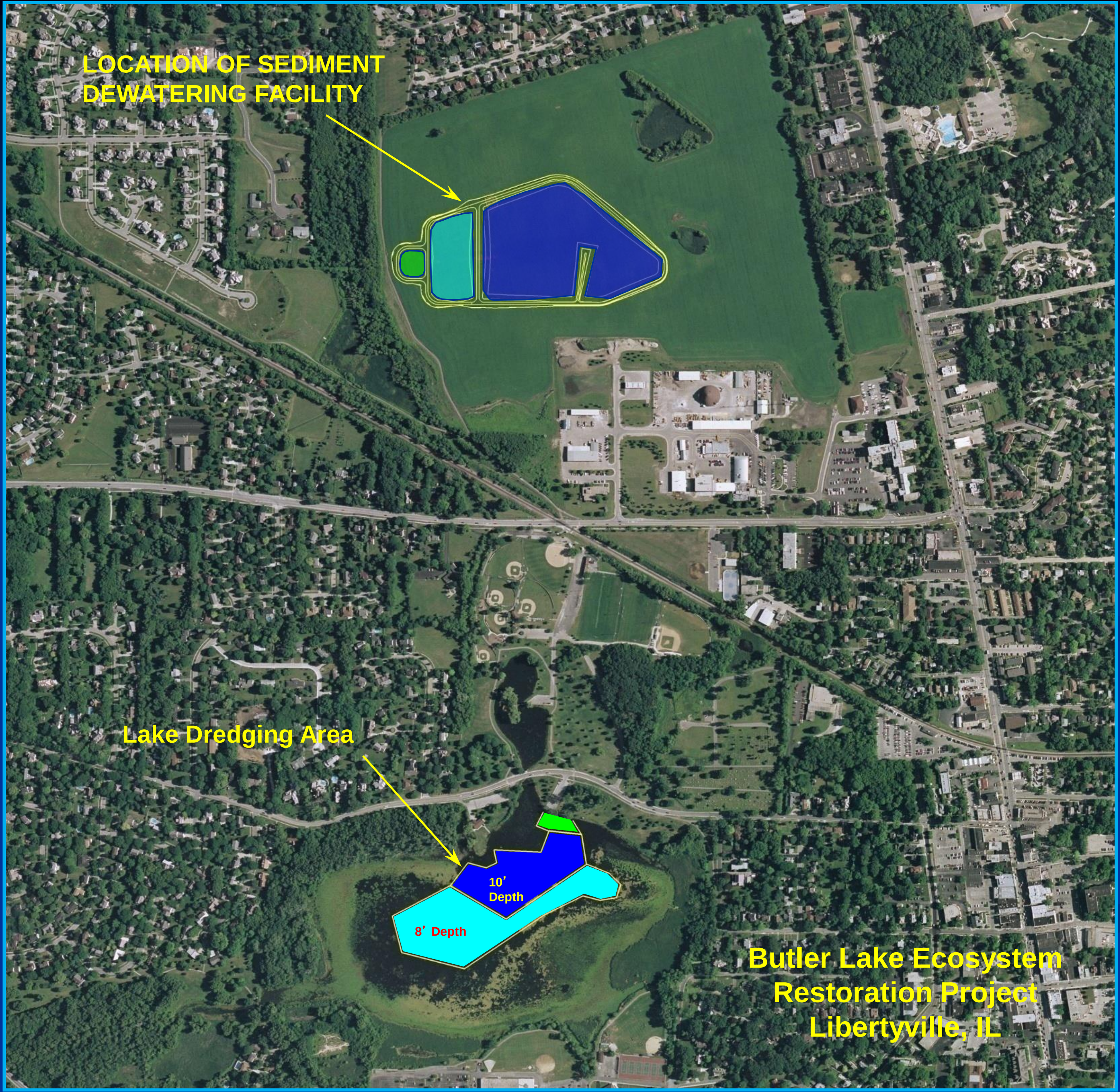
Typical Site Selection Matrix

Site Evaluation Criteria	SW Nelson Rd. West	SW Nelson Rd. East	Christie Lane NW	SW Nelson Rd. SW	CR-201 NE	SW Nelson Rd. South	State Route U North	CR-199 West
Total Site Acreage	48.0	8.0	3.0	16.0	18.0	49.0	66.0	29.0
Usable Acreage (assume 80% of site)	38.4	6.4	2.4	12.8	14.4	39.2	52.8	23.2
Type of Storage Site	Upland Dikes	Geotubes	Geotubes	Upland Dikes	Upland Dikes	Upland Dikes	Upland Dikes	Upland Dikes
Storage Capacity in CY **	495,615	82,602	30,976	165,205	185,856	505,940	681,471	299,434
Total Length of Perimeter Embankment (ft.)								
Estimated Earthwork Quantity (cy)								
Dist. - Lake to Storage Site	800	700	300	2,300	2,400	2,300	3,500	800
Dist. - Lake to Farthest Pt.	11,000	10,000	9,000	9,000	9,000	5,500	5,500	5,500
Min. Dredging Dist. (ft.)	800	700	300	2,300	2,400	2,300	3,500	800
Max. Dredging Dist. (ft.)	11,800	10,700	9,300	11,300	11,400	7,800	9,000	6,300
Avg. Dredging Dist. (ft.)	5,900	5,350	4,650	5,650	5,700	3,900	4,500	3,150
Average Site Elevation	800.0	800.0	800.0	805.0	810.0	810.0	810.0	805.0
Lake Surface Elevation (avg.)	798.0	798.0	798.0	798.0	798.0	798.0	798.0	798.0
Avg. Elev. above Lake	2.0	2.0	2.0	7.0	12.0	12.0	12.0	7.0
Terminal (Pumping) Elev.	12.0	12.0	12.0	17.0	22.0	22.0	22.0	17.0
Booster Pump (s) for dredged sediment	Yes	Yes	Yes	Yes	Yes	No	No	No
Return Water back to Lake	Gravity	Gravity	Gravity	Gravity	Gravity	Gravity	Gravity	Gravity
Adj. Homes/Buildings	Low	Low	Low	Low	Low	Low	Low	Moderate
Land Cost (if applicable)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Road or RR Crossings for Pipeline	1	0	0	1	2	2	2	1
Suitability of Topography	Good	Partial Wetland	Partial Wetland	Good	Good	Good	Good	Good
Suitability of Soils	Good	Good	Good	Good	Good	Good	Good	Good
Impact to Habitat	None	Low	Low	None	None	None	None	None
Aesthetic Impact	Low	Low	Low	Low	Moderate	Moderate	Moderate	Moderate
Amt. of Timber to Clear	None	Low	Low	None	Low	None	None	None

** Assume 10 ft. average sediment height for Upland Dike Sites; storage volume includes 1.2 sediment bulking factor

Types of Storage Sites:

- Floodplain Sites - earthen SDF with pumped effluent back to lake
- Upland Sites - earthen SDF with gravity flow effluent to lake
- In-Lake or Adjacent Wetland Sites - Consists of limited in-lake storage created by filling geotextile tubes


LOCATION OF SEDIMENT
DEWATERING FACILITY
Lake Dredging Area
10' Depth
8' Depth
Butler Lake Ecosystem
Restoration Project
Libertyville, IL

Various site characteristics and obstacles must be considered for the dredge pipeline access, sediment storage and dewatering requirements

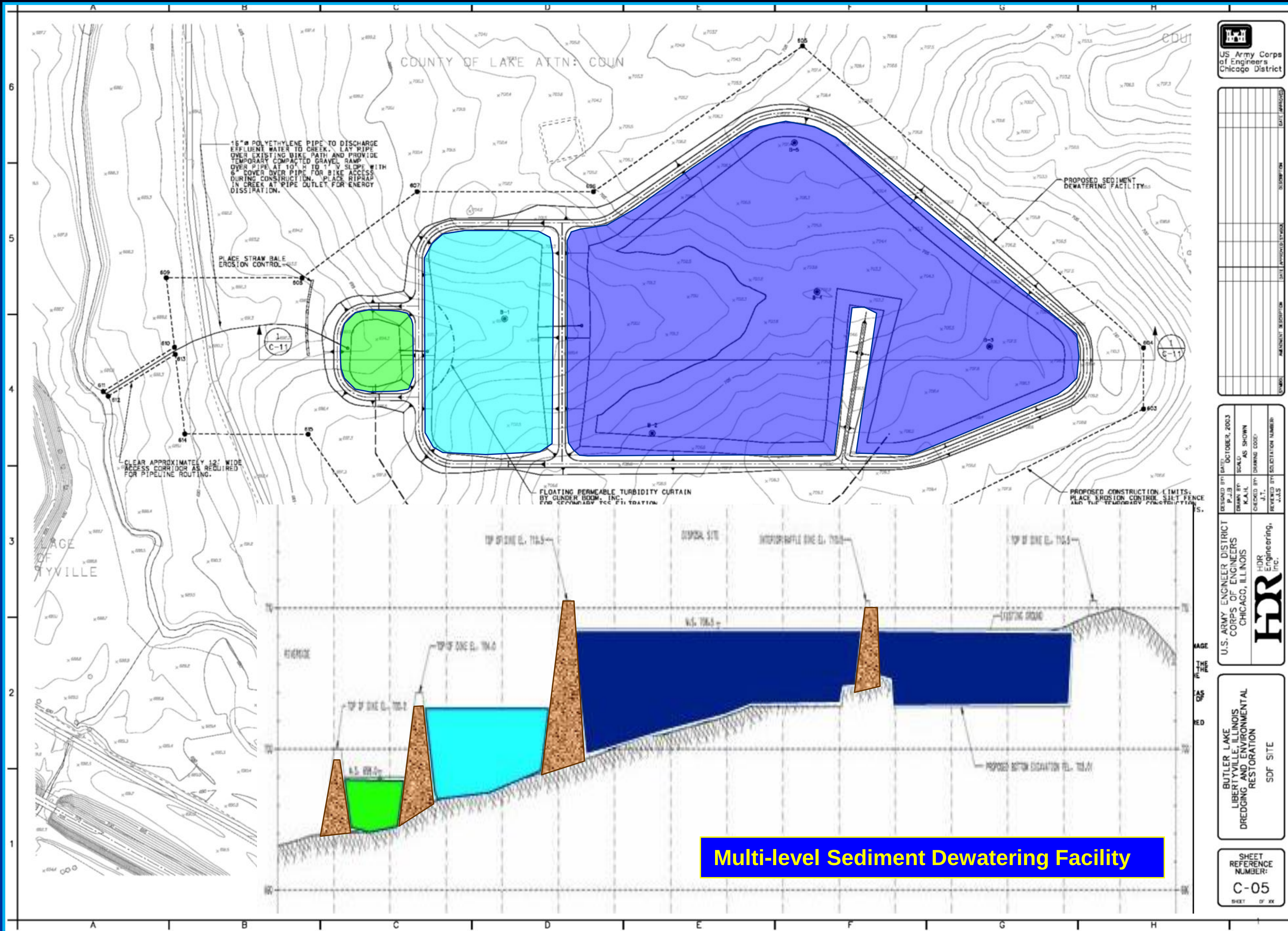
Permitting Requirements

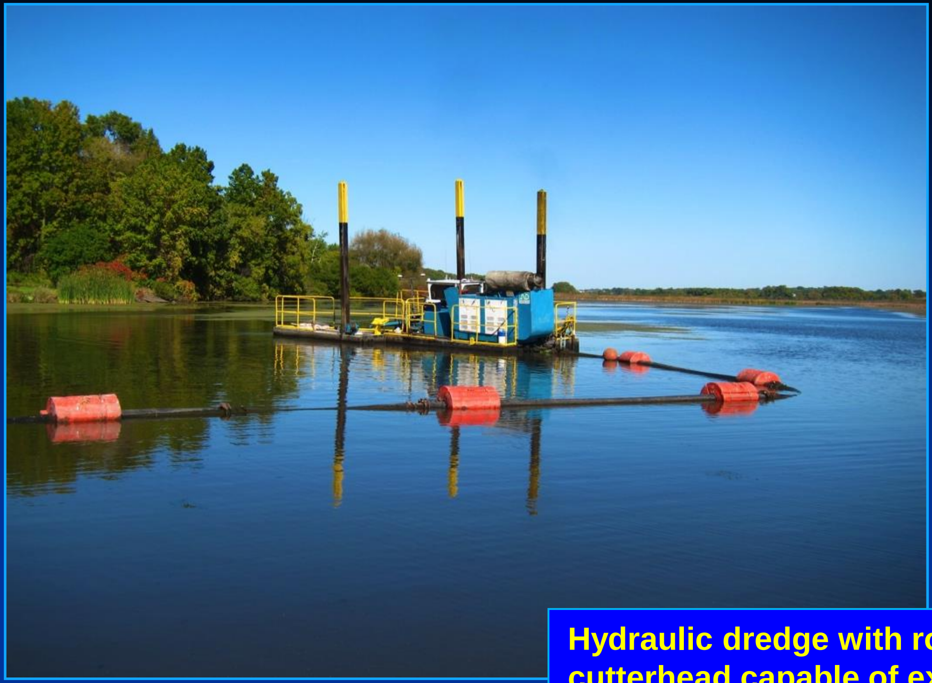
(depends on state, location, size and complexity of project)

- Permit Application to be completed and submitted to Corps, IEPA and IDNR as required
- Section 401 Water Quality Cert. (IEPA)
- Anti-Degradation Assessment (IEPA); Threatened or Endangered Species (IDNR)
- IDNR Dam Permit may be required for storage and dewatering impoundment:
- IEPA/County Storm Water Permit
- Local and County Permits as Required

Dredging & Dewatering Options

- Hydraulic Cutterhead, Swinging Ladder, Horizontal Auger, Low Turbidity, High Solids, Diver Operated
- Mechanical Excavation: Wet and Dry
- Conventional Upland Containment Area Designs based on retention and gravity settling of solids
- Geotextile Tubes (Geotubes) both in-lake and upland
- Treatment Options such as Polymers, Flocculants, etc.
- On-Site Mechanical Dewatering Systems


US Army Corps of Engineers Chicago District
COUNTY OF LAKE ATTN: COUN
16"ø POLYETHYLENE PIPE TO DISCHARGE EFFLUENT WATER TO CREEK. LAY PIPE OVER EXISTING BIKE PATH AND PROVIDE TEMPORARY COMPACTED GRAVEL RAMP OVER PIPE AT 10' H TO 1' V SLOPE WITH 6" COVER OVER PIPE FOR BIKE ACCESS DURING CONSTRUCTION. PLACE RIPRAP IN CREEK AT PIPE OUTLET FOR ENERGY DISSIPATION.
PLACE STRAW BALE EROSION CONTROL
CLEAR APPROXIMATELY 12' WIDE ACCESS CORRIDOR AS REQUIRED FOR PIPELINE ROUTING.
PROPOSED SEDIMENT DEWATERING FACILITY
FLOATING PERMEABLE TURBIDITY CURTAIN BY GUNDER BOOM, INC.
PROPOSED CONSTRUCTION LIMITS. PLACE EROSION CONTROL SILT FENCE
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS CHICAGO, ILLINOIS
HDR Engineering, Inc.
OCTOBER, 2003
AS SHOWN
BUTLER LAKE LIBERTYVILLE, ILLINOIS DREDGING AND ENVIRONMENTAL RESTORATION
SDF SITE
SHEET REFERENCE NUMBER:
C-05
Multi-level Sediment Dewatering Facility



Hydraulic dredge with rotating basket type cutterhead capable of excavating large volumes of sediment and transporting a slurry via pipeline.

Hydraulic dredge equipment with both horizontal auger type cutterhead for soft sediment and swinging ladder with basket type cutterhead for maneuverability and versatility.

Hydraulic dredge equipment with conventional upland sediment storage and dewatering facilities.


Hydraulic dredge mobilization and pipeline assembly.




Hydraulic dredge slurry discharge from pipeline and water control structures at dewatering facilities.

Clarified effluent return water being discharged from sediment dewatering facilities must be compliant with State permit requirements.

Fine grained sediment that does not settle within a 24 hour period may require a polymer or flocculent to achieve necessary return water clarity.

Geotextile tubes can provide an effective sediment dewatering option depending on specific project conditions

Mobile Mechanical Dewatering Systems can provide an effective dewatering option for small spaces

From Wet Lake Sediment to Recovered Soil

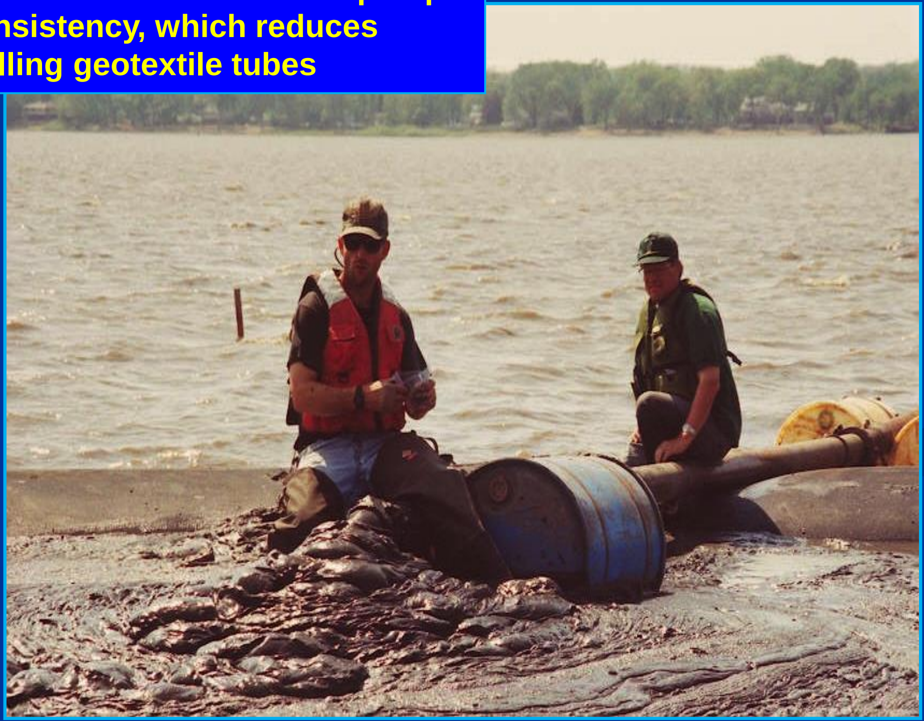
Coarse Material Separator and Hydrocyclone

Clarifier, Polymers and Clear Return Water

Loading Trucks for Transport to Placement Site

Recovered Soil for Future Beneficial Use

A high solids “Dry Dredge” can excavate material and pump a thickened slurry of “lava” consistency, which reduces dewatering and is efficient at filling geotextile tubes



Wet Mechanical Dredging with Barge Mounted Excavators

Dry Mechanical Dredging with Long Reach Excavators

Options for the Beneficial Use of dredged lake sediment may include processed topsoil, landscape and park enhancement, wildlife feed plots and constructed wetlands, selective fill and contouring, clean construction fill, recreational hills for sledding, park aesthetics, etc. Screening, processing and blending increases the value of the recovered fine-grained soil

A restored lake can provide increased water storage capacity, enhanced recreational opportunities, improved water quality and expanded habitat.

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Peter is a Geologist and Certified Lake Professional with significant project experience in all aspects of lake and reservoir restoration and has specialized in planning and implementing lake dredging projects throughout the United States for more than 30 years. He has planned, designed, permitted and completed more than 50 dredging and dewatering projects ranging in size from 300 cubic yards to 3,000,000 cubic yards.