Case Studies
Rain & Storm Water Management at the Cincinnati Zoo and Botanical Gardens

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The challenge:

- Treat Stormwater to acceptable quality for beneficial reuse for:
  - Polar Bear makeup water
  - Bird House irrigation
  - Lion Moat make up water
  - Cheetah Moat make up water
  - Africa exhibit irrigation
  - Restaurant lower-level restroom toilet-flushing (possible future)
The solution:

- Treats harvested Stormwater to desired quality
- Delivers reuse quality water at 60 GPM @ 65 psig
Catchment

- Water sources
  - 60+% parking lot
  - Catch basins, roof drains, walking paths of pervious pavement, and exhibit space
Pre-Filtration

- First Flush
- Pre-filter/Sand/Debris filter
- The best way to filter the water is at the source!
Storage

- 300,000 gallon below ground

![Diagram of water treatment cycle:
- Catchment
- Pre-Filtration
- Post Filtration
- Controls
- Pumping water
- Storage](image-url)
Pumping Water

- Submersible in cistern
- 5 HP Grinder Pump
- VFD Controlled
- On/Off based upon day tank level
Transfer Pump Install
Controls

- Color touch screen
- Membrane flush/integrity
- Transfer pump
- UF pre-filter flush
- Buffer tank level
- Distribution pump
- Pressure regulation
- Outdoor tank level
Control Panel Install

100 PSI 128 GPM
Low Pressure Alarm

OVERVIEW
SYSTEM
FLOW
LOGGING
ALARMS
Water Quality

Ultra Filtration

- Pre-Ultra Filtration: 100 micron automatic self-flushing filter
- 2580 SQ-FT total UF membrane filtration surface area
- 0.02 micron pore size delivers >80% TSS removal
- Automatic back-flushing/cleaning
What is Ultrafiltration?

- Ultrafiltration, or UF, is a variety of membrane filtration that forces liquid at a pressure against a semi-permeable membrane material.

- This process “screens” out microscopic suspended solids (TSS) and various virus, bacteria, and pathogens like E-coli, Giardia, and Cryptosporidium from the water source!

- Membrane filtration pores are at a microscopic size. Typically 3000 times smaller than a human hair!
Micron Size Comparison

- 150 Microns
  - Average Human Hair

- 25 Microns
  - Lint, Particles Visible to the Naked Eye

- 10 Microns
  - Heavy Dust, Lint, Fertilizer, Pollen

- 5 - 10 Microns
  - Average Dust, Plant Spores, Mold

- 1 - 5 Microns
  - Bacteria, Light Dust, Animal Dander

- 0.3 - 1 Microns
  - Bacteria, Tobacco and Cooking Smoke

- 0.001 - 0.01 Microns
  - Viruses
Intro To Ultrafiltration

Typical UF Membrane Construction

600SQFT TO 1200SQFT Surface Area Range
Ultra-Filtration
End Result
Other Applications

- Toilet Flushing
  - Ohio specific
    - (Vantage Career Center Van Wert, Otsego School Findlay, Glenwood School Glenwood)
- Vehicle Washing
Otsego School - Ohio

- (2) 20,000 gal below ground tanks
- Submersible pump in tank
- Harvested water from a school roof
- City water plumbed direct for back up
- Flushes all toilets in high school
- 5 micron filtration and UV & dye
Oakville Transit – Wash Application

- 30k Below ground storage tank
- Submersible pump in tank
- Control skid with filtration
- Back up water direct to wash system
Thank you