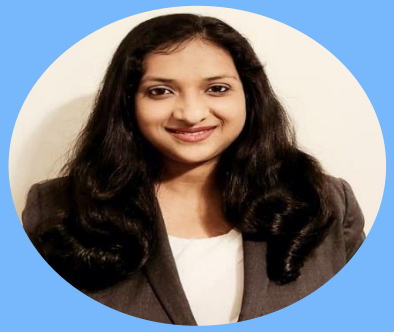
BUILDING A POTABLE WATER REUSE SOLUTION

Gwinnett County's Experience Implementing Advanced Wastewater Treatment

November 2nd, 2021

Today's Presenters

Stephen Katz, - **Presenter**
Global Market Development Manager
SUEZ – Water Technologies & Solutions



Gayathri Ram Mohan, Ph.D., P.E. - **Presenter**
Research Scientist V
Gwinnett County – Dept. Water of Resources

Trevor Dale, Ph.D. - **Moderator**
Global Product Manager
SUEZ – Water Technologies & Solutions

Justin Garmon, - **Presenter**
Operations Superintendent
Gwinnett County – Dept. Water of Resources

Agenda

1. Potable Water Reuse & Technology
2. Gwinnett County's Experience
3. Q&A

1.

Potable Reuse & Technology

Water Risks to Society

Too Much

Too Little

Too Polluted

water reuse at the center

The continuum of water recycling

Key Drivers for Potable Water Recycling

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Acceptance

Need has pushed growth in public acceptance

Scarcity

40+% of global population deal with water scarcity today & water scarcity could cost some regions up to 6% of their GDP

Resilience

Communities need a consistent supply of freshwater

Cost

Recycling is a cost competitive means of augmenting freshwater supplies

Environmental

Protection of waterways and certain areas have significant issues like land subsidence or sea-water intrusion due to groundwater extraction

Technology Building Blocks for Advanced Reuse

Membrane Bioreactor

BARRIER TO: Organics, Particulates, Nutrients - N&P, Pathogens

Ultrafiltration

BARRIER TO: Particulates, Nutrients - P, Pathogens

Reverse Osmosis and Nanofiltration

BARRIER TO: Particulates, Nutrients - N&P, Pathogens, Trace Chemicals, Dissolved Salts

ADDRESS REMOVALS OF:

- Organics
- Particulates
- Nutrients – N&P
- Pathogens
- Trace Chemicals
- Dissolved Salts

Advanced Organics Monitoring

TOC Analyzers

Ozone and Biofiltration

BARRIER TO: Trace Chemicals, Pathogens

EDR

BARRIER TO: Nutrients - N&P, Dissolved Salts

Ozone and UV

BARRIER TO: Pathogens, Trace Chemicals

Deciding on a Treatment Scheme

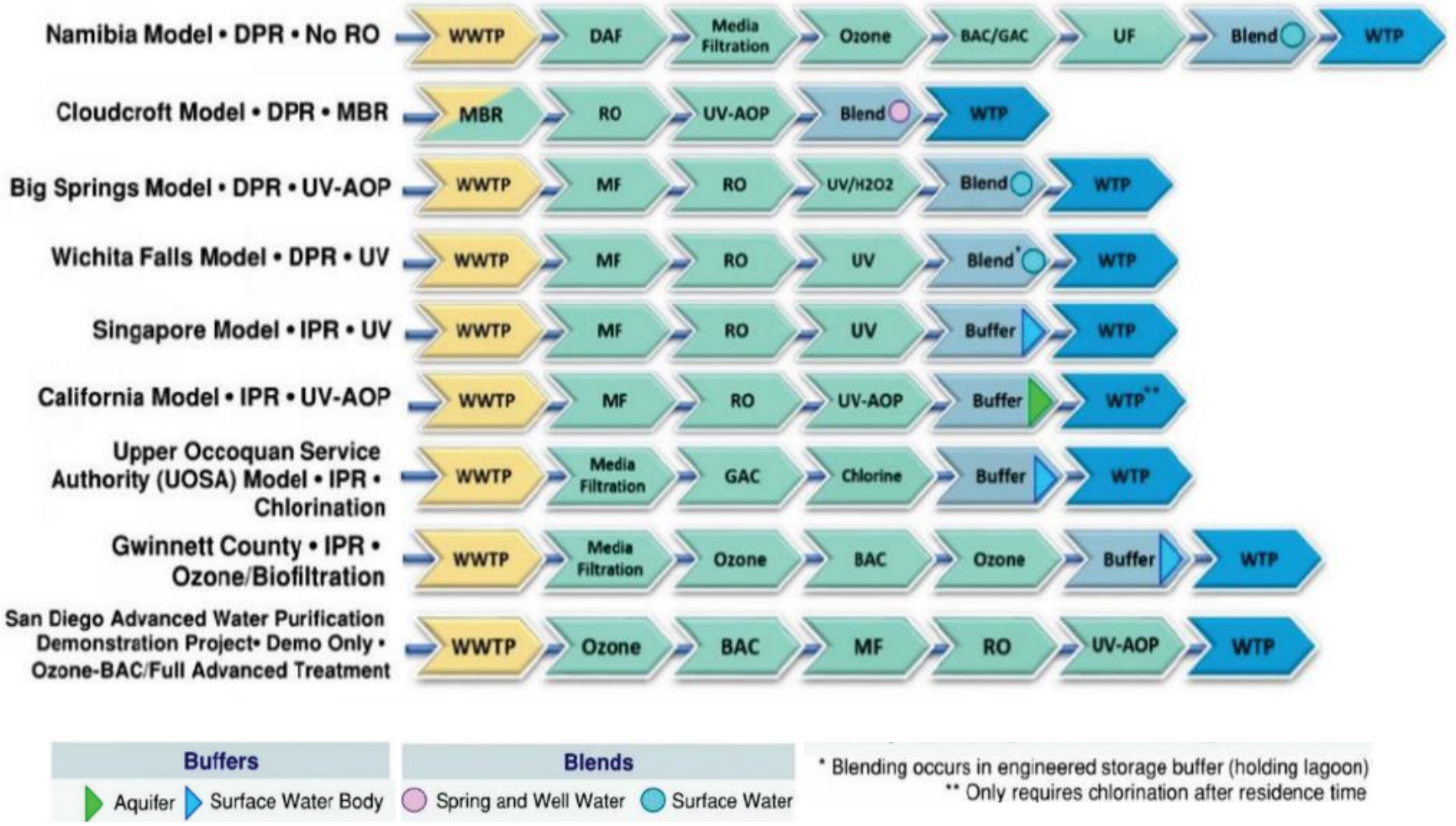
Starting Quality

Available Infrastructure

Treatment Objectives

Regulatory Framework (?)

Local Implication



US EPA 2017 Potable Reuse Compendium

2.

Gwinnett County’s Experience

GCDWR Facilities

Water Production

Two Facilities
150 MG per Day
98 MG per Day

Water Reclamation

Three Facilities
60 MG per Day
22 MG per Day
16 MG per Day

Wastewater Pump Stations

220 Pump Stations

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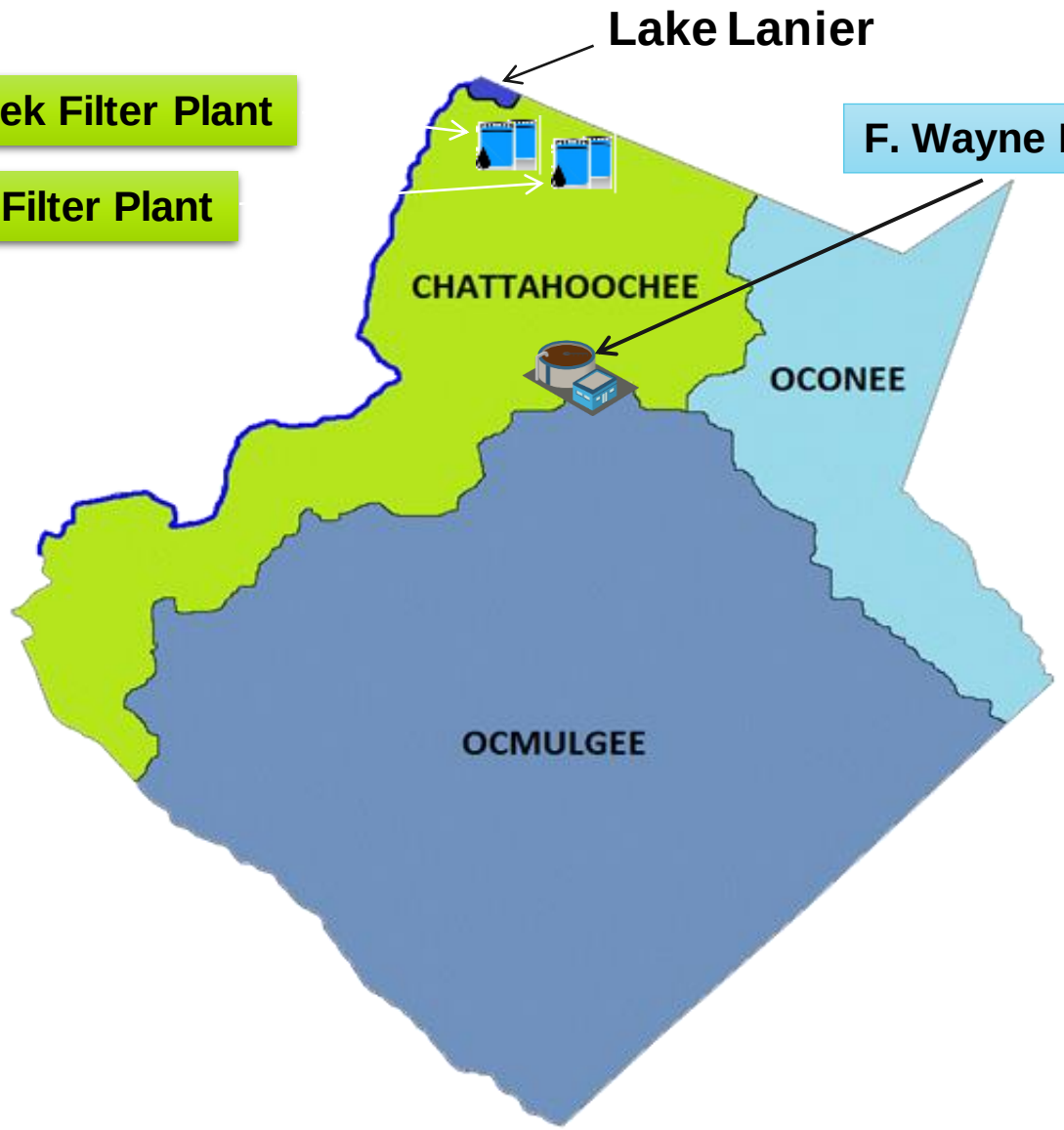
GCDWR Facilities

Water Production

Shoal Creek Filter Plant

Lanier Filter Plant

Two Facilities
150 MG per Day
98 MG per Day



Water Reclamation

Three Facilities
60 MG per Day
22 MG per Day
16 MG per Day

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F. Wayne Hill
Water Resources Center

60 MGD Capacity

- Phase 1 completed in 2000
- Phase 2 completed in 2006

One of World's Largest Membrane and Ozone Facility

Produces Highest Quality Reuse Water Return to Lake Lanier

Provides Wastewater Treatment for over 50% of Gwinnett County's Residents

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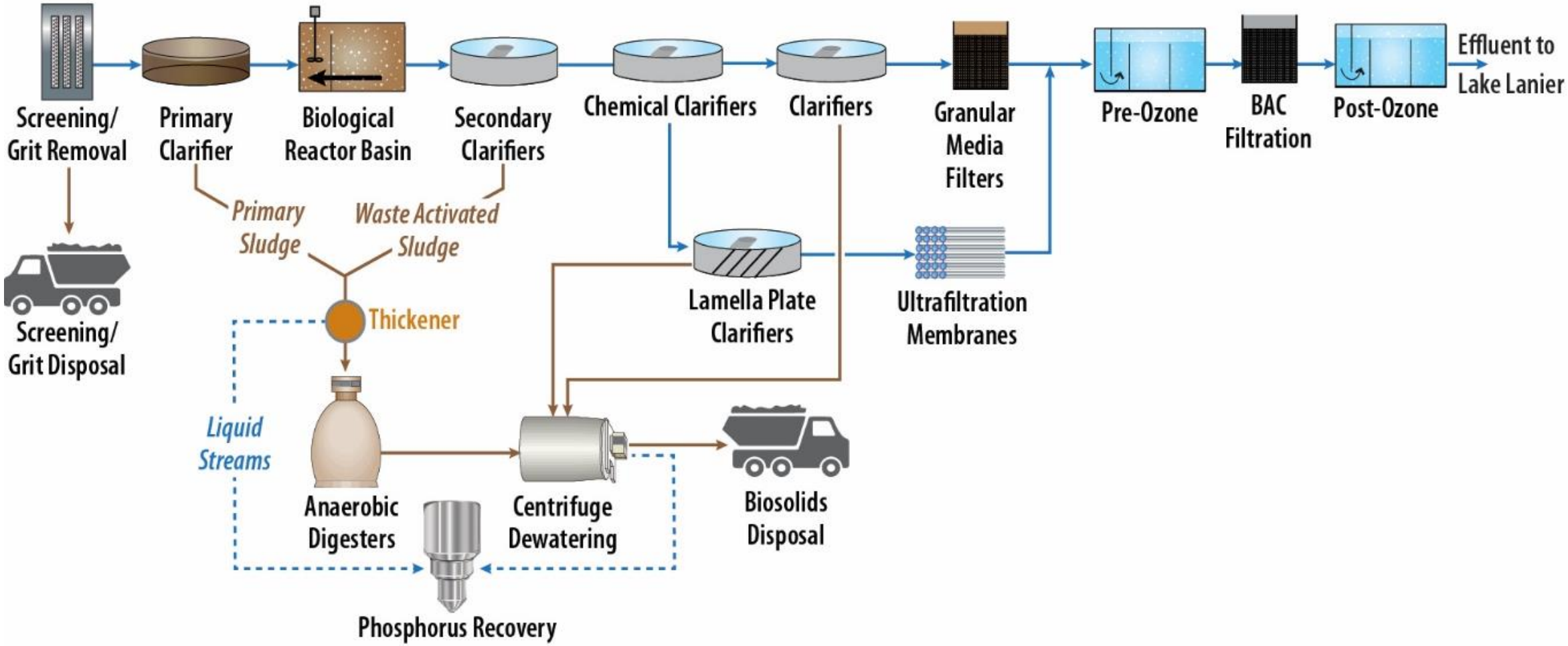
FWHWRC Process Flow

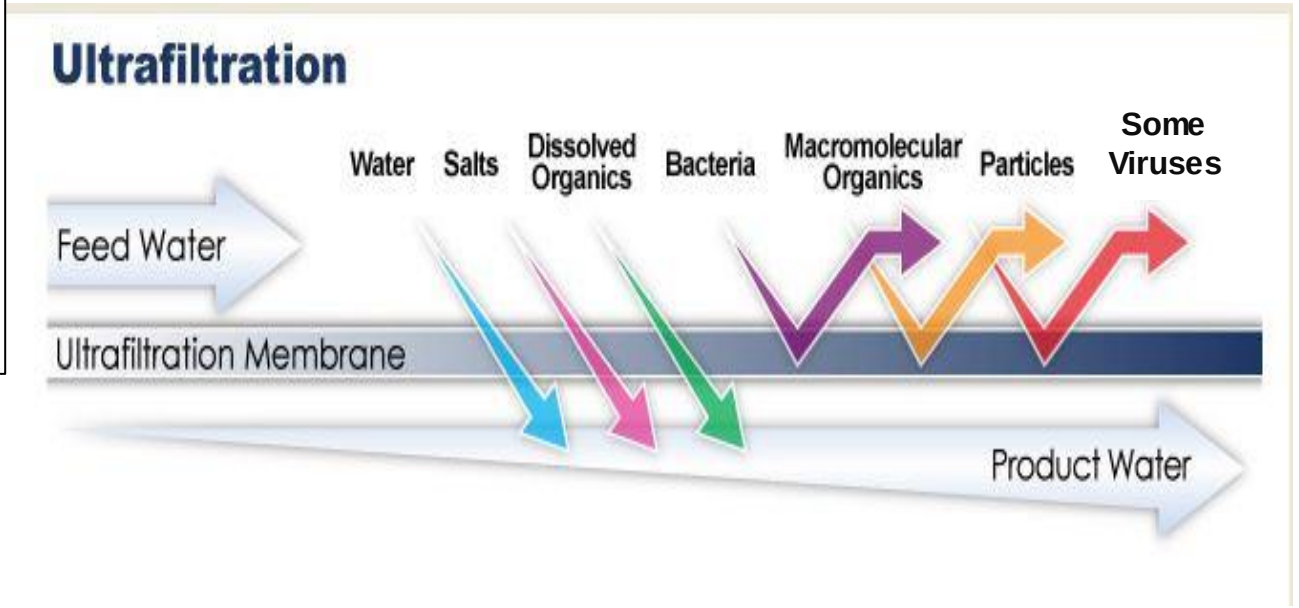


Tertiary Filtration - Ultrafiltration Membranes

Removes solids down to 0.045 microns

Membrane Influent WQ-

- COD- 20 mg/L
- TOC- 7 mg/L
- Turbidity- 1.5 NTU
- TSS- 7 mg/L
- Total P- 0.13 mg/L



Membrane Effluent WQ-

- COD- 12 mg/L
- TOC- 5 mg/L
- Turbidity- < 0.2 NTU
- TSS- <1 mg/L
- Total P- 0.02 mg/L

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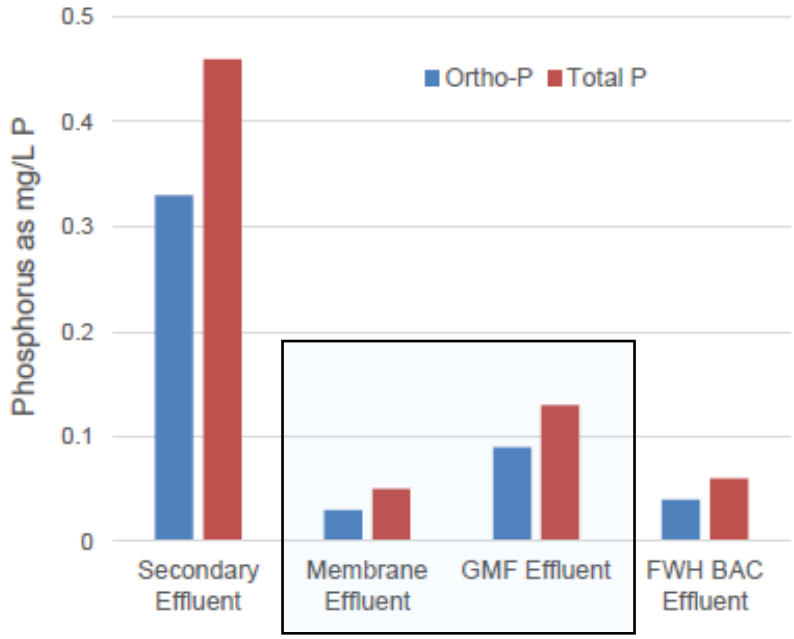
Submerged UF Membranes- ZeeWeed 500C (Original) ZeeWeed 500D (2021)

Parameter	Design
Production Capacity, MGD	48
Number of Trains	14 + 2[a]
Flux Rate[1] GFD Net Instantaneous	 29.3 38.9
Average Transmembrane Pressure, PSI	6.2
Average Permeability, GFD/PSI	5.5

[a] *The UF System is designed to process 48 MGD with two trains out of service.*



GMF Eff Turbidity- 0.5-1 NTU
Membrane Eff Turbidity- 0.1-0.2 NTU

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Approach to Restoring Performance via Enhanced Recovery Cleaning (ERC)

CHARACTERIZE FOULANTS

Irreversible Fouling from Ferric

SCREEN CANDIDATE CLEANING CHEMICALS

Citric acid, Ascorbic acid, SBS, Avista 127

BENCH-SCALE TESTING

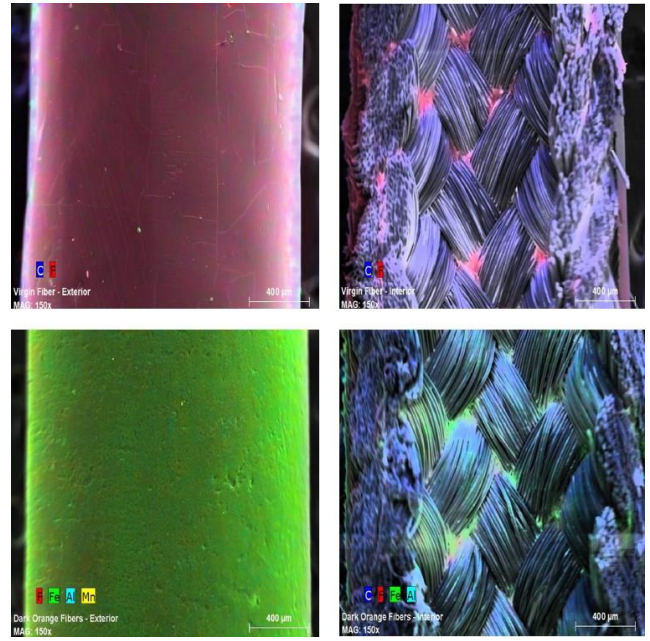
Single fiber module testing

FULL-SCALE TRIALS

Dip Tank trials

OPTIMIZE & IMPLEMENT CLEANING PROTOCOL

Patent for enhanced cleaning awarded to GCDWR in 2021



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Benefits of ERC

- RESTORED PERMEABILITY & INCREASED PLANT PRODUCTION
- REDUCED CHEMICAL AND ENERGY COSTS
- EXTENDED MEMBRANE LIFE (17 YEARS VS INDUSTRY EXPECTATION 10 YEAR)
- ALLOWED SUFFICIENT TIME TO EVALUATE MEMBRANE REPLACEMENT OPTIONS
- PATENT ISSUED IN 2021 FOR ENHANCED MEMBRANE CLEANING
  - Enables other utilities to benefit

- 34% INCREASE IN PERMEABILITY ACROSS ALL TRAINS
- 4.4 BILLION GALS OF ADDITIONAL PRODUCTION
- 660 MEGAWATT-HOURS OF ENERGY SAVINGS

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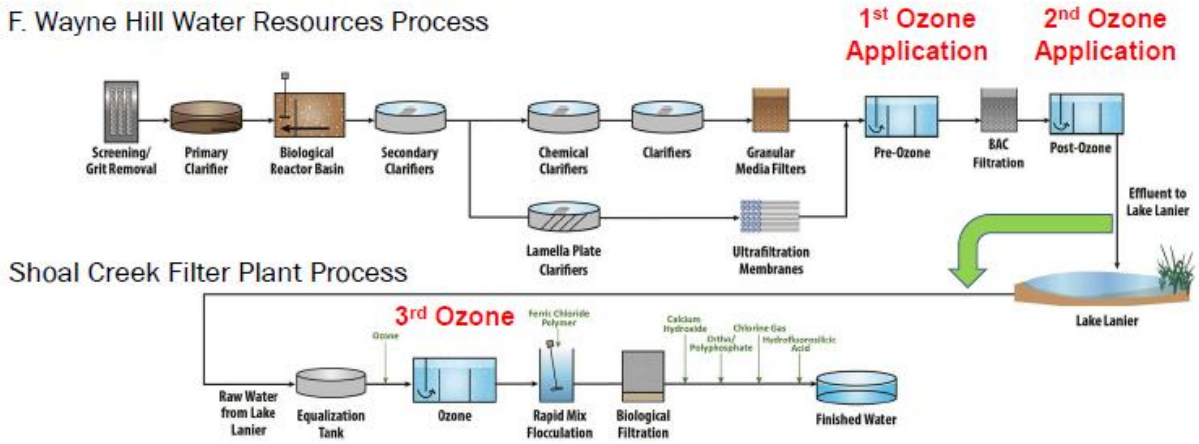
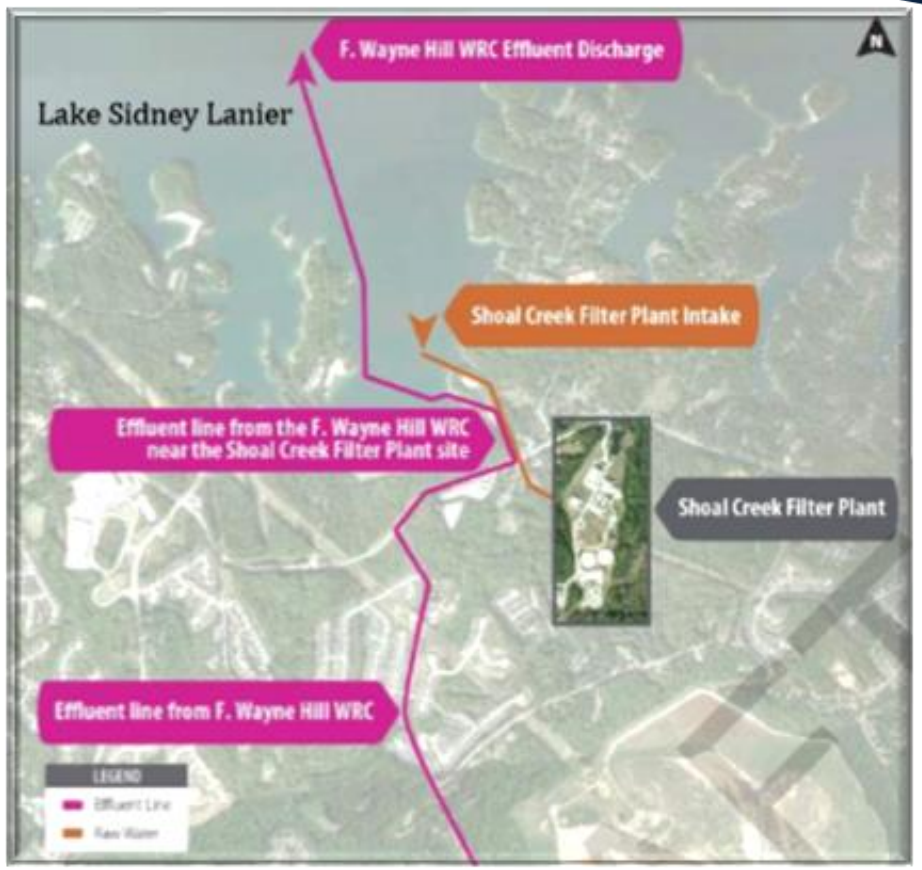
IPR at Gwinnett County



FWHWRC Design Flow- 60 MGD (MMADF)

NPDES Permit Requirement-
COD - 18 mg/L
TP - 0.08 mg/L
NH3 – 0.4 mg/L
TSS – 3 mg/L
Turbidity – 0.5 NTU



Indirect Potable Reuse at Gwinnett County

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The future of Reuse- DPR

TESTED VARIOUS BLENDS OF FWHWRC EFFLUENT + LAKE LANIER RAW WATER SOURCE TO SHOAL CREEK FILTER PLANT

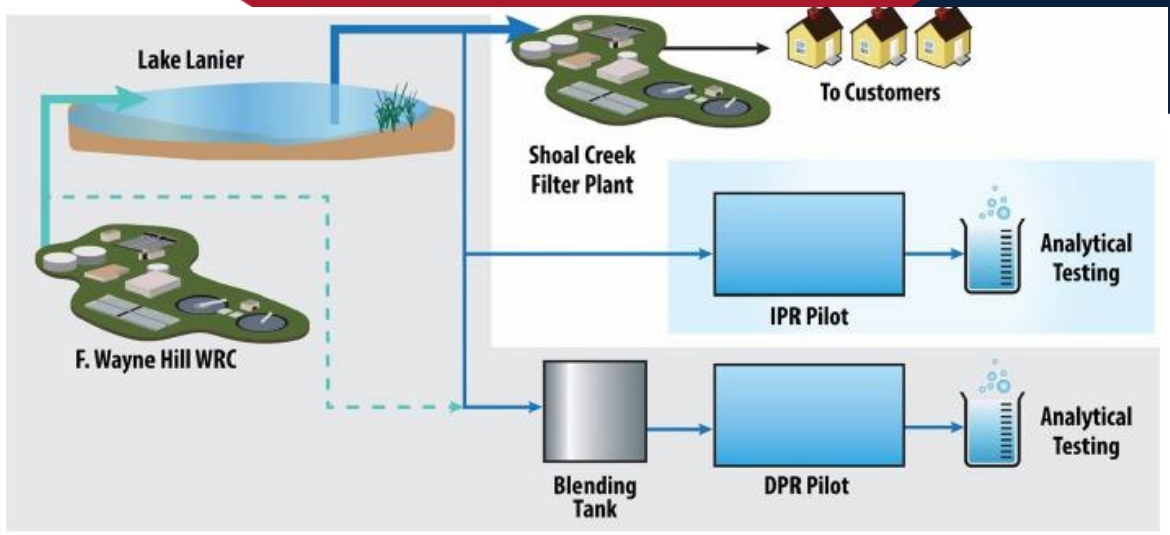
15% BLEND MET ALL PRIMARY AND SECONDARY MCLS

ONLY 3 OUT OF 300 PRIMARY CONTAMINANTS EXCEEDED POTABLE WATER QUALITY

STUDY SHOWED O3-BAF TO BE AN ECONOMIC ALTERNATIVE TO RO BASED REUSE TREATMENT SCHEME, ESPECIALLY FOR INLAND UTILITIES

REFERENCE –

HTTPS://WWW.WATERRF.ORG/RESEARCH/PROJECTS/DEMONSTRATION-HIGH-QUALITY-DRINKING-WATER-PRODUCTION-USING-MULTI-STAGE-OZONE



Reference- WRF 4777 (WERF 15-11)

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Ozonia Equipment Evolution at FWH

Original install = 1999

Equipment = ***3 x Ozonia OF-208L ozone generators***

Max ozone production = ***900 lbs/day @ 8% O3 ea. unit***

Expansion = 2004

Equipment = ***2 x Ozonia OF-210L ozone generators***

Max ozone production = ***900 lbs/day @ 10% O3 ea. unit***

Upgrade = 2014

Power/controls equipment = ***upgrade PLCs, HMIs, & core power technology of PSUs; (incl. pre-ozone and post-ozone MOCP (master ozone control panels))***

Process equipment = ***Dielectrics (core of ozone generator) upgraded in the OF-208Ls to more efficient IGS™ (Intelligent Gap System) technology***

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F. Wayne Hill WRC- Advanced Treatment

Breaks down Recalcitrant Organics

Removes Dissolved Organics

Disinfection

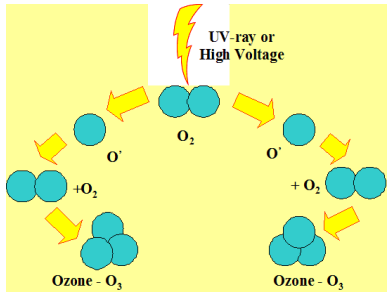
Chemical Clarifiers

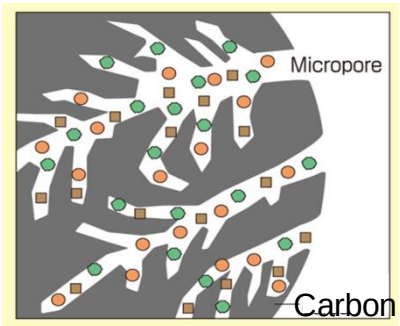
Membranes/ Granular Media Filters

Pre-Ozonation

Biologically Activated Carbon

Post-Ozonation





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WRF 5092

Understanding and Improving Reuse Biofilter Performance During Transition from GAC to BAC

GAIN A BETTER UNDERSTANDING OF THE TRANSFORMATION FROM GAC TO BIOLOGICALLY ACTIVATED CARBON (BAC) FILTRATION.

INVESTIGATE ENHANCED SEEDING APPROACHES

EVALUATE ROLE OF PRE-OXIDANT (OZONE) AS A SELECTOR

COMPARE PILOT AND FULL-SCALE IMPLEMENTATION OF SEEDING STRATEGIES

DEVELOP GUIDANCE FOR UTILITIES EMPLOYING BIOFILTRATION IN REUSE APPLICATIONS.

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PILOT TRIAL COMPLETED AT FWHWRC

YEAR–LONG FULL-SCALE OZONE-BAC TRIALS TO BEGIN IN NOV 2021

PROJECT LINK- HTTPS://WWW.WATERRF.ORG/RESEARCH/PROJECTS/UNDERSTANDING-AND-IMPROVING-REUSE-BIOFILTER-PERFORMANCE-DURING-TRANSFORMATION-GAC

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3.

Questions & Answers

Submit your questions via the chat function.

THANK YOU!

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