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# Navigating Regulatory Hurdles to Improve Water Quality

Advancing the Use of Innovative Sediment Treatment Technologies

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Wood Environment & Infrastructure Solutions

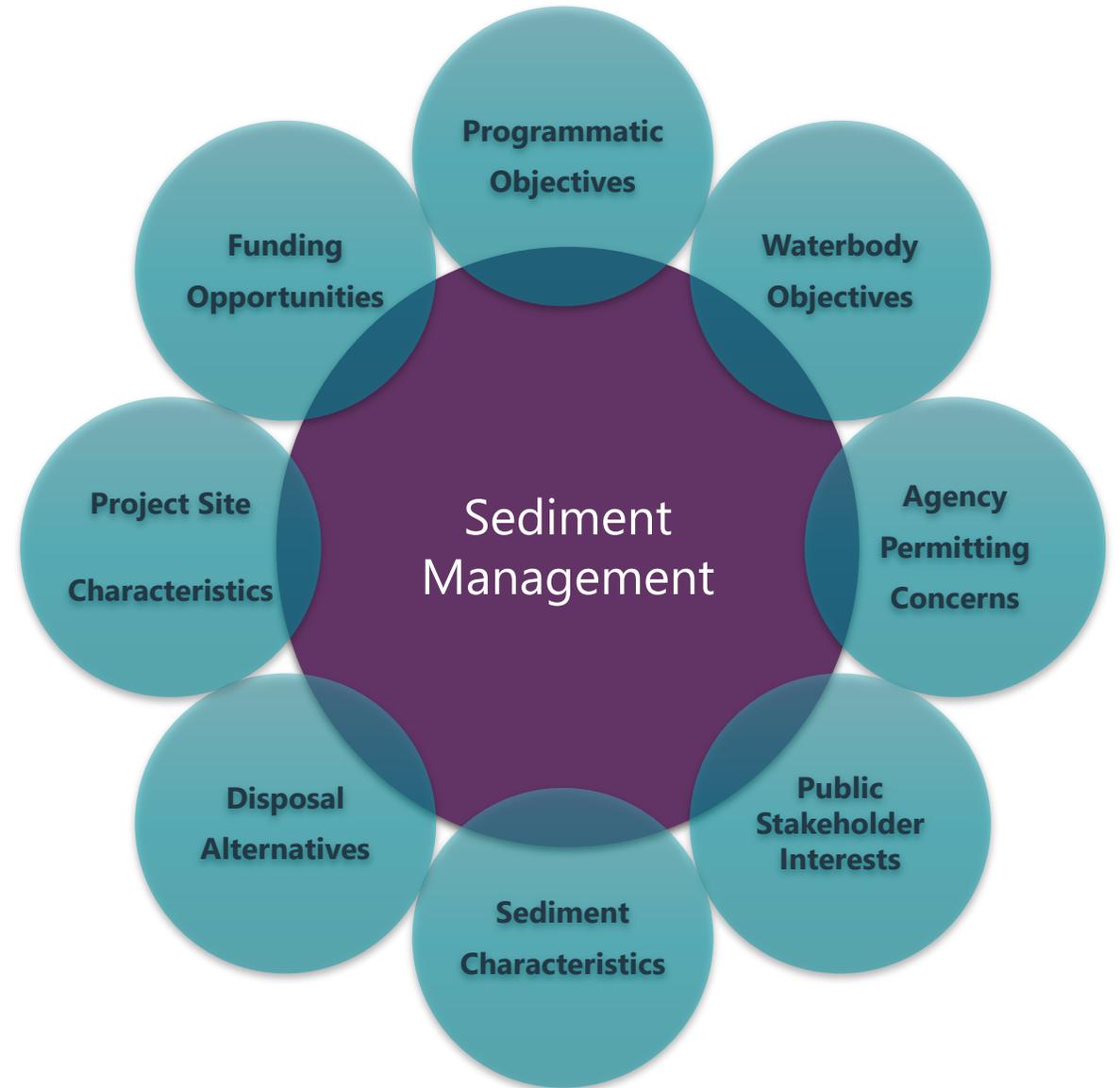
Laurie Smith, CPM, CFM  
City of Lakeland – Lakes & Stormwater

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# Outline

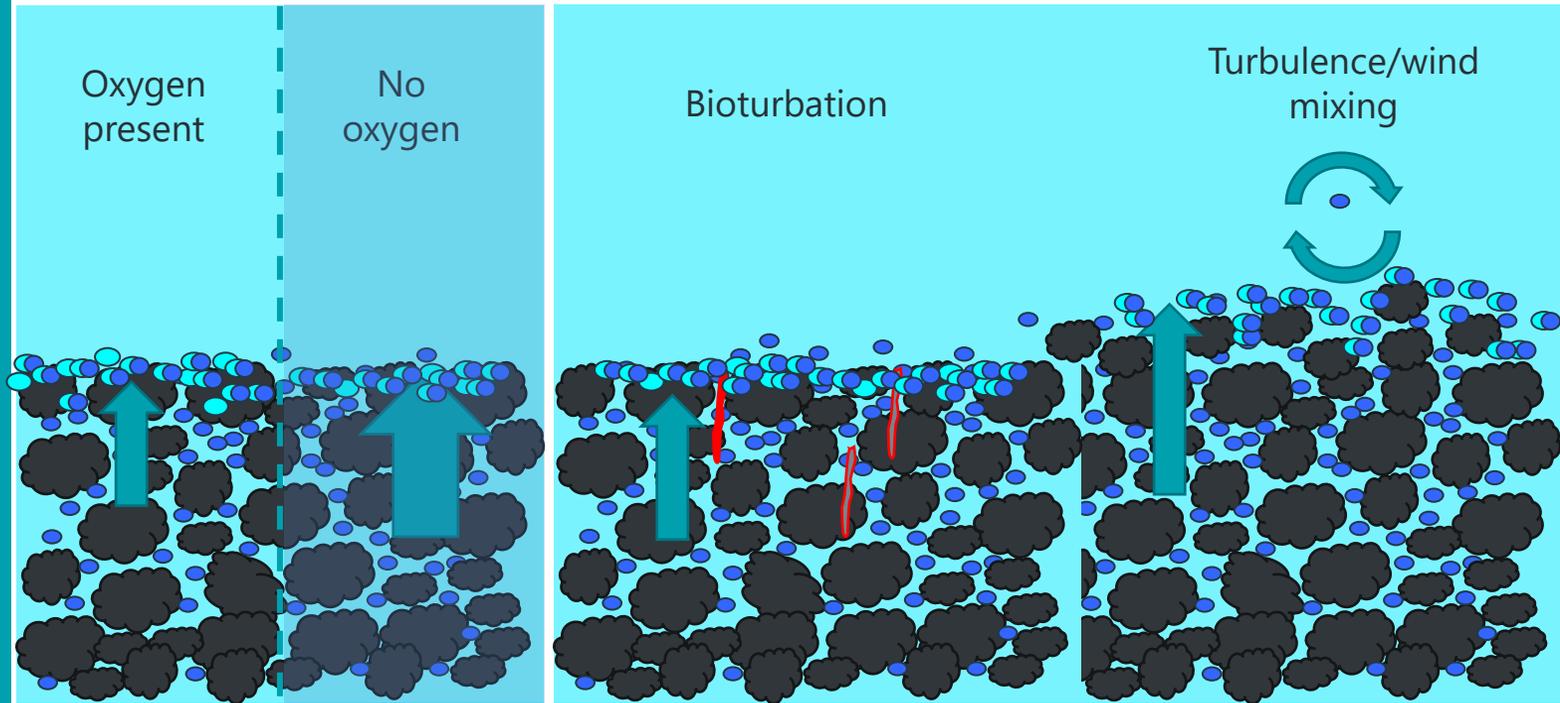
- Overview of Sediment Management Approach and Benefits
- Case Study
- Sediment Management Permitting
- Summary



# Sediment Management Approach and Benefits

# How does sediment quality impact water quality?

- + Stabilize sediments for aquatic vegetation establishment and growth
- + Reduce algal blooms
- Resuspension
- Diffusion
  - Release nutrients and other pollutants to water column
  - Source or sink for pollutants – internal cycling



# Approaches to Sediment Management

## No Action

- Natural Attenuation

## Cap/Inactivate

- Sand
- Biological
- **Chemical Inactivation**
  - **Alum**
  - **Phoslock**
  - **Flock & Lock**
  - **Virophos**
  - **Nclear TPX**

## Dredge/Dewater

- Mechanical
- Hydraulic

DMMAAs

Geotextile tubes

Subaqueous

Wastewater plant

Islands

Relocation

Is Permitting  
Feasible?



A presentation by Wood.

## How and When to Pursue a Sediment-Focused Waterbody Management Project

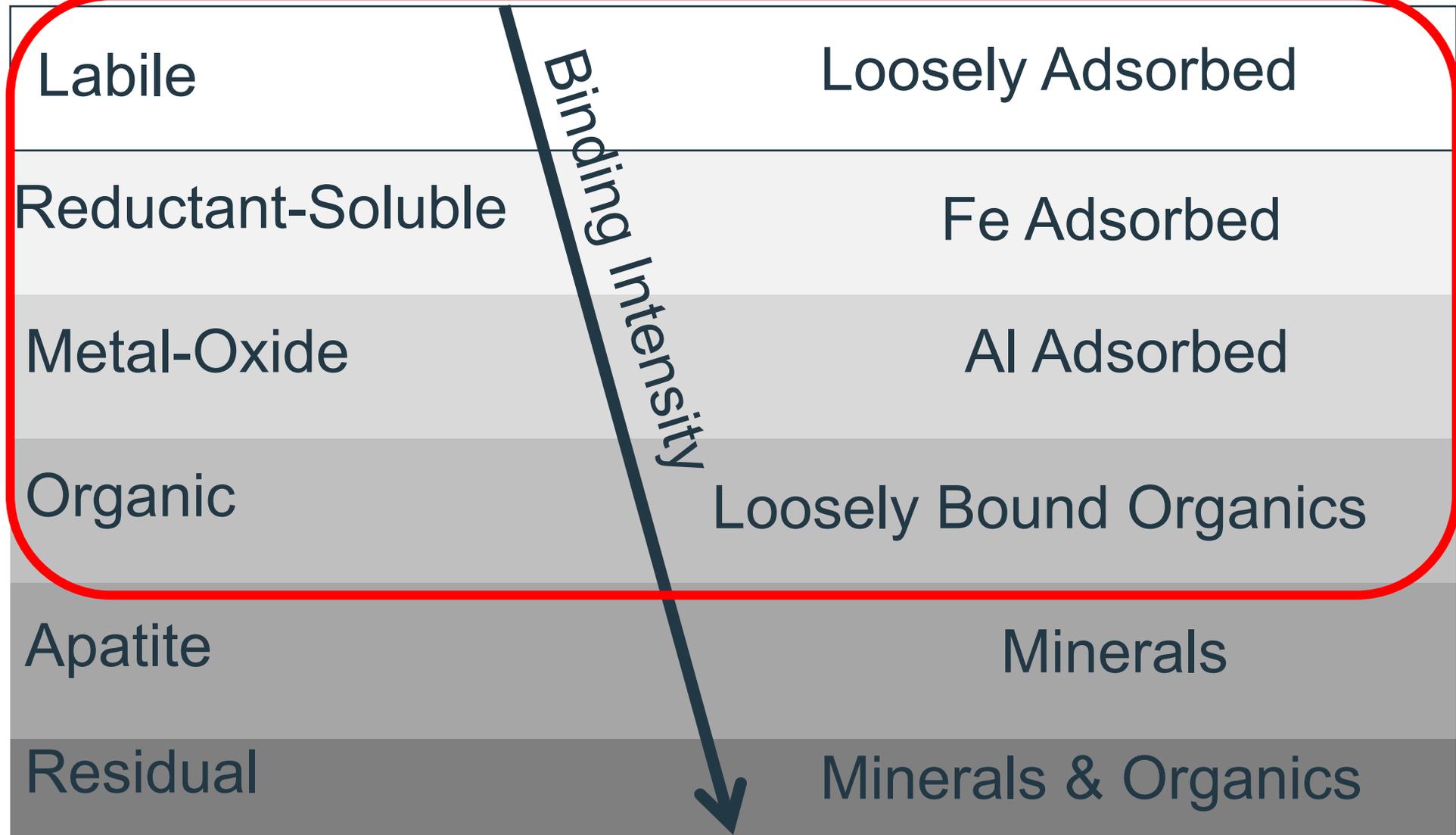
- Waterbody or alternatives analysis studies indicate that sediment cycling generates a significant portion of the pollutant loading
- Untreated stormwater inputs are limited or being addressed
- Upstream sediment transport is limited or has been addressed
- Treatment alternatives analysis has been conducted
- Funding source has been identified

# Sediment Phosphorus Fractionation

Nuisance algae prefer biologically available phosphorus - BAP

MUCK  
HIGH  
BAP

SAND  
LOW  
BAP

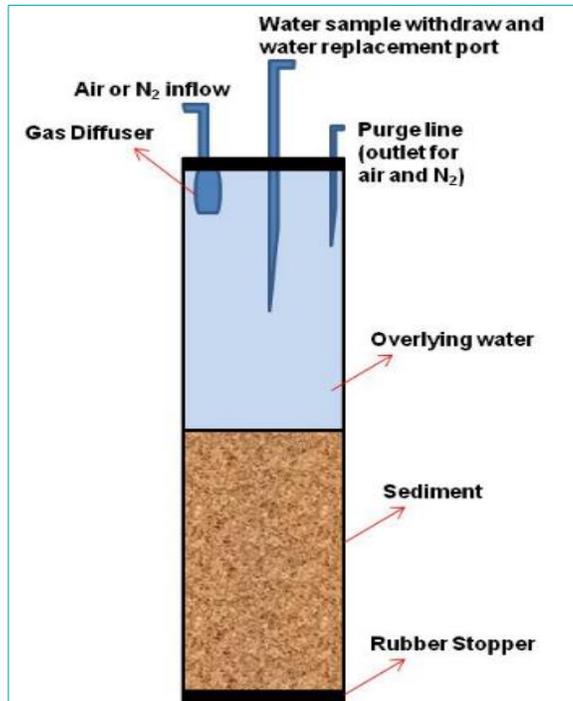


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# Treatment Alternative Analysis

## Bench Scale Sediment Flux

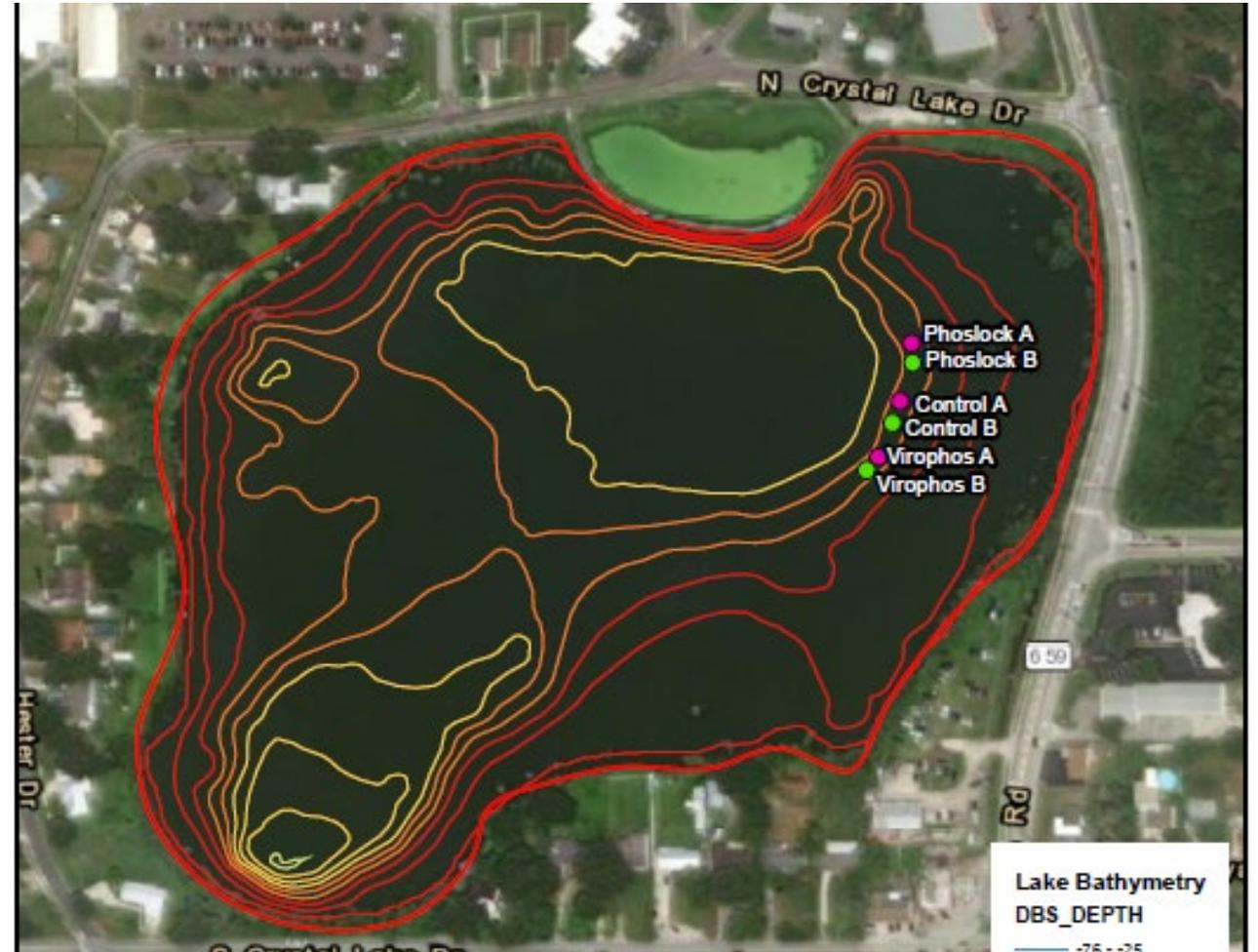
Intact sediment core incubations to measure flux (release) of nutrients or other pollutants



# Case Study

# City of Lakeland Crystal Lake Mesocosm Study

- Crystal Lake is verified impaired (per FDEP 3030(d) list) for total phosphorus (TP), total nitrogen (TN) and chlorophyll-a, and has regularly documented harmful algal blooms (HABs).
- Phased project – Phase I: Nutrient and hydrologic budget
  - Sediment = primary source
- Deferred TMDL with a 4e Pollutant Reduction Plan (PRP)
  - Developed restoration alternatives
  - Sediment management is top priority - Phase II
- Cooperative funding obtained from SWFWMD



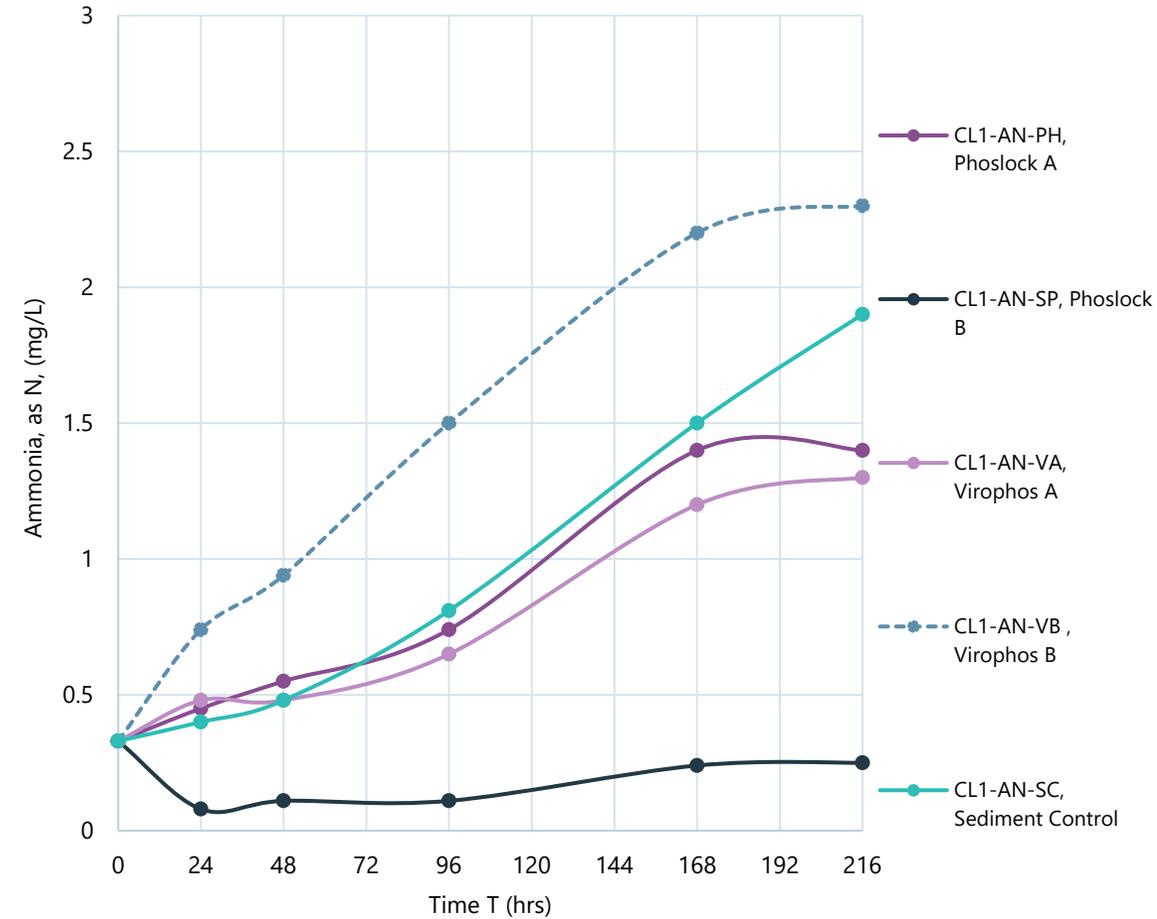
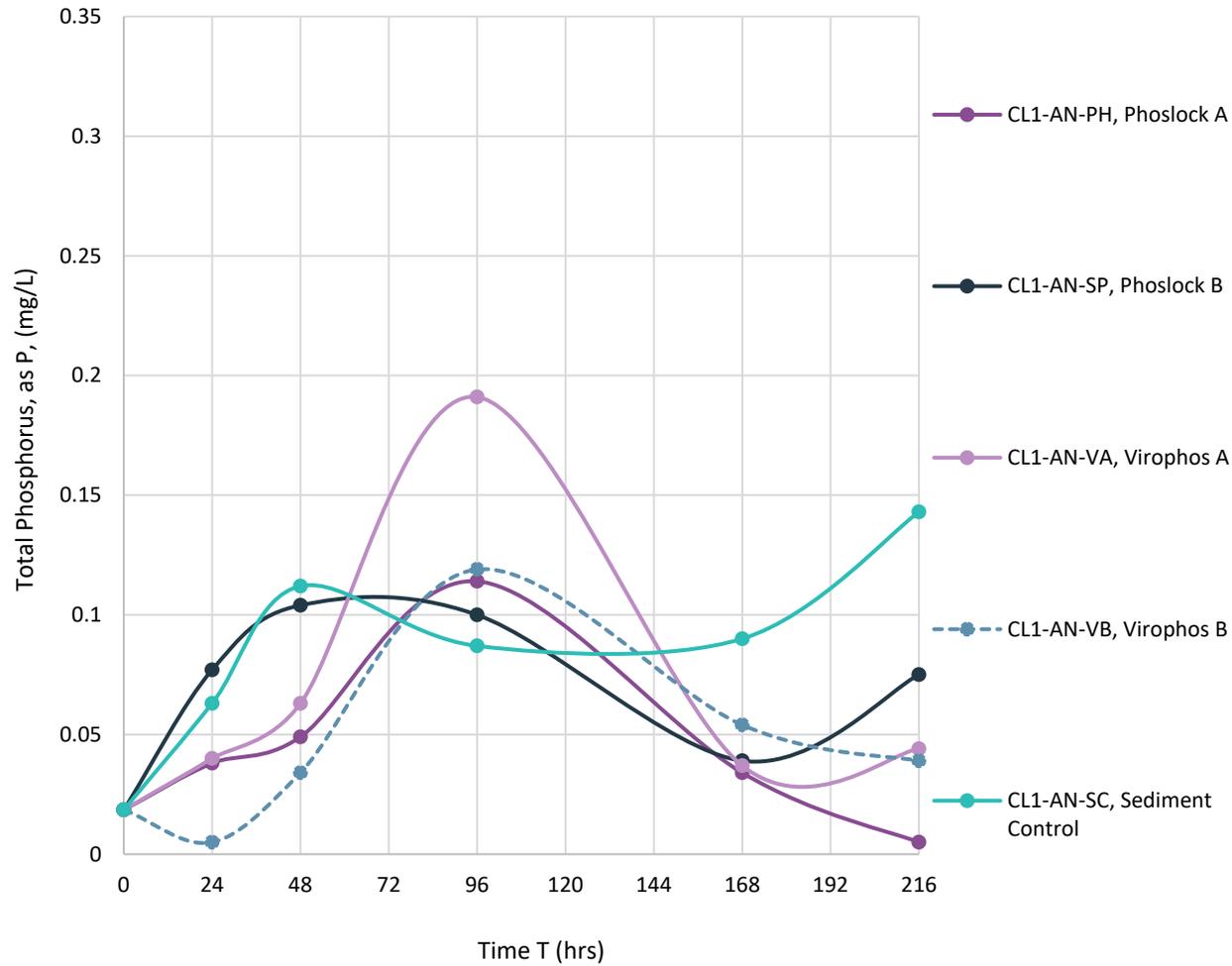
# Alternatives Analysis

- Vendor prescribed treatment amendment dosages based on:
  - Water quality data
  - Phosphorus fractionation data
  - Sediment core specs

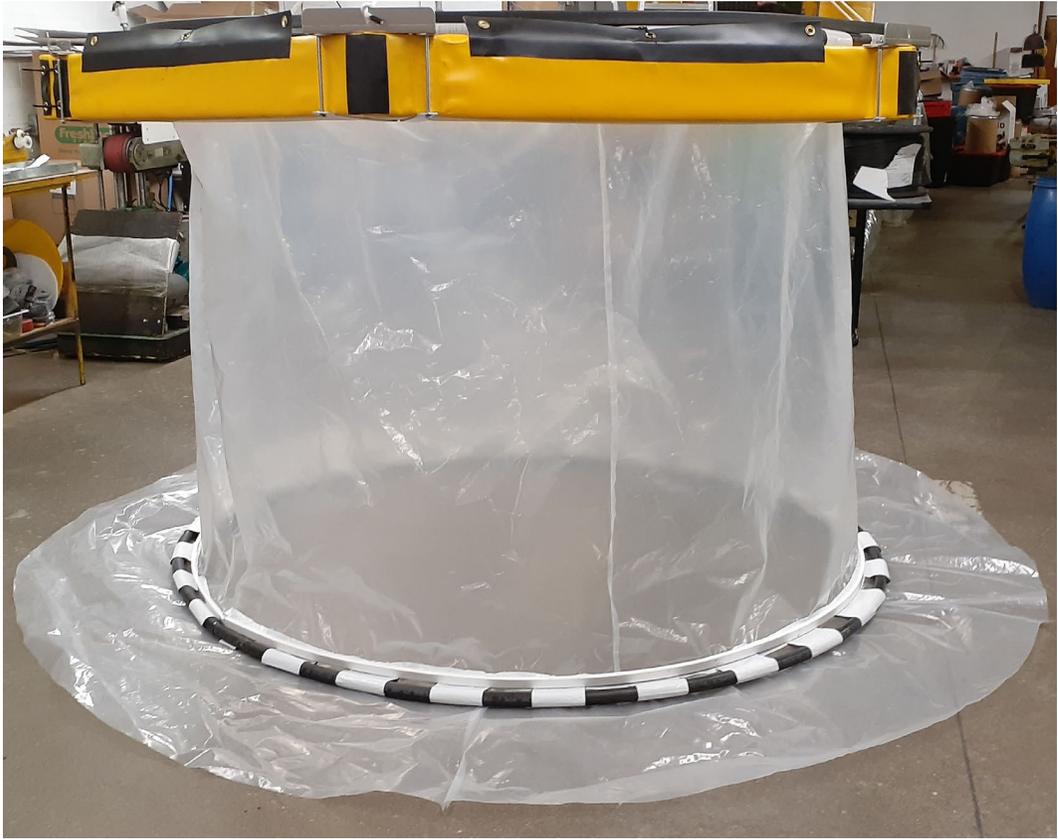
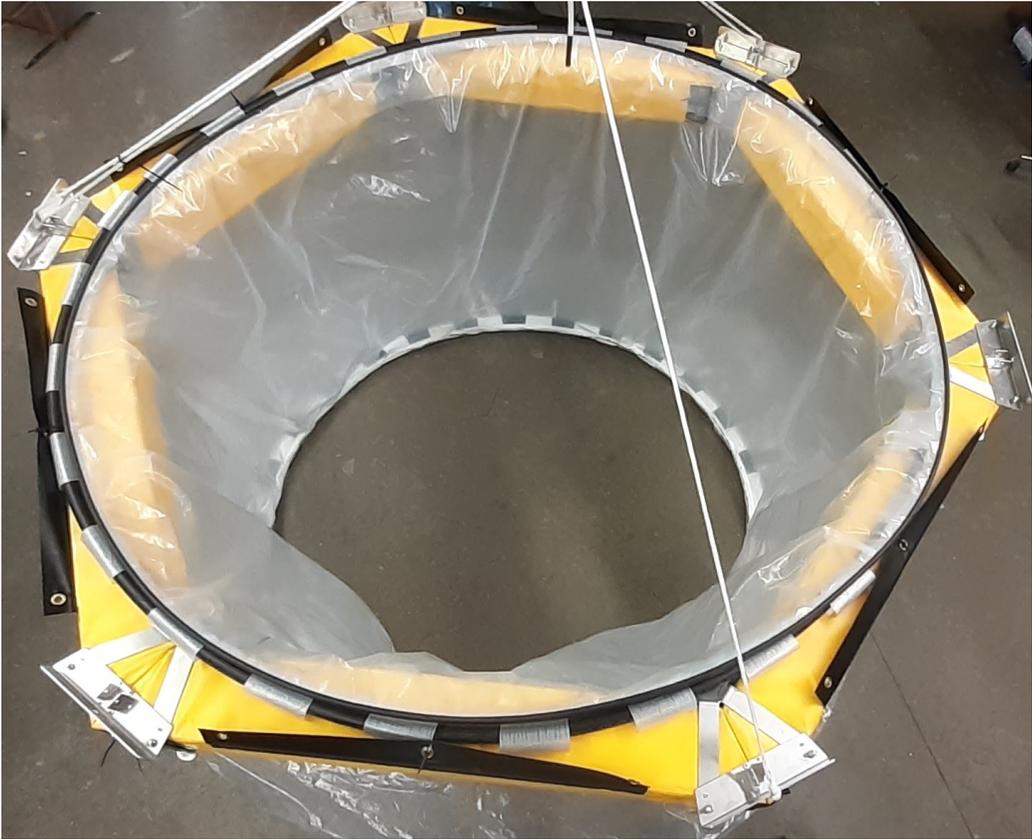
Core Name	Treatment	Dose (g)	Condition
CL1-AN-PH	Phoslock A	10	Anoxic
CL1-AN-SP	Phoslock B	30	Anoxic
CL1-AN-VA	ViroPhos A	9.43	Anoxic
CL1-AN-VB	ViroPhos B	9.43	Anoxic
<b>CL1-AN-SC</b>	<b>Sediment Control</b>	-	<b>Anoxic</b>
CL1-AE-PH	Phoslock A	10	Aerobic
CL1-AE-SP	Phoslock B	30	Aerobic
CL1-AE-VA	ViroPhos A	9.43	Aerobic
CL1-AE-VB	ViroPhos B	9.43	Aerobic
<b>CL1-AE-SC</b>	<b>Sediment Control</b>	-	<b>Aerobic</b>

Evaluate effectiveness of various treatment alternatives

# Alternatives Analysis – Compare Product Variants



# Mesocosm Construction



# Mesocosm Construction



# Mesocosm Deployment



# Mesocosm Deployment Challenges

- Wood Dive Team
- Multiple Boats
- Prevent navigational hazards
- Unique logistics
- Anchoring is KEY!
- Sometimes adaptations are needed



# Sediment Management Permitting

# Mesocosm Permitting Issues

- ERP/404 Permit Exemption request from FDEP
  - **Sovereign Submerged Lands (SSL)**
    - Adding amendments was considered as “fill” in new State 404 permit interpretation
- Proof of “real property rights” needed to conduct study
- Permit conditions required removal of all structures and materials added



# Full Scale Implementation Considerations

## Waterbodies that are State SSLs

- Will need continued discussions with FDEP to overcome regulatory hurdles
  - FDEP interested in potential impacts to storage and smothering SAV – relative thickness of material
- Will assumption of “minor fill” become permissible?
  - Will treatment products that generate low solid mass volumes be permissible?
  - What about the ongoing benefits of reducing HABs that reduce sediment accretion?



# Summary

- Internal loading from nutrient-laden organic sediments can be a significant source of water quality impairments
- Understanding and quantifying internal loading potential is critical
- Sediment capping and chemical inactivation can result in significant load reduction that is highly cost-effective and direly needed in many lakes in FL
- Reduced internal loading can reduce HAB abundance and improve water quality
- Additional evaluation of benefits from sediment capping are needed



Sediment capping projects are not currently permissible in SSLs – how do we overcome this hurdle?

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