



**Tuesday, August 16, 2022**  
(Opening Session begins at 8:30am in Napa A&B)

## Keynote Presentation:

### Brian Bernados, P.E.

- ❖ State of California Water Board, Division of Drinking Water
  - ❖ B.S. Civil Engineering, University of Pittsburgh
  - ❖ M.S. Civil Engineering, San Diego State University
  - ❖ Professional Engineer, Civil, State of California
- ❖ Grade T5, Water Treatment Operator, State of California



Technical Specialist reviewing water reuse via groundwater recharge, surface water augmentation, and direct potable reuse. Technical Specialist in advanced technologies, such as ozone/biological filtration, reverse osmosis, UV disinfection, and UV advanced oxidation processes.

### **“Ozone for Direct Potable Reuse: From 1994 to the 2022 California Proposed Criteria”**

Ozonation is an essential water treatment process for Direct Potable Reuse (DPR) in the State of California, where drought necessitates the reuse of wastewater for human consumption. The California Water Board, Division of Drinking Water (DDW) is developing statewide uniform criteria for DPR. Ozonation will be required in concert with Biologically Active Carbon (BAC). Ozonation provides disinfection of pathogens and oxidation of chemicals. When followed by BAC, biodegradation of chemicals provides a critical treatment mechanism.

Ozonation was proposed in 1994 for the famous (or infamous in the eye of the public) City of San Diego “Repurification Project“. That project was ahead of its time and public opposition canceled it in 1999. With its demise, ozonation took a backseat to high dose UV advanced oxidation processes (UV/AOP) in California potable reuse projects. UV/AOP removes the contaminant NDMA via photolysis, whereas ozone oxidizes NDMA precursors. Since this increases the concentration of NDMA, BAC is utilized after ozonation, where the biodegradation lowers the NDMA by over 90%.

California formed an Expert Panel to consider the feasibility of developing uniform regulations for DPR. They wrote a report in 2016, finding development of uniform regulations was feasible. However, DPR would need to address spikes of low molecular chemicals that could pass through Reverse Osmosis (RO), such as acetone and formaldehyde. Demonstration work at the City of San Diego showed that ozone/BAC upstream of RO removed these chemicals by over 90%.

Based upon this demonstration work and a Water Research Foundation report on chemical spikes, DDW is requiring ozone/BAC for DPR projects. Each DPR project will have to design, demonstrate at full-scale, and operate to achieve 90% removal of acetone, formaldehyde, carbamazepine, and sulfamethoxazole. These were identified by a second Expert Panel in 2022 as indicator chemicals.