



# Wastewater Impacts on Receiving Streams

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# Overview

- Common Contaminants / Indicators
- Types of Treatment
- Types of Discharge
- Mitigating Stream Impacts

# Common Contaminants / Indicators

Biochemical Oxygen Demand

Consumes Watercourse Oxygen

Total Suspended Solids

Accumulates in stream

Nutrients - Ammonia / Phosphorus / Nitrogen

Toxic / Algae Blooms

Fecal Coliforms

Indicator of pathogen potential in stream



# Common Types of Treatment

- Facultative Lagoons
- Aerated Lagoons
- Biological Nutrient Removal
- Packaged Treatment Systems
  
- *Wetland lagoons - Uncommon*

# Facultative Lagoons

- <5,000 people
- BOD reduction from natural environment
- TSS / Sludge Settlement
- Generally poor Nutrient Removal
- Often unregulated discharge quality
- Not currently subject to CCME Guidelines



# Aerated Lagoons

- 5,000 – 20,000 people
- BOD reduction from aeration
- TSS / Sludge Settlement
- Generally poor Nutrient Removal
- Struggles to meet to CCME Guidelines for Ammonia Removal







# Biological Nutrient Removal

- Primarily > 20,000 people
- Reduction of Nutrients by Encouraging Microscopic Organisms to break down wastewater constituents
- Complex Operations
- Higher standard of treatment across parameters



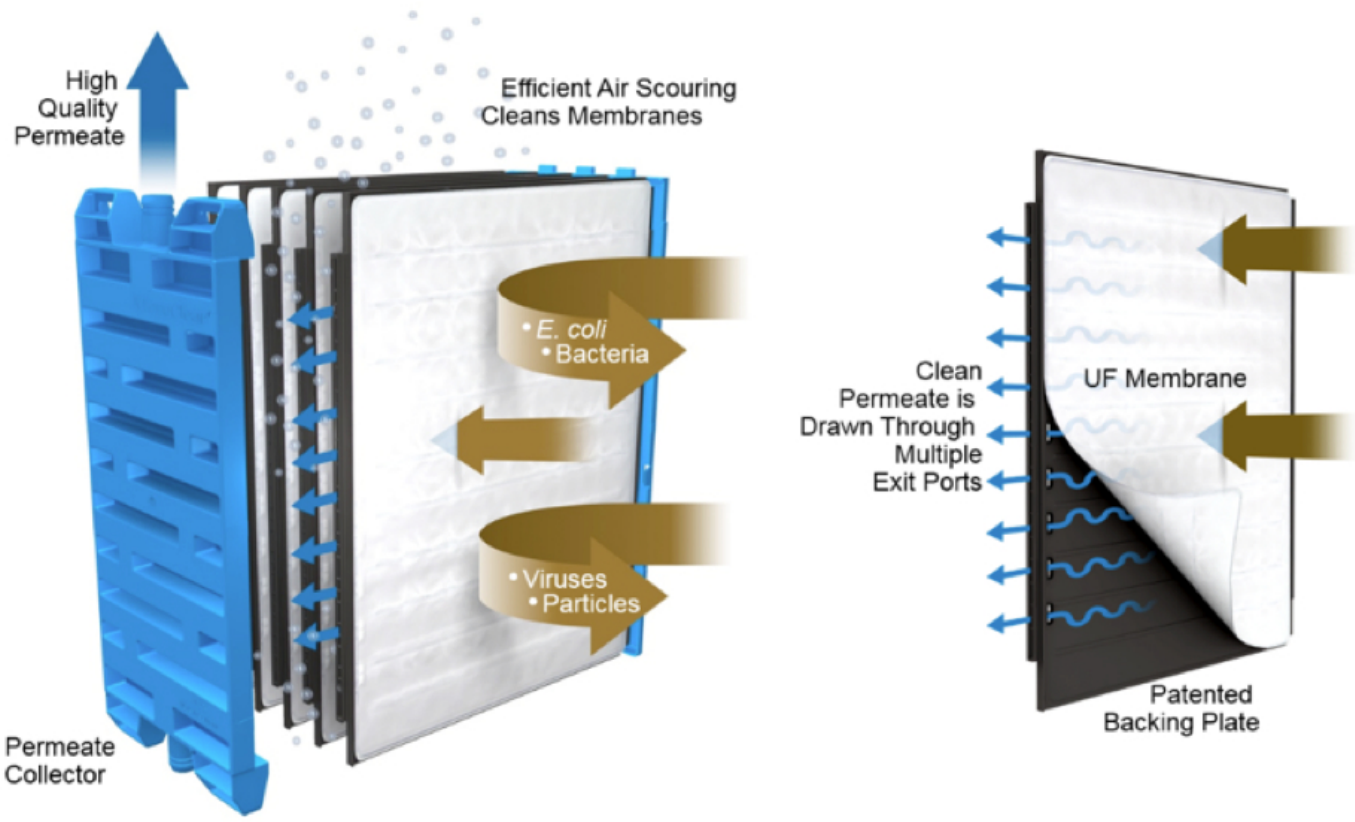




# Packaged Systems

- Small developments, ag/industrial sites and camps
- Scalable, but at small sizes ~300 people equivalents
- Technology selection based on unique site characteristics
- Cost prohibitive at larger sizes
- Operationally intensive
- Beware over-promise, under delivery





# Wetland Lagoons

- Plants used to absorb nutrients from the wastewater
- Very few installations in Alberta
- Small scale residential sites
- Back-end treatment on existing lagoons
- Airport runway runoff treatment
- Meth Lab

# Discharge Options

- Annual / Semi-Annual
  - Consider Ammonia Toxicity
- Continuous Discharge
  - Typical for Large Plants along Rivers
  - Cumulative impacts of discharge now considered when setting treatment parameters (stream health, other discharges, downstream users)
  - Dilution Ratio of 10:1
  - Aquatera Grande Prairie WWTP
- Irrigation / Effluent Reuse
  - Type of Irrigation or Industry User determines treatment requirements
- Evaporation
  - Not common outside of Southern Alberta, sized for 3 year storage



# Mitigation Strategies

- Ammonia
  - No magic ammonia reduction system
  - Understand the impacts of temperature
  - Maintain Heat for Nitrification
  - Storage & Dilution
  - Lagoon-based retrofits for small systems with available space

# Mitigation Strategies

- Right Size, Don't Oversize
  - Biological Systems subject to failure from under-loading
  - Modularize and be realistic with system planning
- Partner with Water Users
  - Maintain Heat for Nitrification
  - Storage & Dilution
- Beware of Regulatory Triggers
  - Treatment jumps = Tighter limits

# Discussion