

# Pulp and Paper

Biological Water Quality and Dredge Program  
Offered by Buckman and MDG

# Overview

**Goal: Introduce biological dredging program & discuss path forward for implementation**

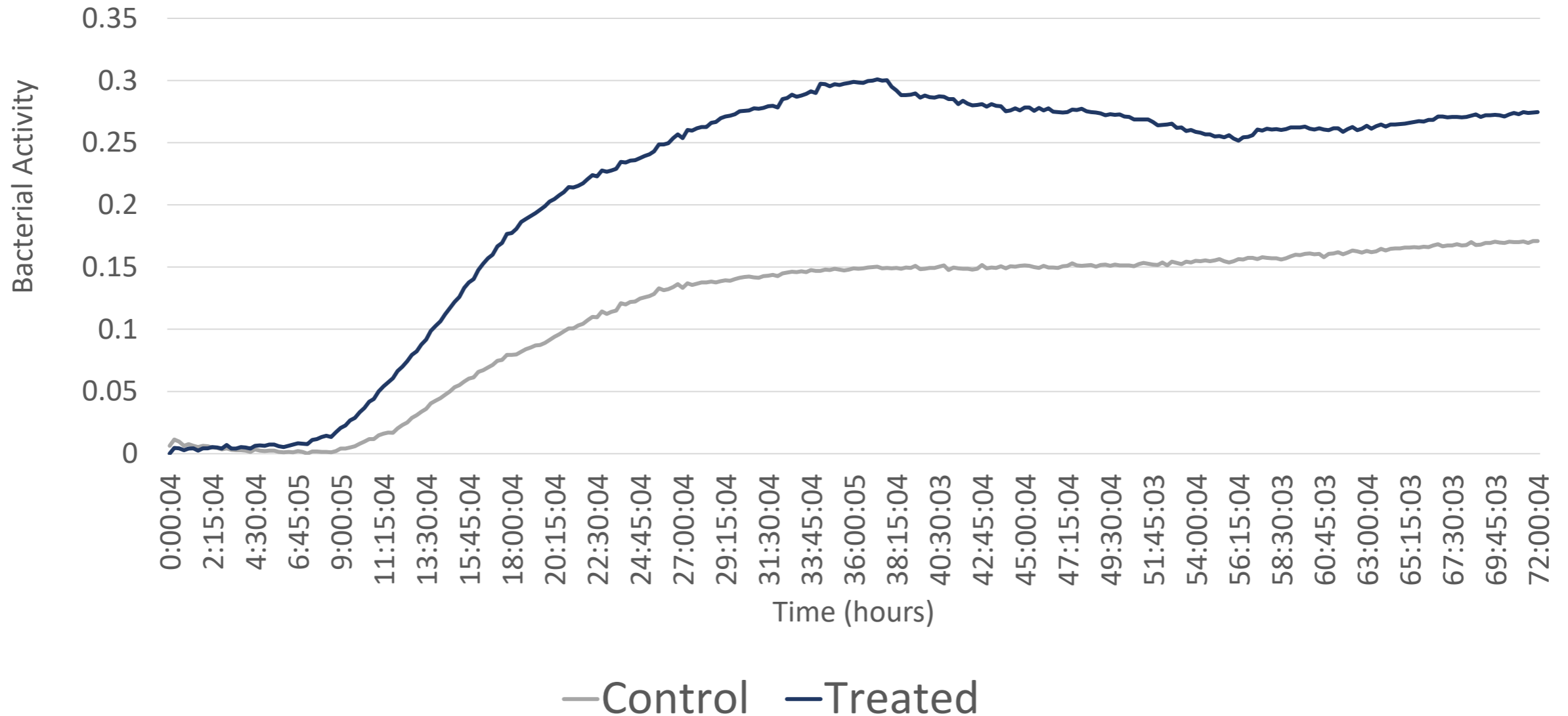
- Biological dredging
- Benefits of biological dredging
- Development of Biological dredging program
  - Real science, Trusted process, Proven Success
- How the program works for you
- Data review
- Path Forward



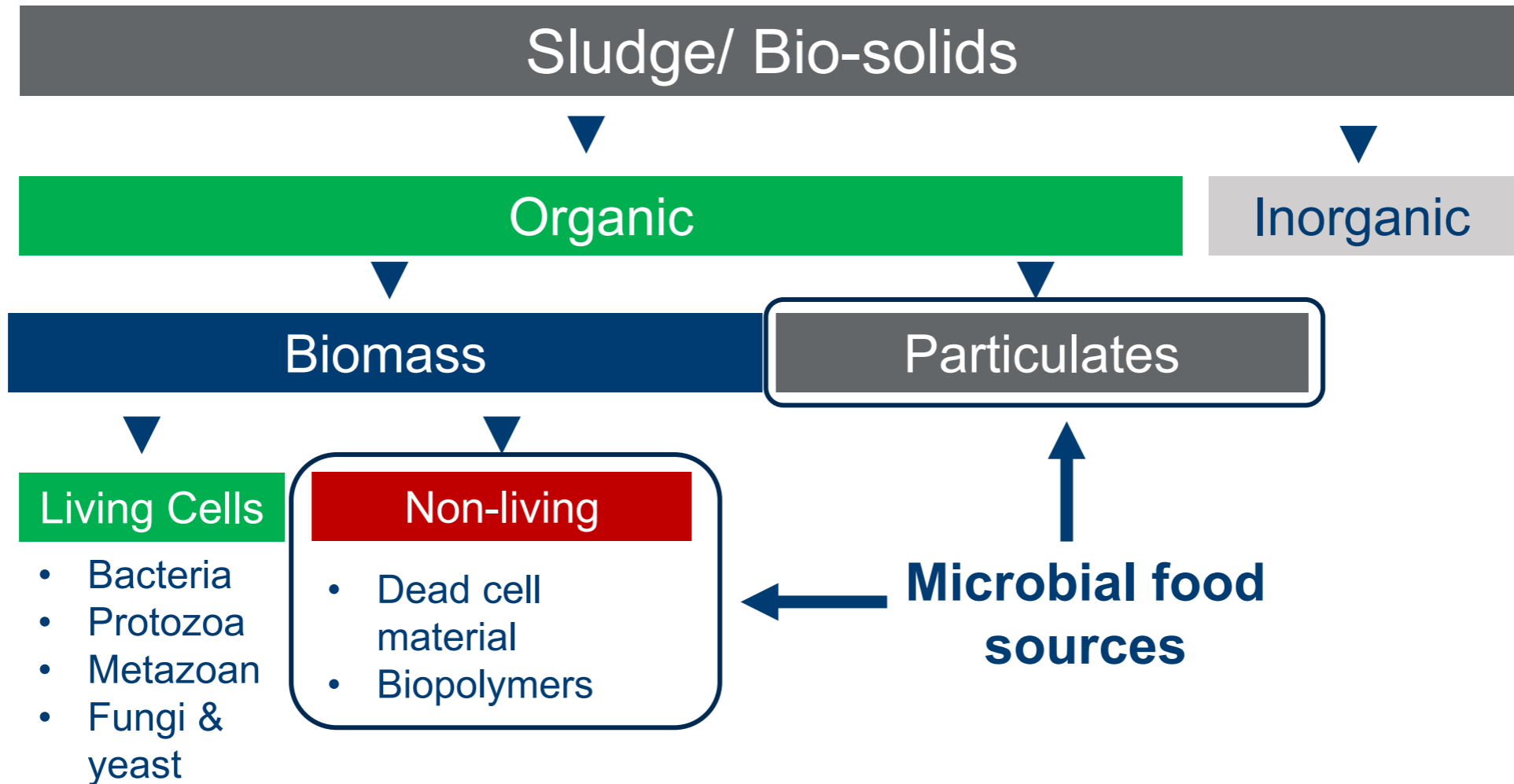
# Bioaugmentation

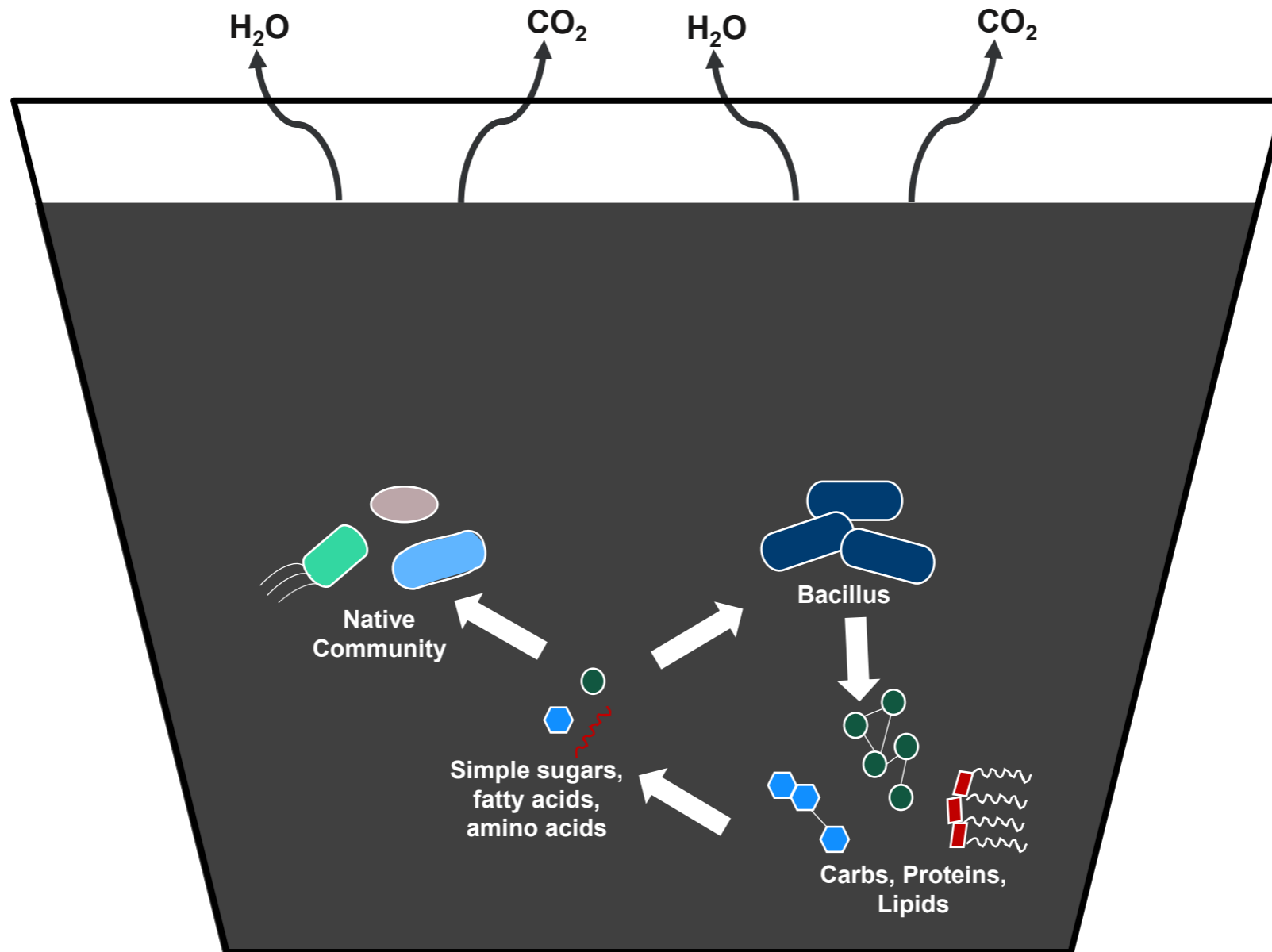
The process of adding **scientifically selected** organisms to a **microbial community** in order to **enhance that community**

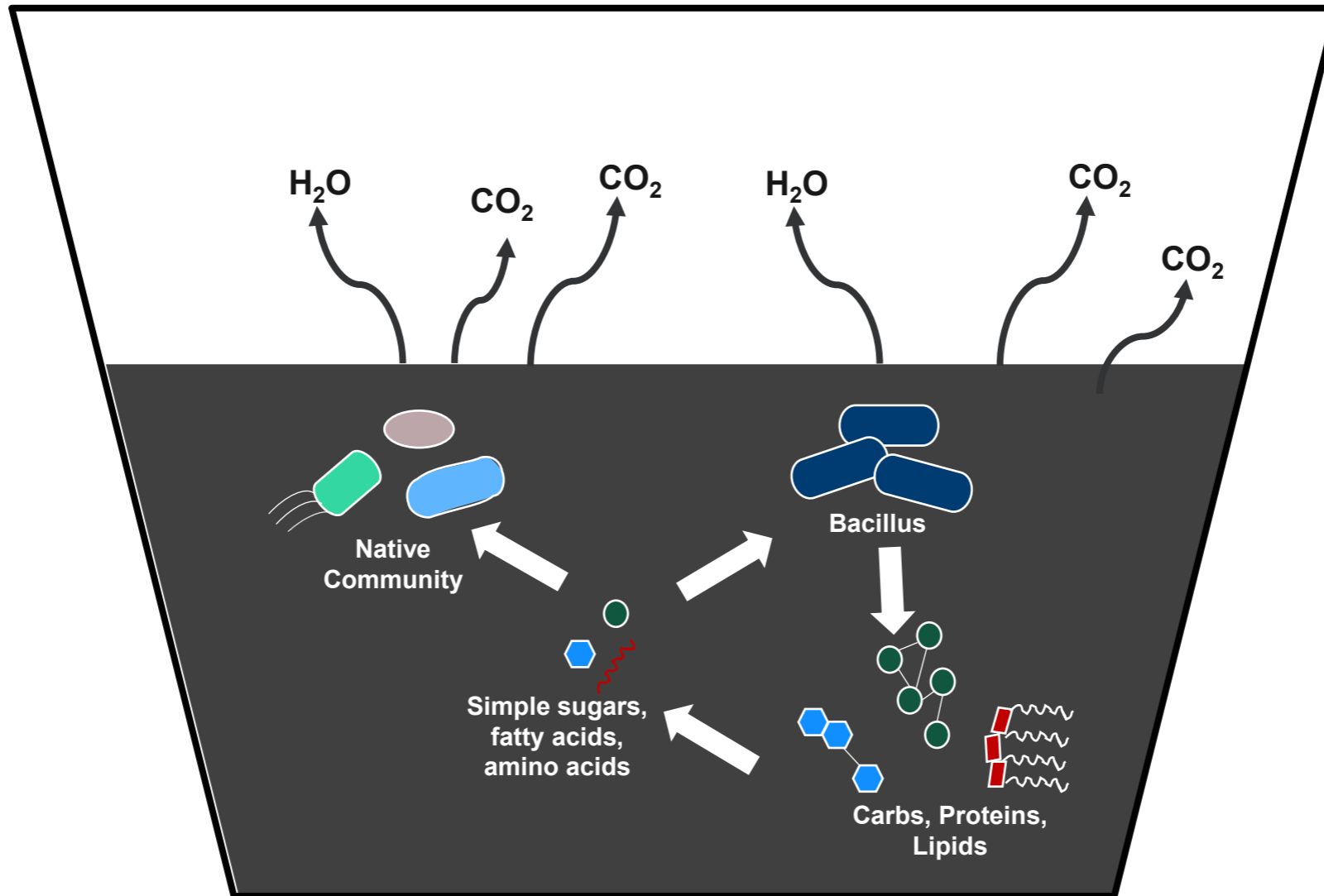
# Biotifx<sup>®</sup> enhanced bacterial activity in a P&P sample



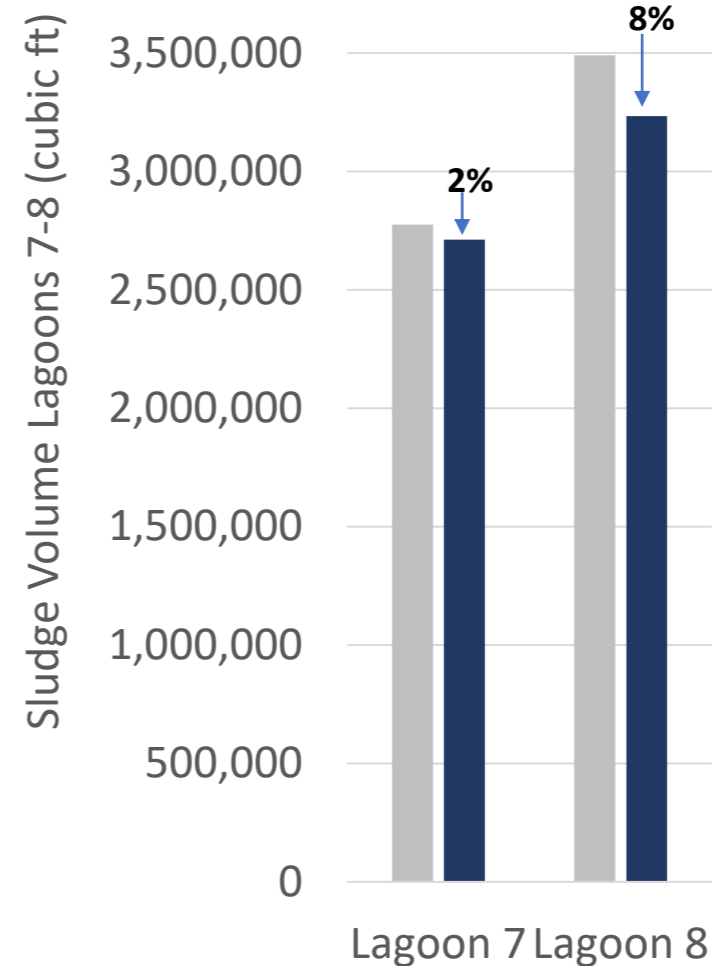
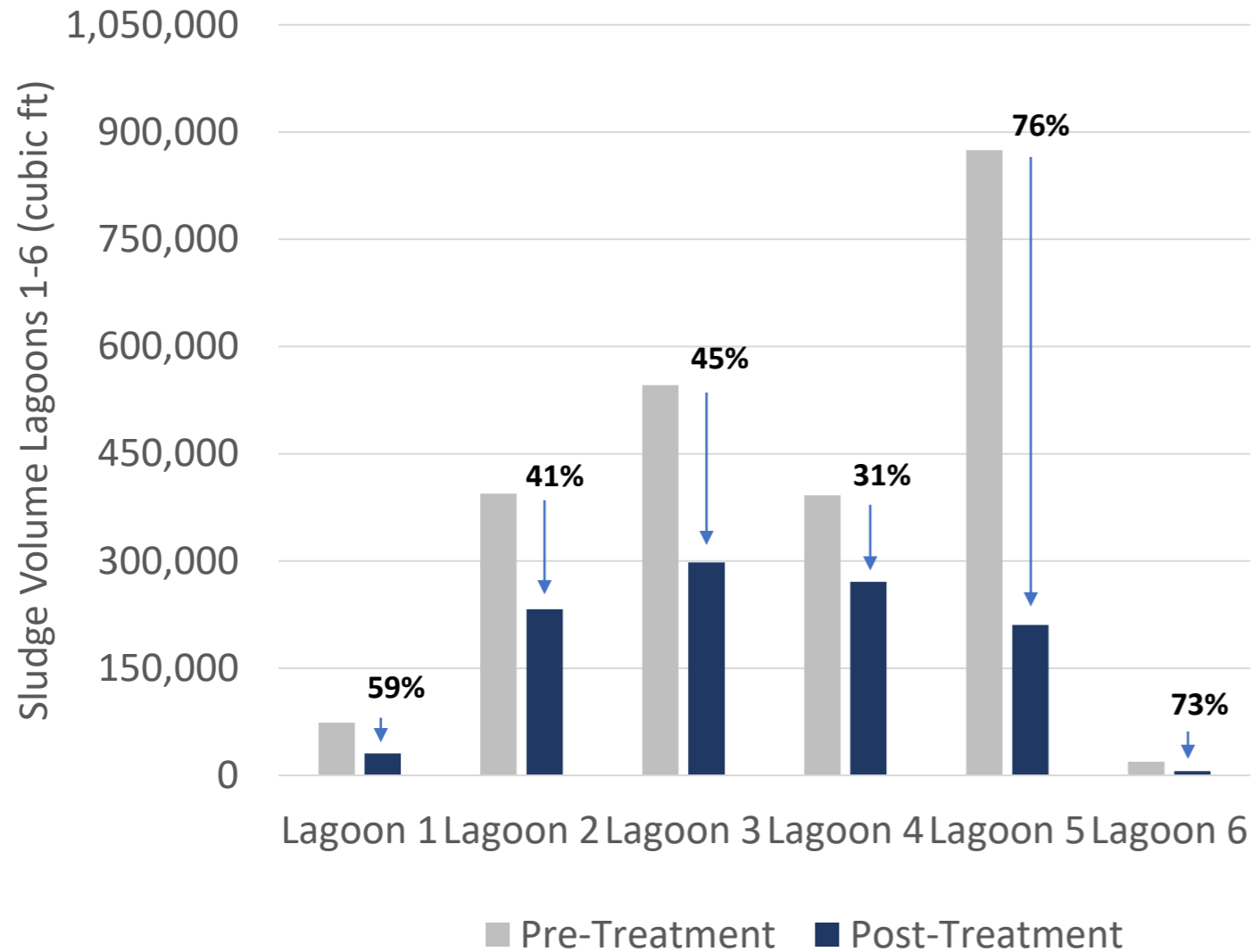
# Components of Sludge



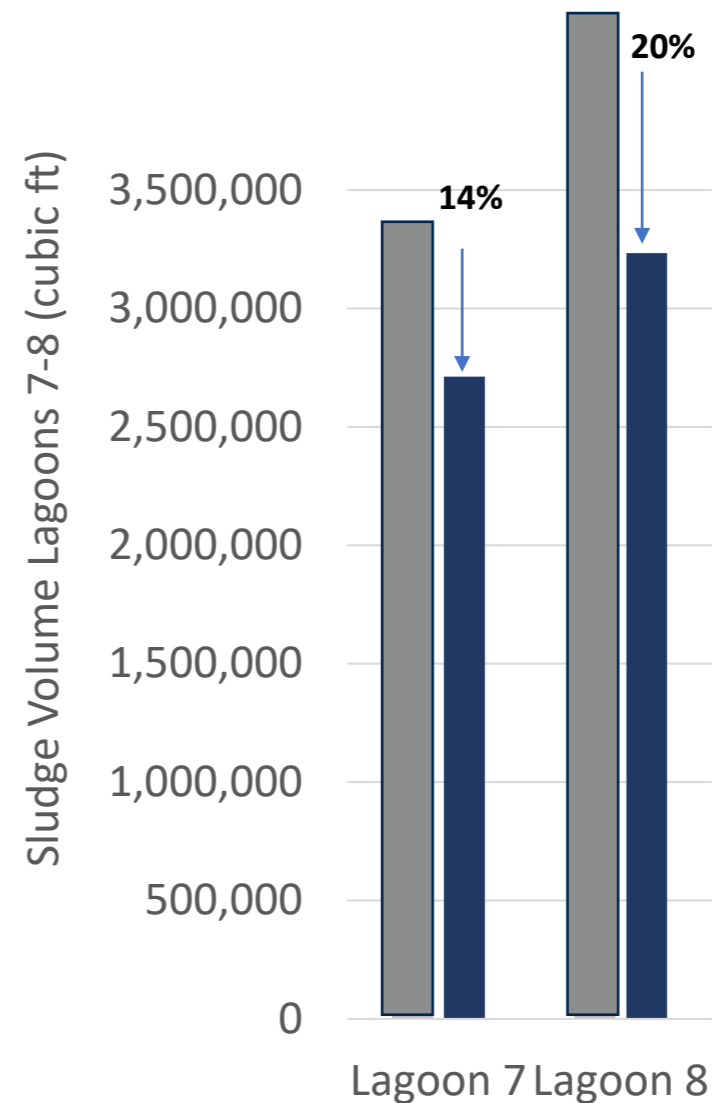
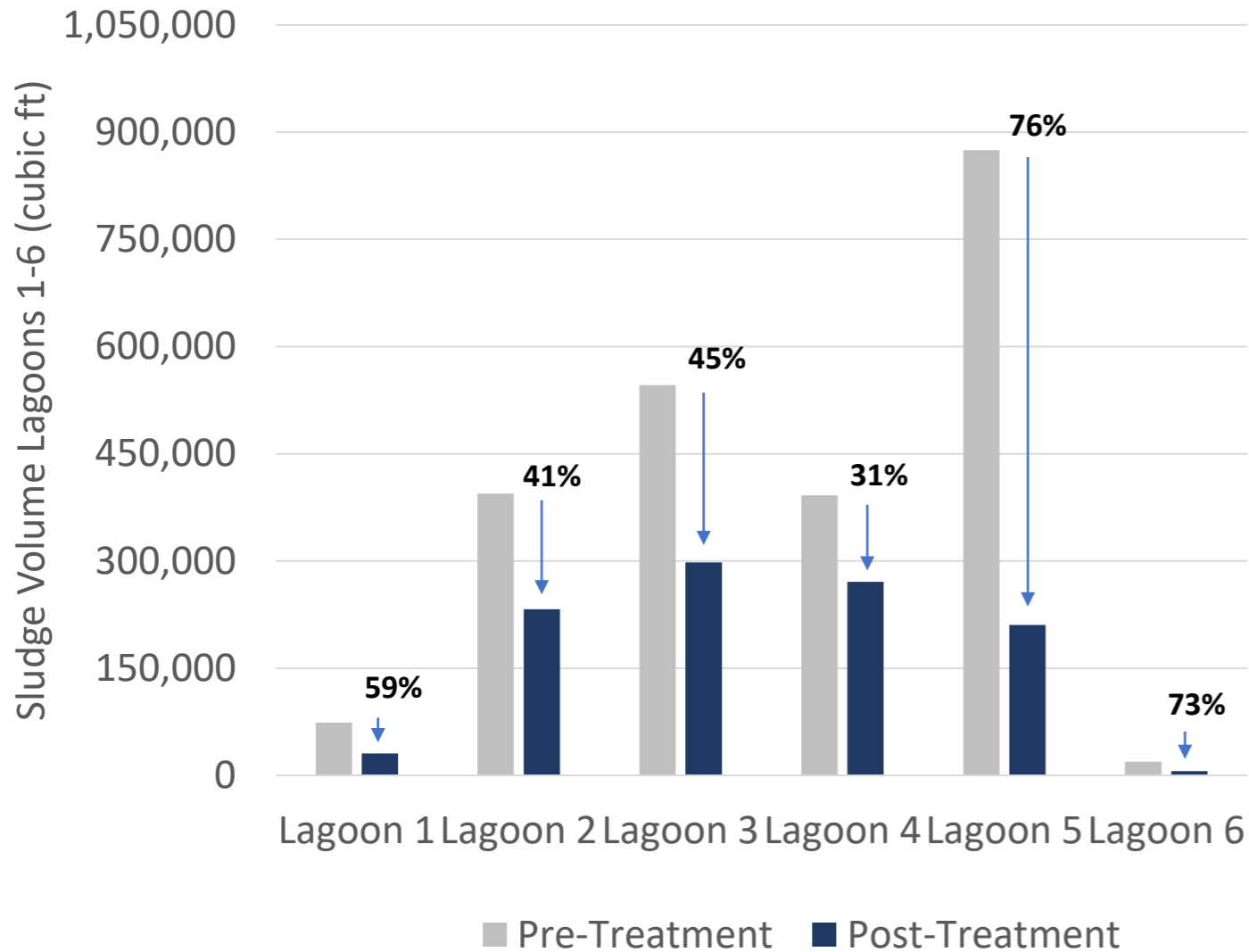




# Reduction of Sludge Volume 41%



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# Benefits of Biological Dredging

- Neutral → significant (30%) cost savings
- No mechanical equipment
- No final disposal of removed solids
- Preserves landfill asset
- No transportation/secondary handling of removed solids
  - No sludge holding ponds, geo bags, presses/centrifuges, polymer usage
- No risk of capital damage
  - *(example: aerator damage)*
- No/ limited "Capitol Footprint"


# Benefits of Biological Dredging

- ⊙ Maintains/Improves effluent quality
  - ⊙ Reduced BOD, TSS removal
- ⊙ Onsite safety improvement
  - ⊙ Safe product to handle/store
  - ⊙ Reduces H<sub>2</sub>S
  - ⊙ Less large equipment, labor at the ponds
- ⊙ Ease, speed to implement



# Proven Success

- ⊙ Treated Thousands of Wastewater Systems
- ⊙ No adverse affects
- ⊙ Overcome perceived risk
  - ⊙ Pre work (Survey, Lab testing, Reports)
  - ⊙ Reviewing current data
  - ⊙ Case history
- ⊙ Holistic Treatment
  - ⊙ Sludge
  - ⊙ Water Quality
  - ⊙ H<sub>2</sub>S and Odor reduction

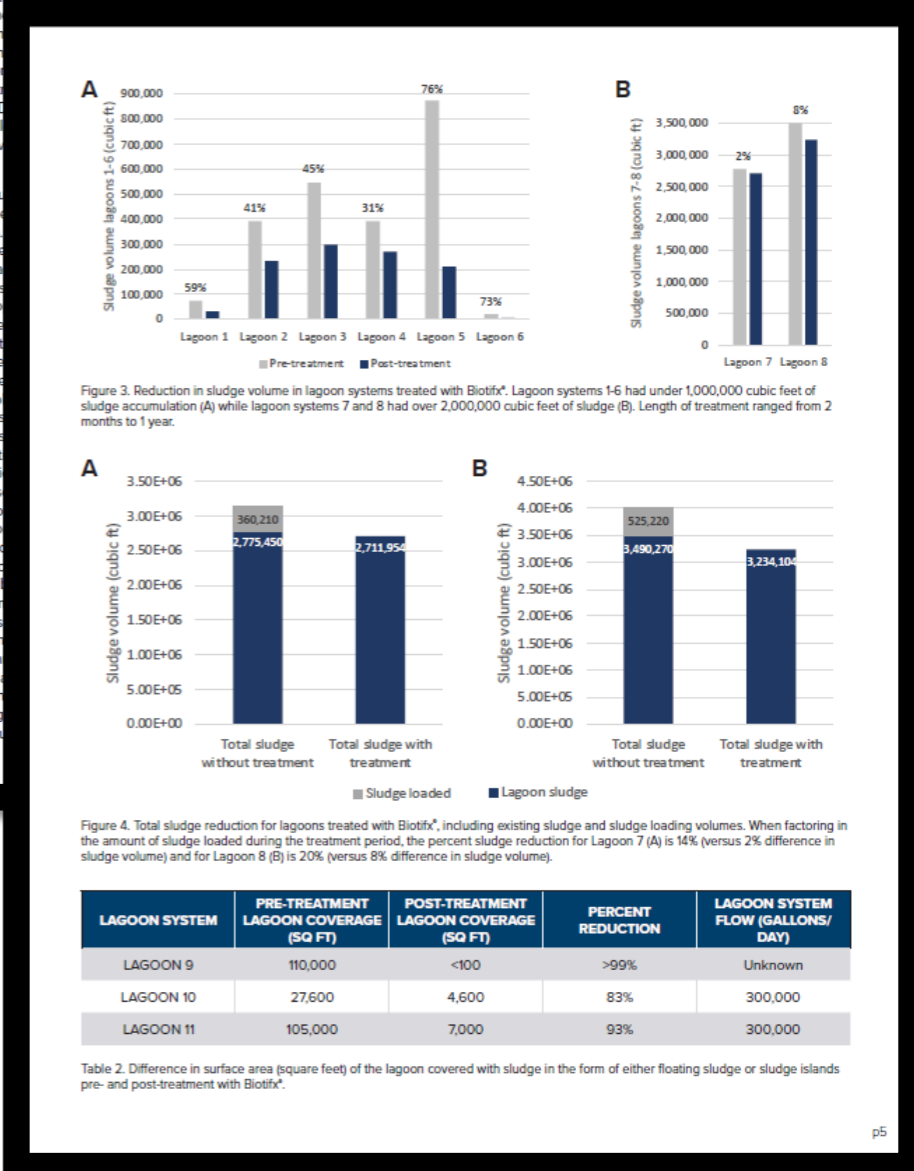


## A Bacillus-Based Bioaugmentation Product Effectively Reduces Sludge In An Analysis Of Eleven Wastewater Lagoons

Authors: Jennifer Cray, Megan Duersteler, Andrea Petersen, Dan Romanek, Josiah Menako, Sona Son & Mike King

**Abstract**  
Managing sludge accumulation in lagoons accounts for a large portion of wastewater treatment budgets. One sludge removal strategy that is both effective and more affordable than mechanical removal methods is bioaugmentation. Bioaugmentation enhances the microbial community in wastewater treatment systems through microbial sludge digestion and with *Bacillus*-based Biotifx® products. Biotifx® products are effective at various locations, and sizes. Biotifx® products have shown an average reduction of 56% (SD 15%) in sludge volume in lagoons with high sludge volumes. Biotifx® products is an effective and affordable sludge management solution.

**Introduction**  
More than 50% of industrial wastewater treatment facilities in the US do not have an integral part of a lagoon system. Sludge accumulation alters the hydraulic capacity of the lagoon and to the bottom (5). These changes in decreased hydraulic retention time subsequently reduce treatment efficiency. Sludge management in wastewater treatment plants amounts to 40-60% of total plant operating costs. Sludge management costs are trending upward, and regulatory requirements are becoming stringent. One solution to help mitigate these costs is the implementation of bioaugmentation. Organic sludge can be effectively digested with a bioaugmentation product, reducing the frequency and volume of sludge removal events, and making bioaugmentation an attractive sludge management solution. Bioaugmentation aims to enhance natural sludge digestion by enhancing the microbial community that naturally exists in the environment. The addition of bacterial species that support microbial growth is the goal of employing bioaugmentation. The goal of employing bioaugmentation is to employ a form of a bacterial species, such as *Bacillus*, to enhance the natural sludge digestion process.



LAGOON SYSTEM	PRE-TREATMENT LAGOON COVERAGE (SQ FT)	POST-TREATMENT LAGOON COVERAGE (SQ FT)	PERCENT REDUCTION	LAGOON SYSTEM FLOW (GALLONS/DAY)
LAGOON 9	110,000	<100	>99%	Unknown
LAGOON 10	27,600	4,600	83%	300,000
LAGOON 11	105,000	7,000	93%	300,000

Table 2. Difference in surface area (square feet) of the lagoon covered with sludge in the form of either floating sludge or sludge islands pre- and post-treatment with Biotifx®.

# Lagoon Case Study Background

## Lagoon full of sludge

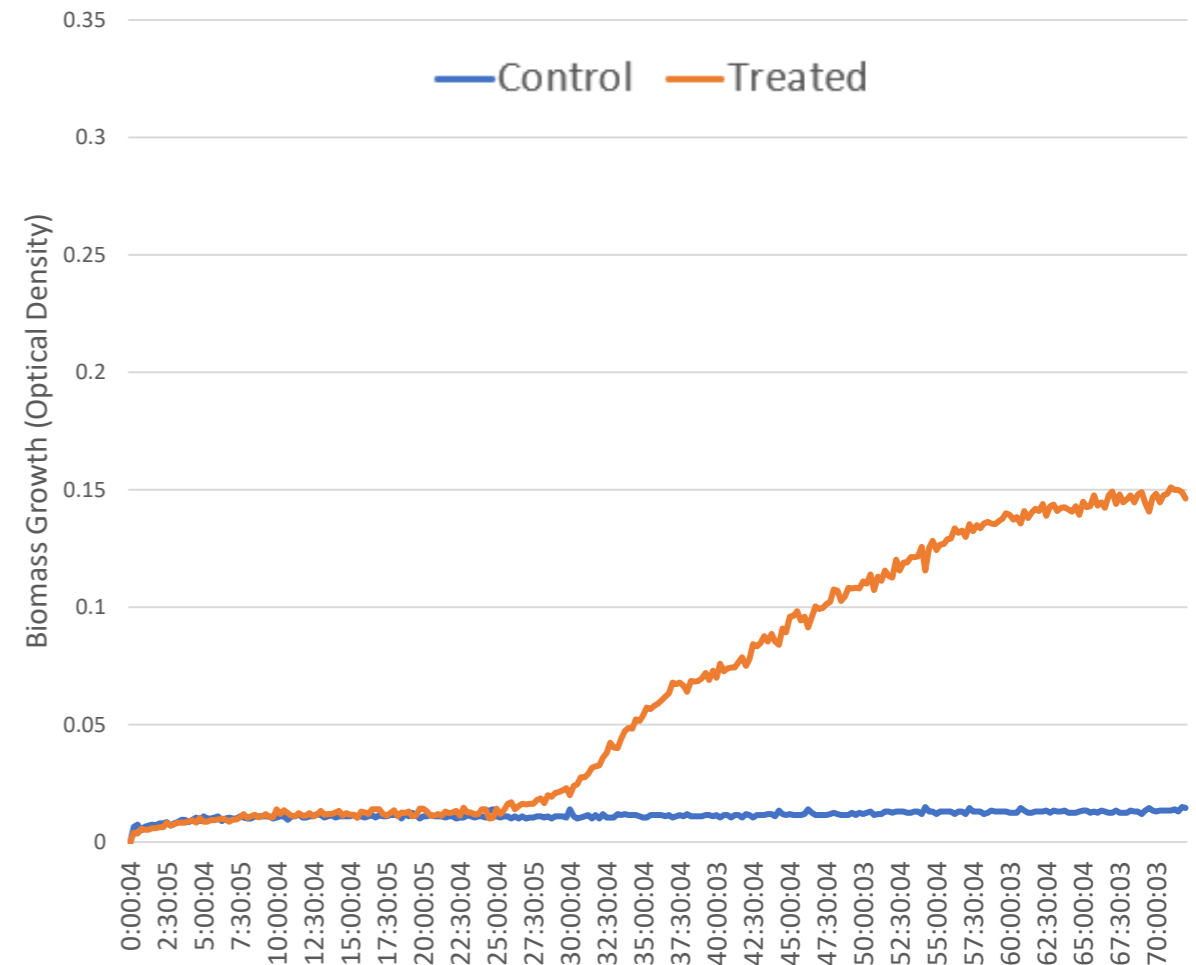
- ⊖ Severely limited retention time  
Large dredging project needed
- ⊖ Lagoon design depth: 12 feet
  - ⊖ 24 hour HRT
- ⊖ **Lagoon actual depth: 4 feet**
  - ⊖ 8 hour HRT



# What was done

- Baseline data collected
- Dosed Biotifx 40B daily
- Surveyed monthly
  - Sonar boat 6,000 data points
  - Sludge core samples for % solids
- Reported results

Laboratory data of our affect on systems wastewater



# Treatment with Biotifx® improved color

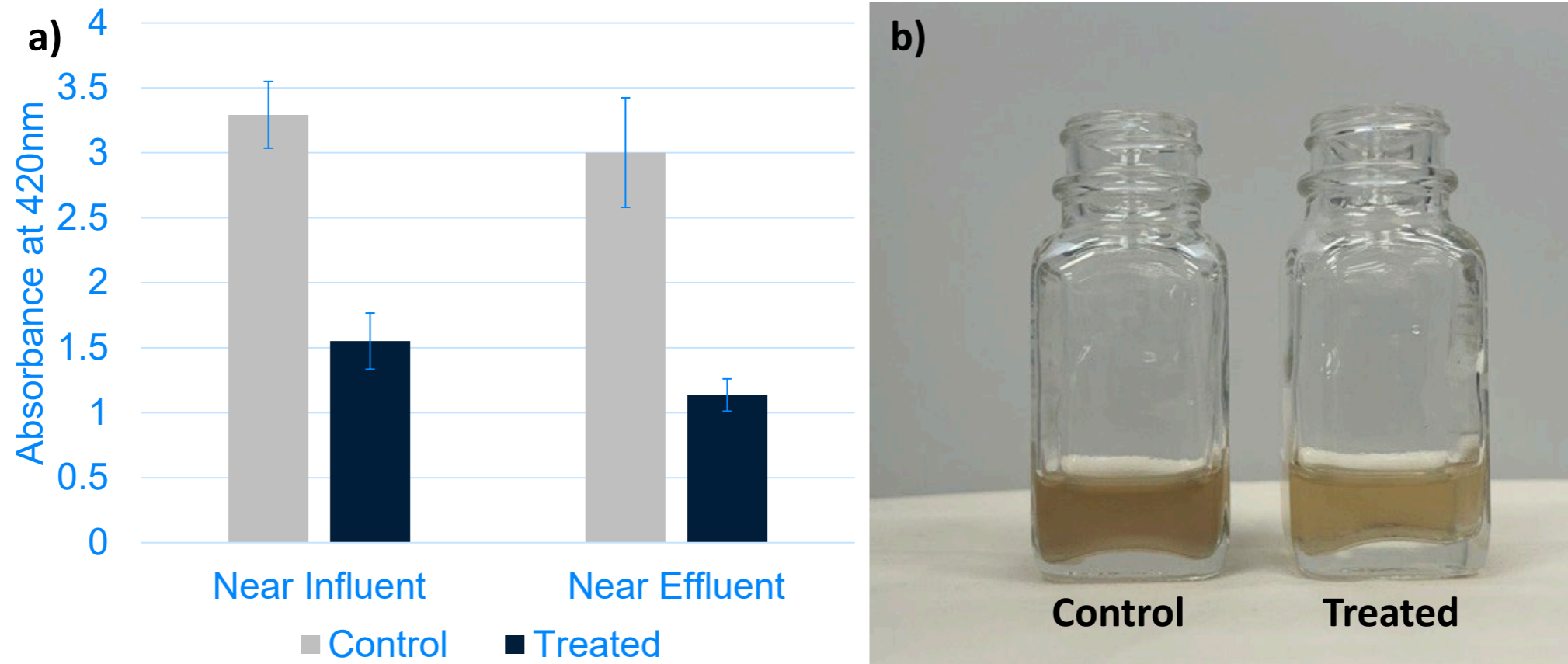
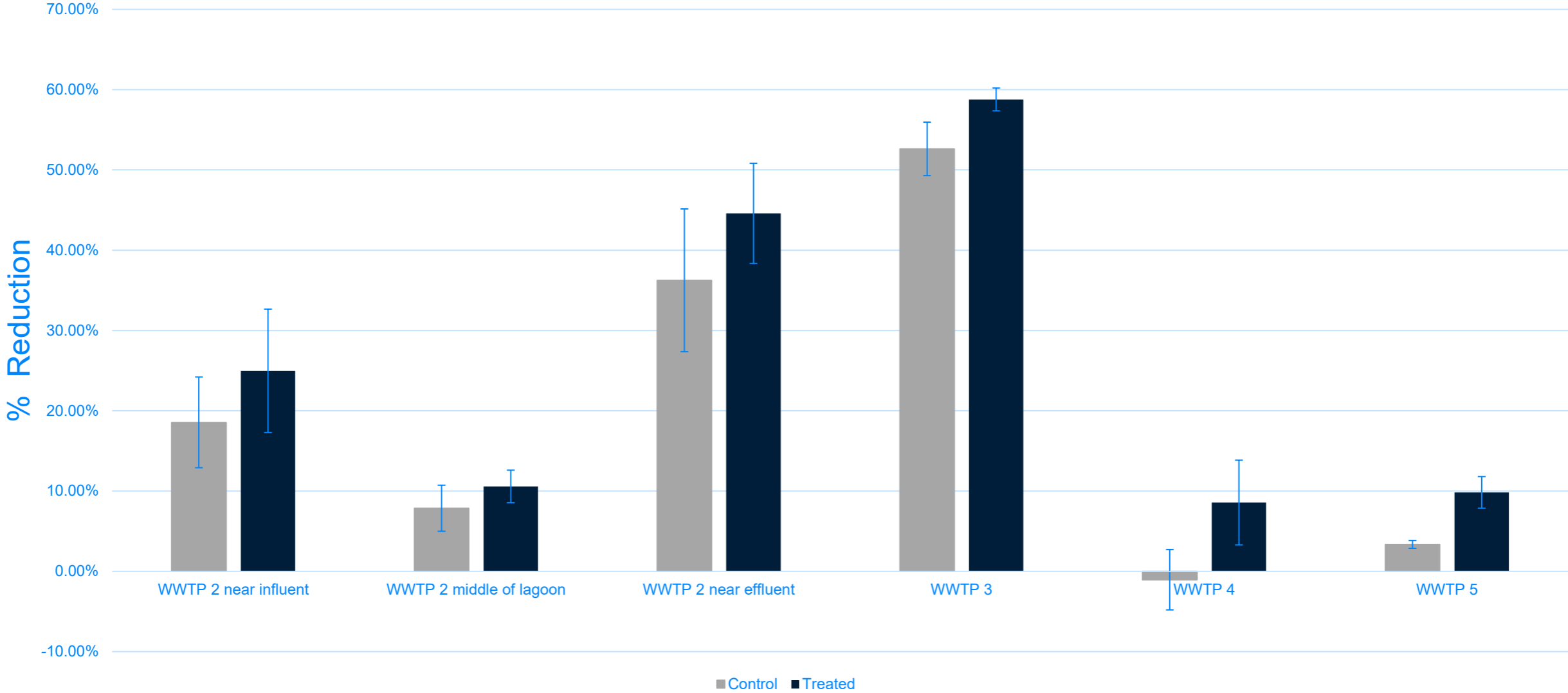


Figure 2: Treatment with Biotifx® reduced absorbance in two samples (a) and resulted in a visual difference in color (b)

# Treatment with Biotifx<sup>®</sup> improved digestion of solids



**Figure 4:** Percent reduction of solids in untreated sludge samples compared to Biotifx<sup>®</sup> treated samples after 5 days.

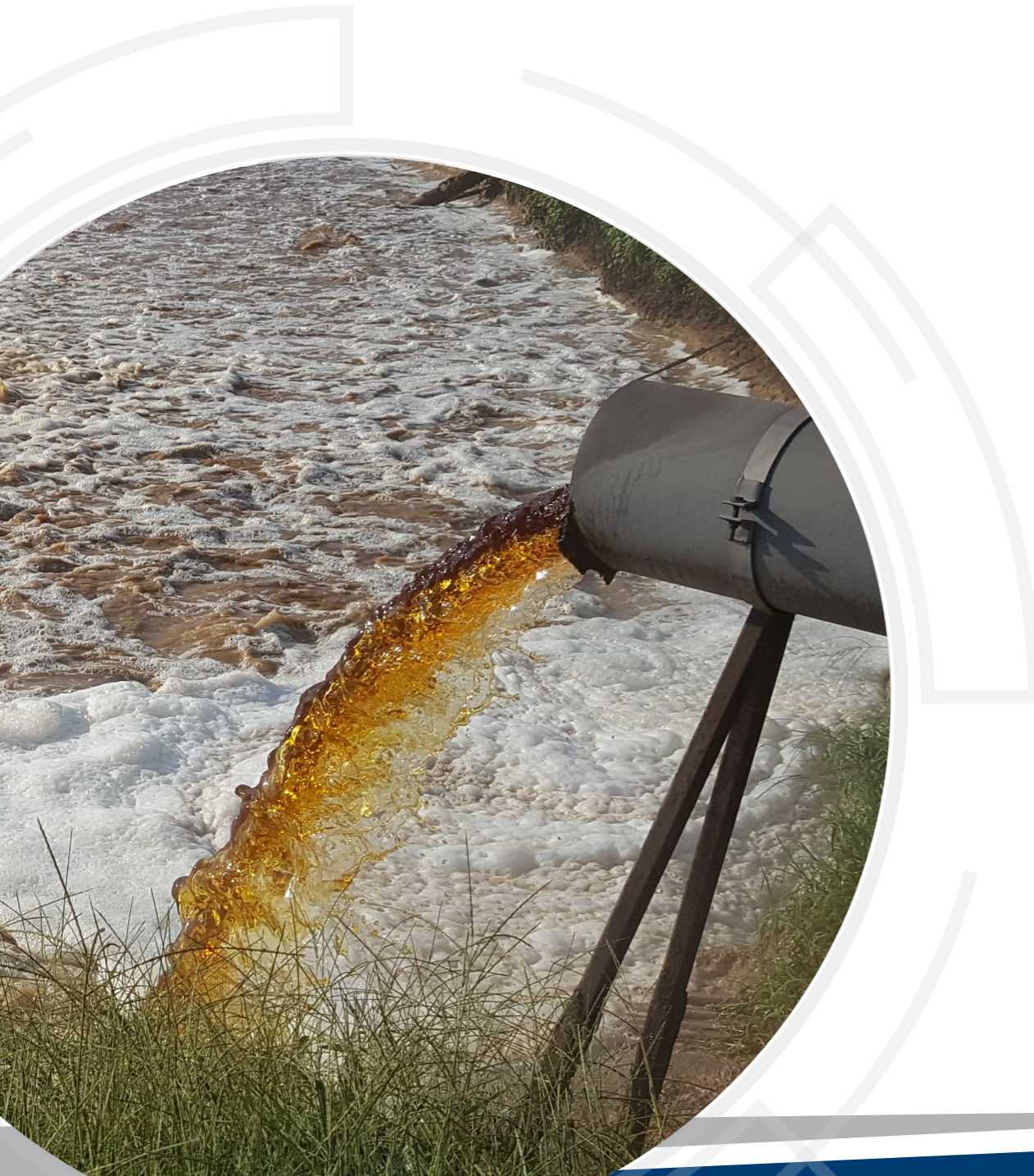
# Monthly Results

- **2 inches/month** of sludge digested & removed
  - 50,000 gallons/acre restored/month
  - 30 minutes hydraulic capacity restored/month

## Sludge Digestion/month

- **180 dry tons or 400,000 gallons restored/month**

# Polishing Pond Loading



## Loading data

### Monthly Loading

Baseline	210 tons
Treatment	260 tons
	<b>+24%</b>

### Monthly Effluent

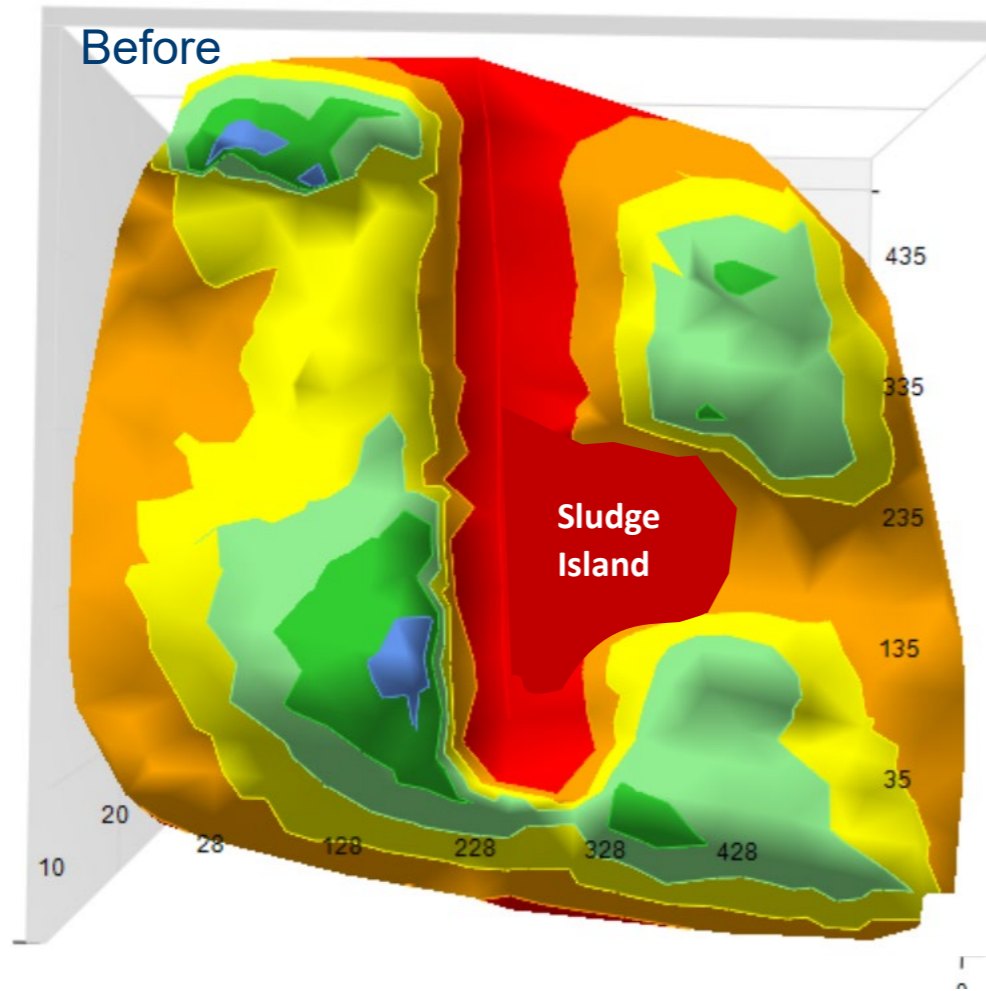
Baseline	110 tons
Treatment	90 tons
	<b>-20%</b>

### Monthly Tons Retained in Lagoon

Baseline	91
Treatment	125
	<b>+38%</b>

With 24% more loading, we improved effluent quality and reduced sludge within the lagoon.

# Proven Success: Pulp and Paper ~30MGD



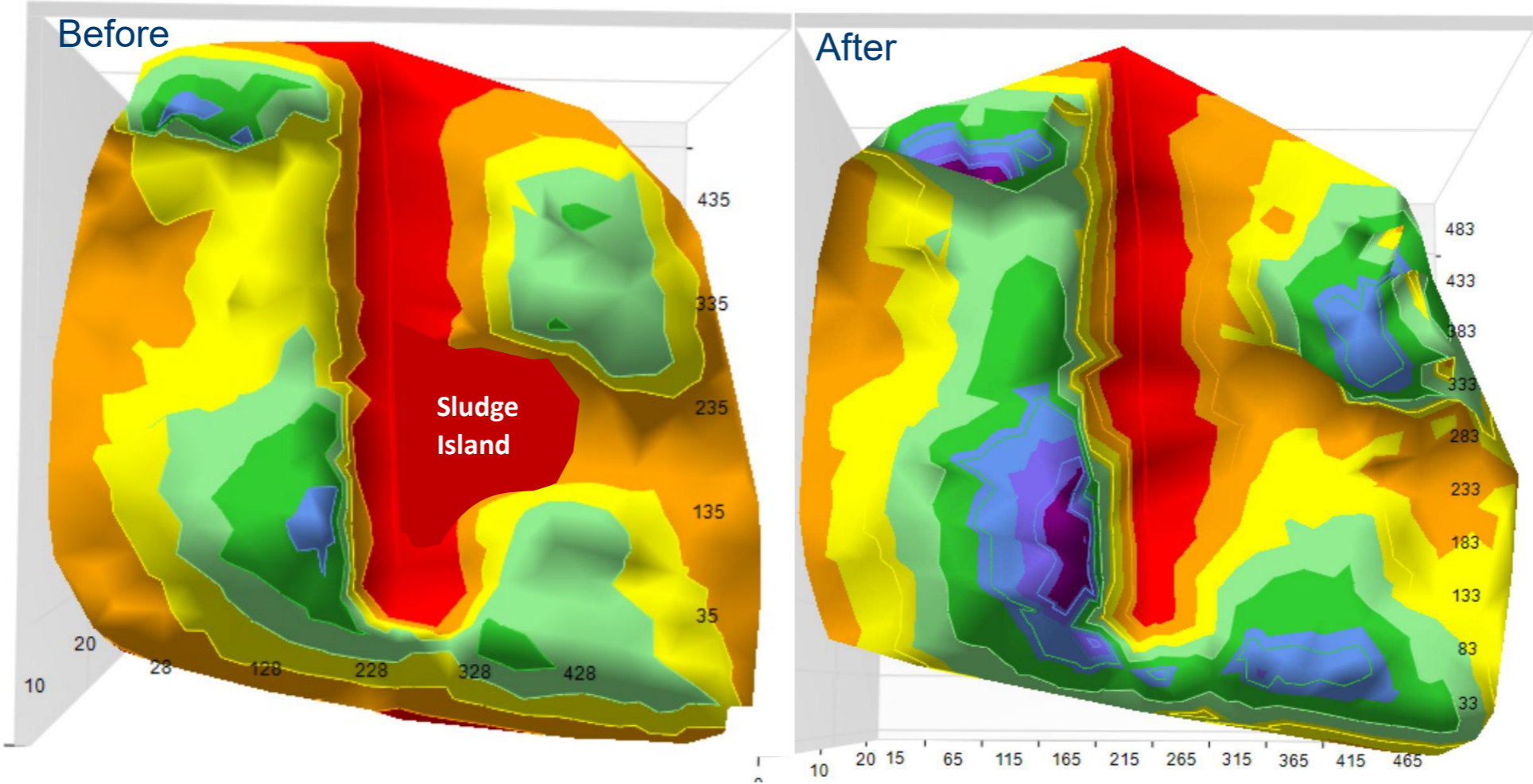
## Background

Annual Dredge 200-600dt

Loading exceeded dredging capacity

Increased dredging & disposal vs. budget

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### Background

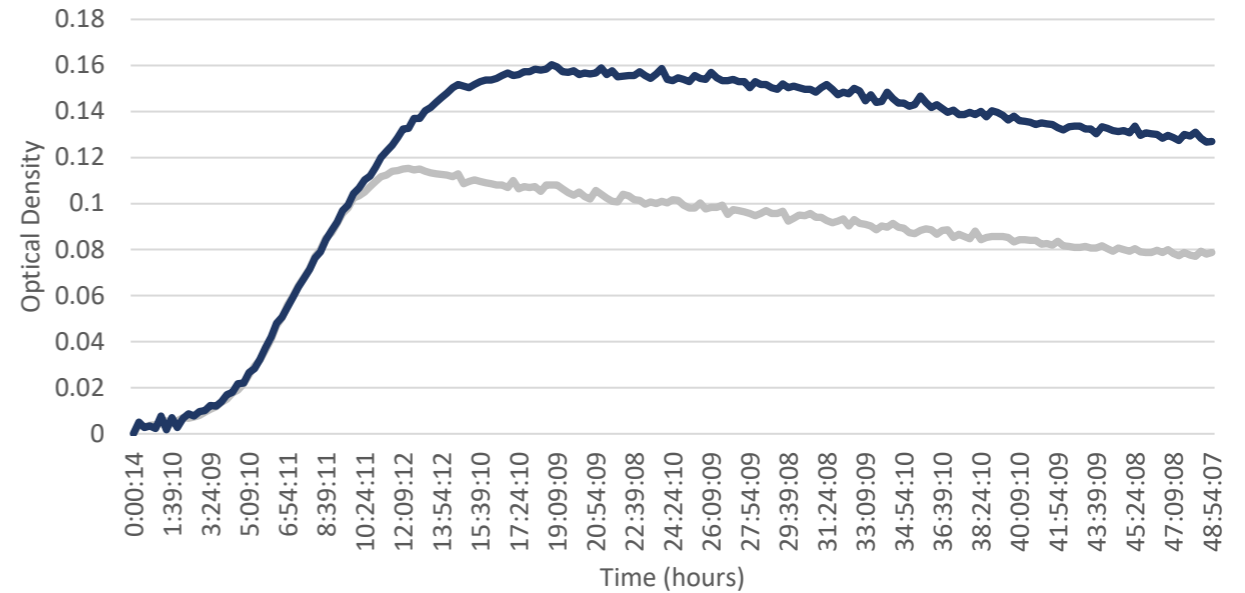
Annual Dredge 200-600dt  
Loading exceeded dredging capacity  
Increased dredging & disposal vs. budget

### What happened

Surveyed, created program to fit budget  
Treated: 4 months  
Removed 711dt  
Restored 15% HRT

# Project Initiation

- Collaborate: removal goals, timelines and budget
- Collect & review system data
- Survey, Sample, & Test
- Prescribe treatment program
  - Duration, removal projections, monitoring needs, cost
- Flexible Program options
  - Pay per. unit of product used
  - Pay per unit of sludge removed



# Buckman-MDG

Biological Dredge Program offered to Pulp  
and Paper