TECHNICAL SNAPSHOT

Cherry Hill Direct Potable Reuse Pilot

Facts and Figures

- Total estimated DPR pilot project costs are $2.59 million.
- Reclaimed water treated at Northwest Regional Waste Water Treatment Facility was analyzed in 2020 to characterize the source water prior to design in 2021.
- The pilot treats 14,400 gallons per day (GPD) or 10 gallons per minute (GPM) of reclaimed water.
- One year of testing will be performed in three phases to identify the most efficient/effective treatment method(s):
    1) Four months with all six treatment processes
    2) Four months bypassing step #1, the Enhanced Coagulation process
    3) Four months bypassing step #4, the Ultrafiltration process
- **No water from the DPR pilot study will be blended with the Cherry Hill WPF or enter the public water system.**
- Florida Department of Health in Polk County issued written Notification of Approval of Proposed Pilot Test on Aug. 11, 2023.

The six treatment processes occur in the following sequence:

1. Enhanced Coagulation and Sedimentation

Enhanced coagulation is achieved in three main steps: coagulation with depressed pH, flocculation, and sedimentation. Conventional coagulation includes adding a chemical or coagulant, such as ferric sulfate, to react with non-soluble compounds and neutralize their surface electrical charge, which destabilizes the water matrix. Flocculation is a physical step where these destabilized particles agglomerate to form larger clumps called "flocs." Coagulation and flocculation are typically followed by sedimentation, where the flocs settle to the bottom of the water tank/chamber by gravity, leaving clear water on the top free of suspended solids and non-soluble compounds. Enhanced coagulation varies from conventional coagulation, where in addition to the coagulant, an acid, such as sulfuric acid, is added to suppress the pH of the water. A suppressed pH allows for removing organic matter and disinfection byproducts precursors, leaving the resulting water with a much lower concentration of total organic carbon (TOC). This step acts as "pre-treatment" to the downstream processes and aids in achieving the treatment process's overall chemical and pathogen goals.

2. Ozone

Ozone is a strong oxidant and a potent disinfectant, capable of oxidizing high molecular weight organic compounds into smaller chain compounds more assimilable by the downstream biological filter. Free radicals such as hydroxyl radicals form when ozone is decomposed in the presence of organic matter, making ozone an advanced oxidation process (AOP) that destroys emerging constituents. Ozone also provides robust removal of illness-causing viruses.

3. Biologically Activated Carbon Filtration

Biologically activated carbon (BAC) filtration is a biodegradation process involving activated carbon as filter media. Activated carbon offers a larger surface area than other common media, such as sand, allowing higher levels of beneficial microorganisms to grow. These beneficial microorganisms easily take up the assimilable organic carbon made available by the upstream ozone process and decrease TOC concentration. Lower TOC decreases the chances of formation of harmful chemical byproducts. Additionally, BAC offers some removal of protozoa.

4. Ultrafiltration

Low-pressure membrane filtration, such as ultrafiltration (UF), is a physical separation process that functions primarily via size exclusion. The UF membrane removes any protozoa and particles greater than the nominal membrane pore size. The UF system consists of hollow fiber membranes that are packaged into a module that will be skid mounted.

5. Granular Activated Carbon

Granular activated carbon (GAC) is an adsorptive filtration step that provides a final barrier for dissolved contaminant removal, including dissolved organic carbon (DOC) and emerging constituents such as per- and polyfluorinated alkyl substances (PFAS). Dissolved contaminants accumulate on the surface of the GAC media until the media's adsorption capacity is consumed. GAC adsorption is a non-steady-state process, with contaminant concentrations in the GAC filtrate increasing over time as media gets consumed. Once the filtrate concentration of the target contaminant reaches a pre-determined operational level, the GAC must be replaced to maintain the finished water treatment goals. The used or "exhausted" GAC media is disposed of offsite and not reused in the treatment.

6. UV Disinfection

UV light is considered as a biophysical disinfection method because of its ability to prevent microorganisms from replicating. The UV disinfection step effectively inactivates any remaining pathogens in the water.

Chlorine Disinfection

Chlorine disinfection is the most widely used form of disinfection in water treatment and is highly effective in disinfecting pathogens such as viruses and bacteria. As a final step in treatment, liquid sodium hypochlorite is added to the treated water to allow for residual disinfecting power.