INFRASTRUCTURE ALTERNATIVES, INC.

RIVER REMEDIATION CASE STUDY:

CAPTURING PCBs FROM IMPACTED SLURRY VIA SEPARATION AND WATER TREATMENT

CLEAN WATER SOLUTIONS

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About IAI

- Founded in 2000
- Based in Rockford, Michigan
- Small business, employee-owned
- Approx. 100 employees
- Water & wastewater treatment
- Dredging & Sediment Dewatering Division

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Key Topics

- Project overview and site layout
- Water treatment process flow adaptability
- Benefits of geotextile tubes for water treatment
- Contamination removal rates by process
- Water treatment plant operational techniques

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Project Overview

- 7.2 mile stretch of navigable waterway
- PCB impacted
- Mechanically dredged
- 2019 Work

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Project Overview

- Water based operations
  - Mechanical dredging
  - Dredged material transport
- Land based operations
  - Hopper barge offloading
  - Amendment of impacted sediment for disposal
  - Treatment of impacted slurry for discharge

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Sources of Impacted Slurry Flow

- Surface water mixing with impacted sediment in hopper barges
- Waste water from wash and decontamination processes
- Precipitation

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Unanticipated Flow of Impacted Slurry

- Higher volumes of water in hopper barges
  - Increased water flow to WTP
- Minimization of slurry to amendment process
  - Increased solids flow to WTP
- Size of collection sump not ideal for increased flows
  - Decreased ability for solids settling

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Original Anticipated Flow

- 150 GPM to WTP
- 2-4% solids content by weight

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Realized Process Flow

- 350 GPM to WTP
- 8-12% solids content by weight

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Original WTP Processes

- Impacted slurry
- Collection sump
- Geotextile tube
- Settling sump
- Influent holding tanks
- Lamella clarifier w coagulant
- Sand filter vessels
- Bag filter vessels
- GAC adsorption vessels
- Effluent holding tanks

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New WTP Processes

- Impacted slurry
- Collection sump
- Geotextile tubes
- Settling sump w coagulant
- Influent holding tanks used for clarification
- ~~Lamella clarifier w coagulant~~
- Sand filter vessels x2
- Bag filter vessels x2
- GAC adsorption vessels x2
- Effluent holding tanks

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Adapting to Increased Flow

- Collection Sump
  - Weir system
  - Floating suction line
  - Mechanical removal of settled solids

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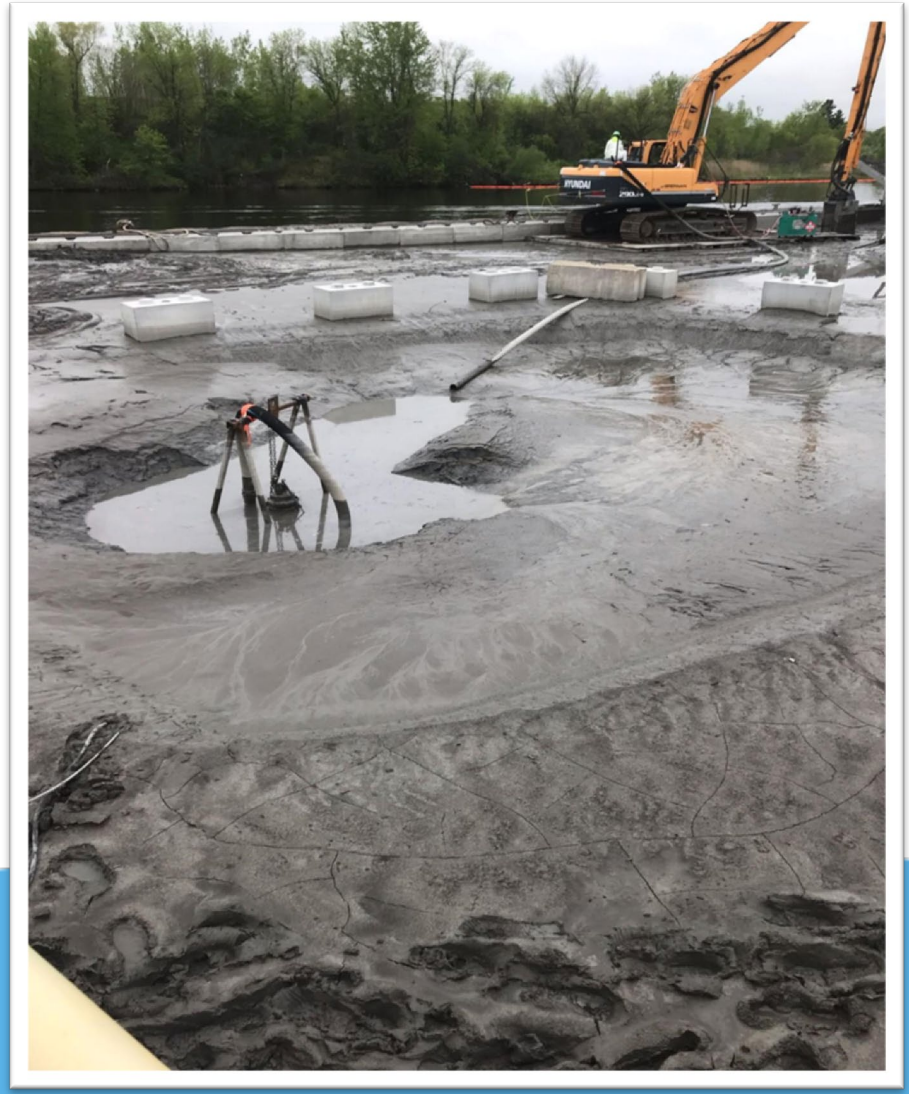

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Adapting to Increased Flow

- Geotextile tubes
  - 3 tubes used concurrently
  - Unique sizes
  - Selective filling cycles
  - Selective dewatering cycles

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Adapting to Increased Flow

- Settling and clarification processes
  - Altered plumbing of influent holding tanks
  - New coagulant injection points
  - Clarification via original lamella recognized as unnecessary
  - Selective pumping

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Adapting to Increased Flow

- Filtration and adsorption processes
  - 2nd treatment train with same processes installed
    - Operate independently and simultaneously
    - Concurrent treatment and backwash

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Benefits of Geotextile Tubes

- Equalization point in flow process
- Low maintenance with proper chemical dosing
- Ability to capture wide range of material

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Benefits of Geotextile Tubes

- Cost effective
  - Often no amendment
- Protection for sensitive equipment
- Safely contain contaminated material

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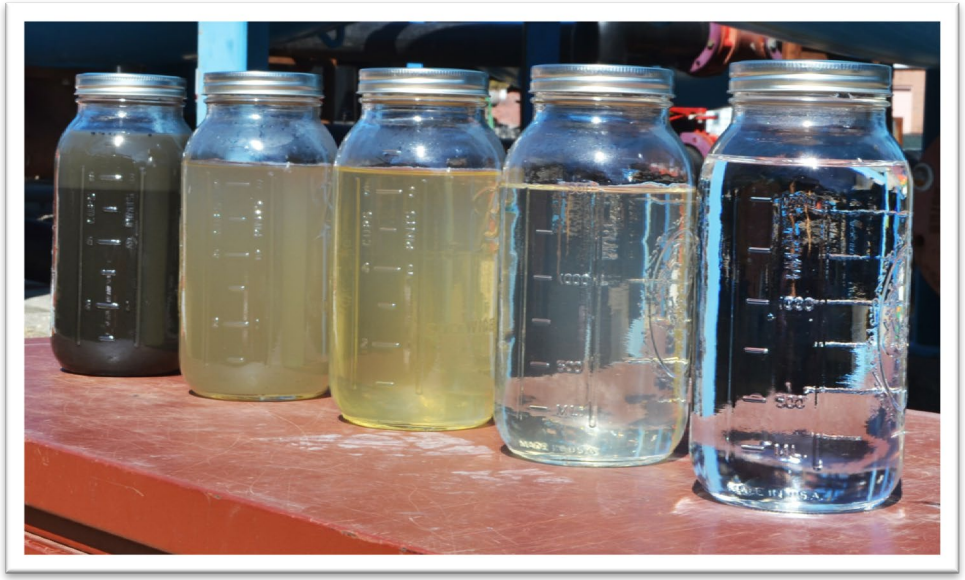
Compliance Monitoring

- Direct discharge to pre-existing water treatment facility
  - Regulated under SPDES permit program
- Continuous discharge
  - Batch discharge for first 60,000 gallons



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Compliance Monitoring

- Effluent samples collected for analysis weekly
  - Discharge criteria established by project specification
  - TSS limit - 20 mg/L
  - Total PCBs limit – 3 µg/L
- Discharge criteria met throughout this work
- Zero effluent samples with detectable concentrations of PCBs

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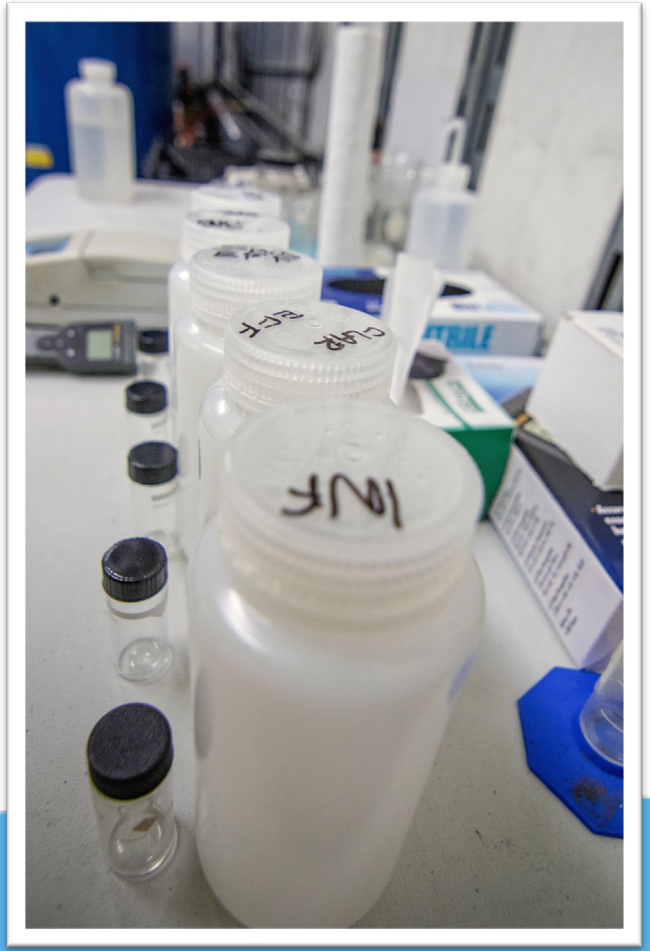
Process Control Monitoring

- Samples collected bi-monthly
  - Geotextile tube slurry (TSS, PCBs)
  - Geotextile tube filtrate (TSS, PCBs)
  - Multimedia filter effluent (TSS)
  - Bag filter effluent (TSS)
  - Lead GAC effluent (PCBs)
- Provides individual process performance insight
- Allows for trends to develop



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Rates of Contamination Removal

- Geotextile tube filtration
  - Available TSS removal rate ~ 99%
  - Available PCB removal rate ~ 58%
- Suggests PCBs affinity for solids

	Process Influent	Process Effluent
Avg. TSS conc. (mg/L)	71,000	23
Avg. PCB conc. (µg/L)	2.26	.946

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Rates of Contamination Removal

- Clarification
  - Available TSS removal rate ~ 30%
- Resuspension of settled solids a factor
  - Lack of ability to capture settled solids

	Process Influent	Process Effluent
Avg. TSS conc. (mg/L)	23	16

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Rates of Contamination Removal

- Multimedia filtration
  - Available TSS removal rate ~ 100%
  - Method reporting limit of 1.0 mg/L

	Process Influent	Process Effluent
Avg. TSS conc. (mg/L)	16	<1.0

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Rates of Contamination Removal

- Bag filtration
  - Available TSS removal rate ~ negligible
  - Not uncommon for higher effluent turbidity
  - Prevent potential GAC fouling

	Process Influent	Process Effluent
Avg. TSS conc. (mg/L)	<1.0	<1.0

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Rates of Contamination Removal

- Granular Activated Carbon (GAC) adsorption
  - Lead GAC primary adsorber
  - Lag GAC safety measure

	WTP Influent	WTP Effluent
Avg. PCB conc. (µg/L)	0.946	0.023

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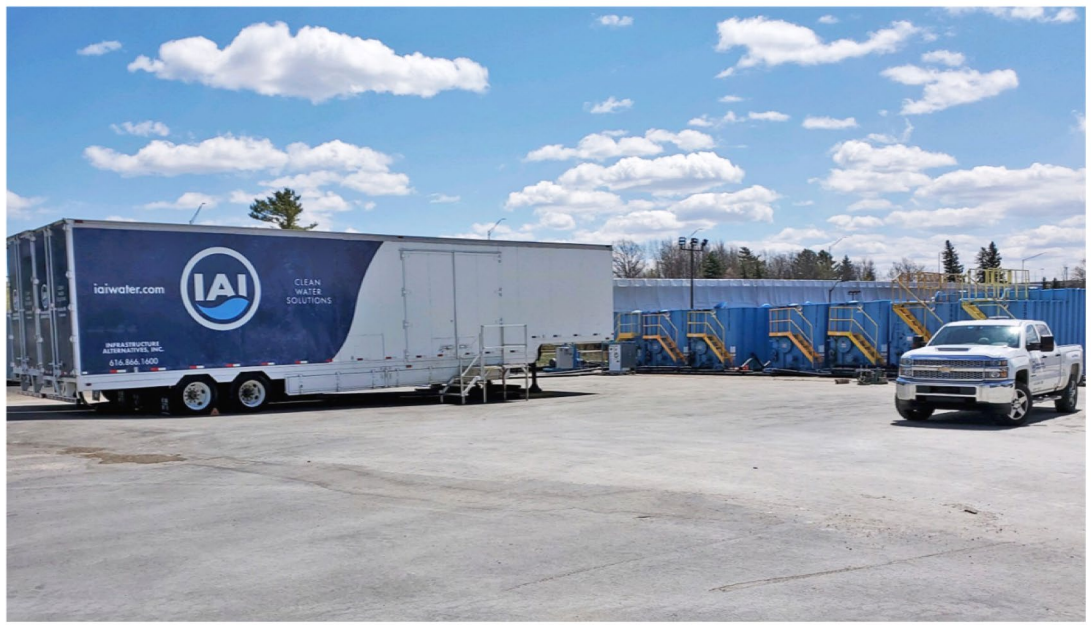
Operational Techniques

- Plan for unexpected occurrences
  - Unanticipated flows
  - Changes to key operations
  - Unusual weather events
- Add flexibility where possible
  - Equalization points
  - Efficient use of space
  - Additional workers during critical times



Operational Techniques

- Process control monitoring
  - Laboratory analysis
    - Create own schedule
  - Water quality
    - Hourly turbidity and pH measurements
  - Water treatment processes
    - Pressure vessel differential checks
    - Frequent slurry floc checks

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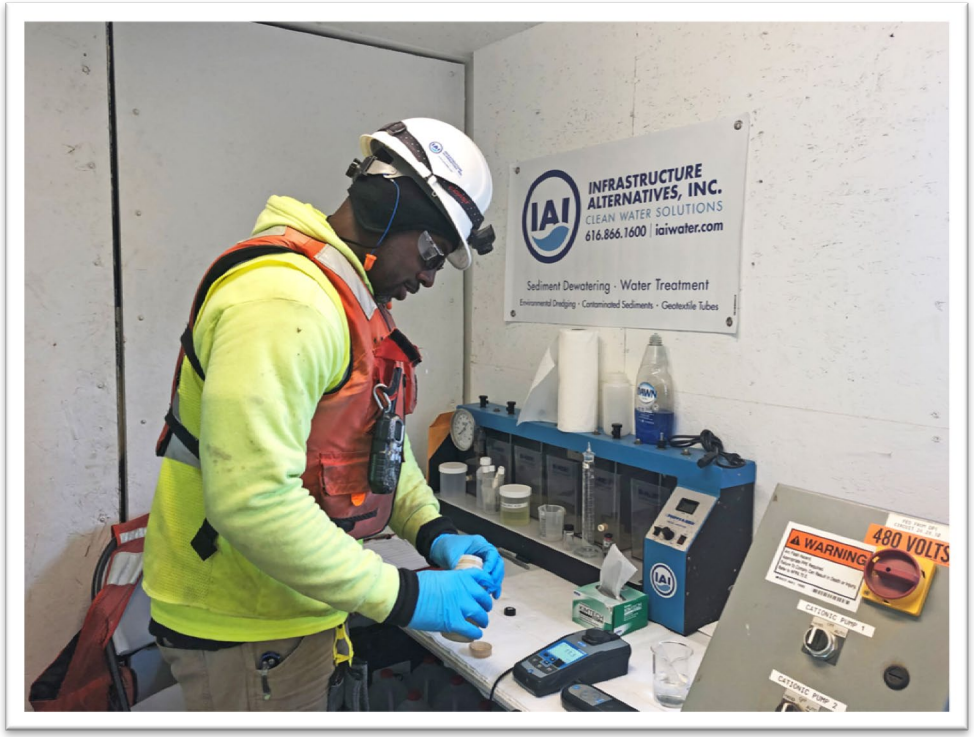
Operational Techniques

- Operator responsibilities
  - Thoroughly understand design capabilities
    - Power requirements, min/max flows and pressures
    - Maintenance based on manufacturer recommendation at minimum
  - Constant visual and auditory observations
  - Know intricacies of entire project



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QUESTIONS?

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