

Status of Regulations for Surface Water Augmentation and Evaluating the Feasibility of Developing Regulations for Direct Potable Reuse of Recycled Water

Information Item #5
State Water Board Meeting
December 15, 2015



Speaker Panel

- **Karen Larsen**
Assistant Deputy Director, Division of Drinking Water
- **Mark Bartson**
Supervising Sanitary Engineer, Division of Drinking Water
- **Jeff Mosher**
Executive Director, National Water Research Institute
- **Jim Fiedler**
Chief Operating Officer at Santa Clara Valley Water District,
Member of Advisory Group on Direct Potable Reuse
- **Adam Olivieri**
Co-Chair, Expert Panel



IPR – Surface Water Augmentation

- Criteria (regulations) must be adopted by December 31, 2016
- An Expert Panel, convened pursuant to Water Code section 13565, must first make a finding that the criteria are adequately protective of public health
- The Expert Panel has reviewed the draft criteria
- Draft criteria includes advanced treatment and reservoir size and retention time requirements
- Scientific portions of criteria must undergo scientific peer review per Health and Safety Code section 57004
- Expert Panel plans to make finding after external peer review
- CEQA initial study in draft

DPR – Direct Potable Reuse

- By December 31, 2016, DDW must investigate and report to legislature on the feasibility of developing uniform water recycling criteria for direct potable reuse with recycled water [Water Code section 13563(a)(1)]
- A draft DPR criteria feasibility report for public review is due [Sept. 1, 2016](#) [WC section 13563(a)(2)]
- A final DPR criteria feasibility report to legislature and the public is due [December 31, 2016](#) [WC section 13563(a)(3)]
- The Expert Panel was selected and meetings are on-going [WC section 13565(a)]
- Advisory Group providing recommendations to the Expert Panel and DDW also are meeting [WC section 13565(b)]

The Path toward Potable Reuse in California

Information Item #5

State Water Resources Control Board

Board Meeting

December 15, 2015

Mark Bartson, P.E.

Chief, Technical Operations Section

Division of Drinking Water



Conventional Drinking Water Sources

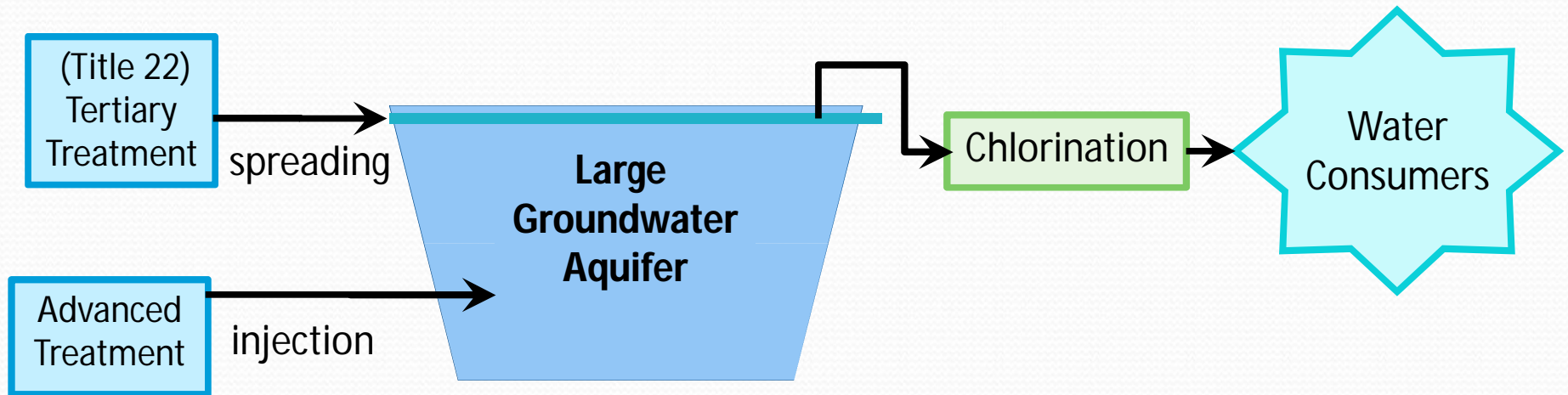
- Groundwater
- Surface Water Sources
- Groundwater directly influenced by surface water
- Extremely Impaired Sources
 - Multiple contaminants or
 - Very high levels of contaminants or
 - Extremely vulnerable to contamination



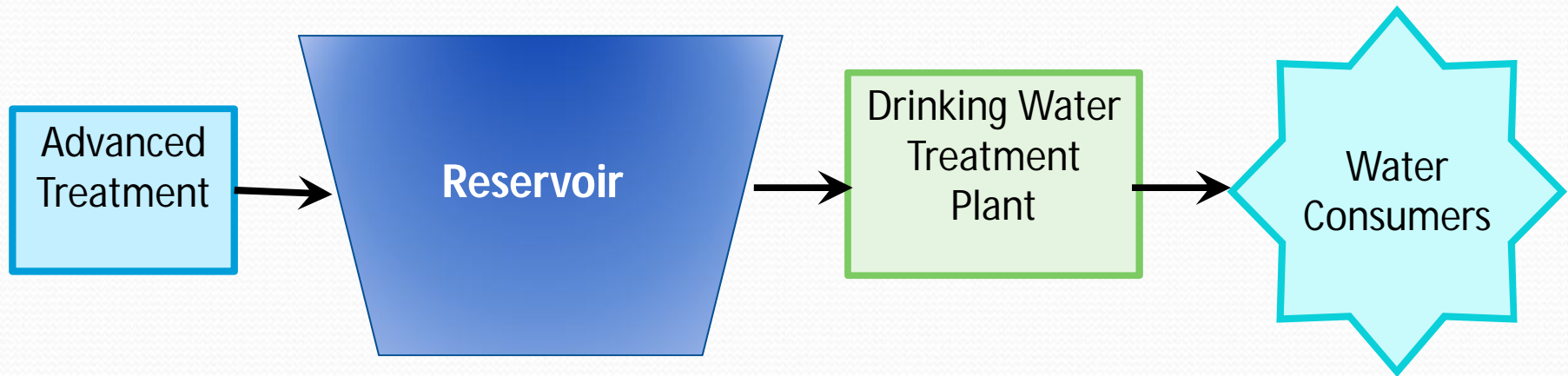
Types of Potable Reuse

- Unplanned potable reuse (de facto)
- Indirect potable reuse by groundwater recharge
- Indirect potable reuse by surface water augmentation
- Direct potable reuse

Indirect Potable Reuse – Groundwater Replenishment (Final Regulations adopted in 2014)



Indirect Potable Reuse – Surface Water Augmentation (Regulations Under Development)





Multiple-Barrier Strategy to Protect Public Health in a Potable Reuse Program

- **Technical barriers** –The Physical Facilities (treatment facilities and environmental barrier)
- **Operational barriers:**
 - Operations and monitoring procedures
 - Failure and response procedures
 - Operator training and certification
- **Management barriers** – Is management committed to go beyond minimum standards?

Multiple Barrier Approach for Groundwater Replenishment

- Municipal wastewater origin
- Source control
- Meet drinking water standards
- **Pathogen control**
- **Minimum treatment train**
- Recycled water contribution requirements
- **Retention time underground**
- TOC and SAT process requirements
- **Control of organic chemicals**
- Control of nitrogen compounds
- Source monitoring, treatment performance monitoring, monitoring wells
- Public Hearing
- Engineering Report
- Hydrogeologic Study, groundwater modeling
- Operation Optimization Plan
- Contingency Plan/Alternative Supply

Technical Considerations for Direct Potable Reuse

- Loss of the environmental buffer (or a small environmental buffer)
- Without an environmental buffer, the monitoring and operation is more critical
- Using the Multiple Barrier approach to develop regulations that are protective of public health
- What additional safeguards are needed to ensure safety of the drinking water supply?



State Water Resources Control Board
December 15, 2015 ♦ Sacramento, California

**SWRCB/DDW Expert Panel for
Surface Water Augmentation
and Direct Potable Reuse**

NWRI | *National
Water
Research
Institute*

Overview

- ❑ Expert Panel Tasks
- ❑ Panel Member Selection
- ❑ Panel Process
- ❑ Timeline



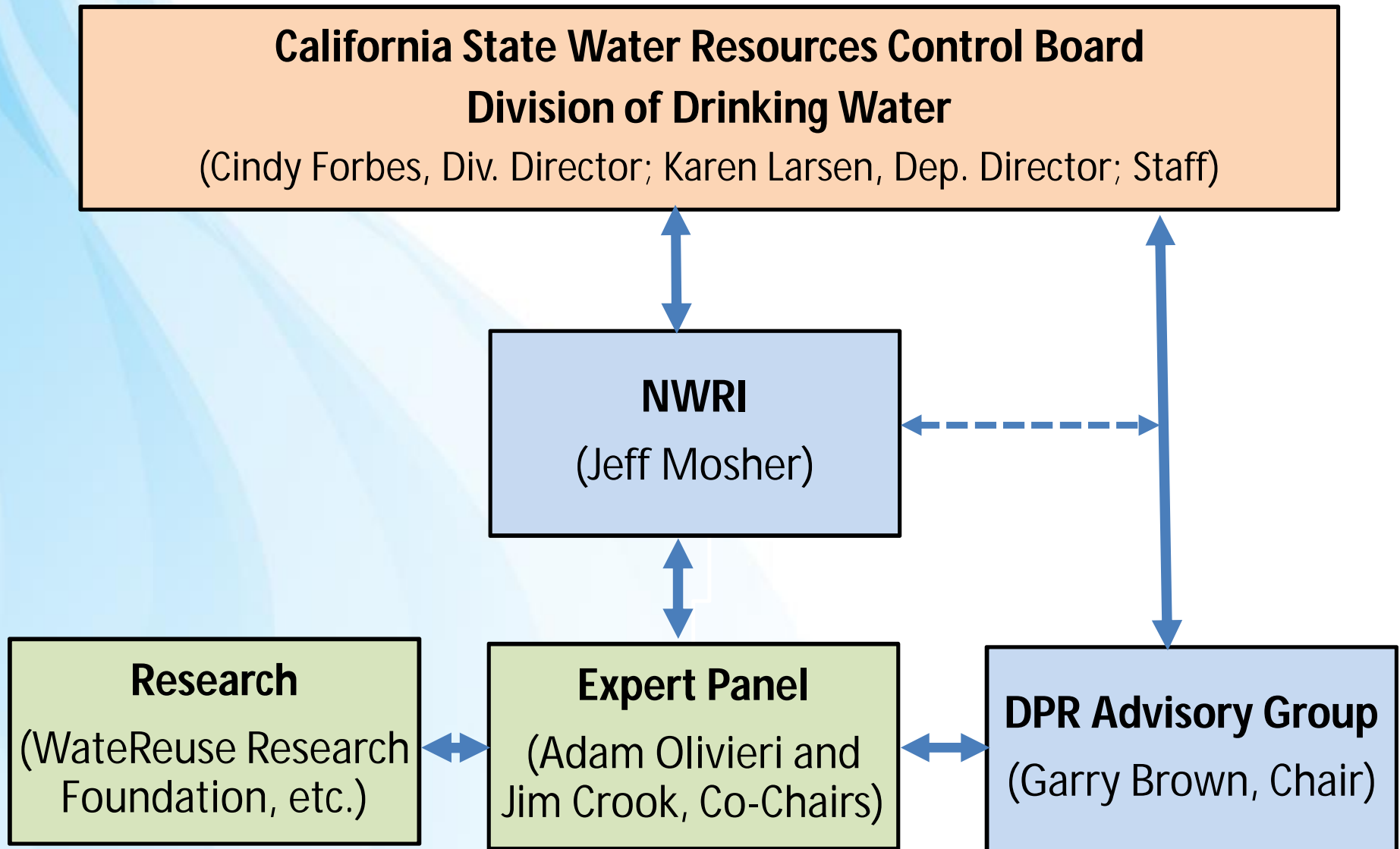


Expert Panel Tasks

[CWC 13565(a)(1)]

1. Advise DDW on public health issues and scientific and technical matters regarding the development of **surface water augmentation (IPR) criteria**
2. Advise DDW on public health issues and scientific and technical matters regarding the **feasibility of developing criteria for DPR.**
3. Assess what, if any, additional **areas of research** are needed to establish criteria for DPR.

SWRCB Expert Panel Organization



Panel Member Selection Process

CDPH (at the time) and NWRI collaboration:

1. Identified “discipline areas”
2. NWRI researched candidates and developed “initial list” based on previous experience, etc.
3. CDPH commented on the list
 - 2 to 4 candidates for each discipline
4. Vetting of list
 - CDPH and NWRI discussed and reviewed candidates
 - Developed (ranked) recommended candidates by discipline
5. NWRI contacted candidates
 - Evaluated “interest” and “availability”

Expert Panel Areas of Expertise

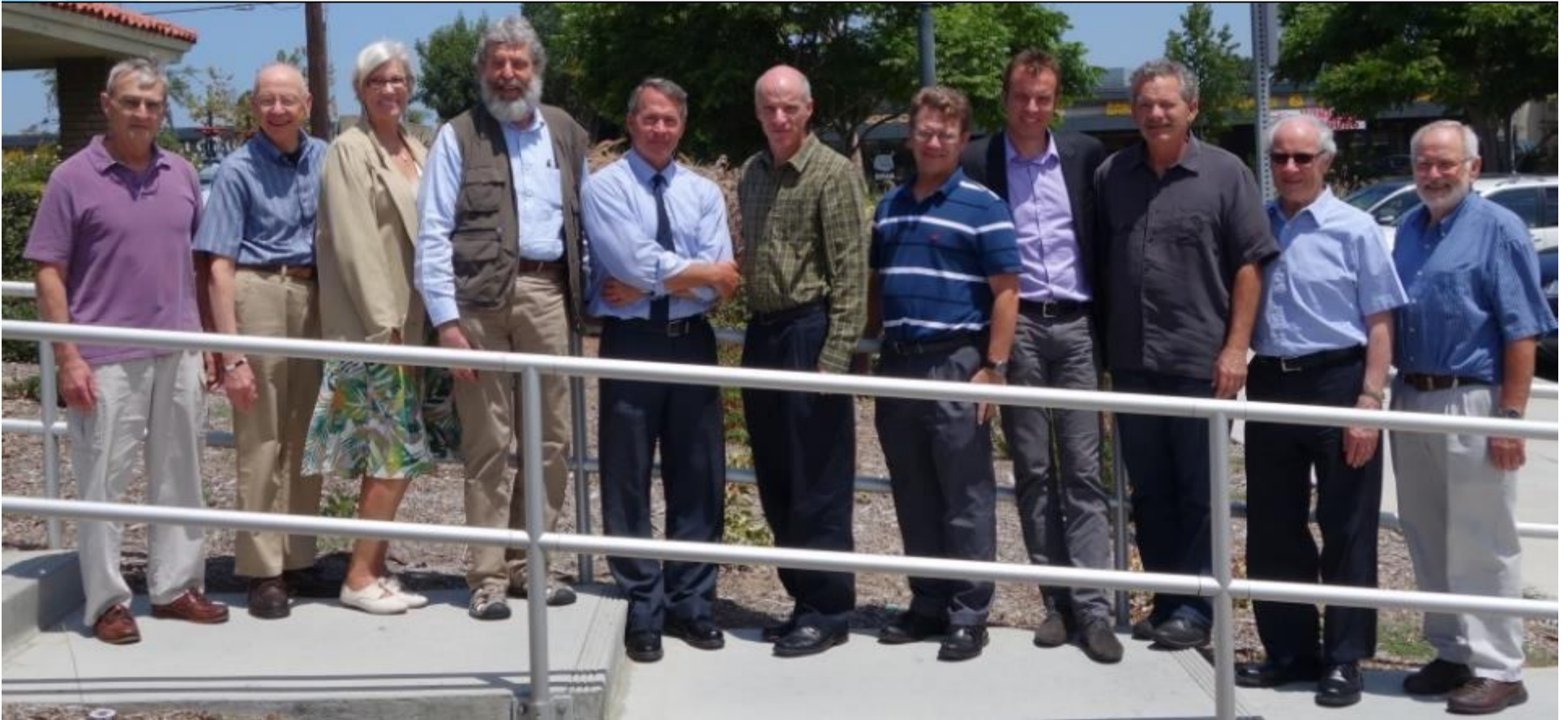
Areas of Expertise [CWC 13565(2)]

- Chair
- Toxicologist
- Wastewater treatment engineering
- Water treatment engineering
- Epidemiology
- Microbiology
- Chemistry
- Multi-barrier system reliability
- Microbial risk assessment
- Limnology

Panel Members

- ❑ **Co-Chair: Adam Olivieri, Dr.P.H., P.E.**, EOA, Inc. (CA)
- ❑ **Co-Chair: James Crook, Ph.D., P.E.**, Environmental Engineering Consultant (MA)
- ❑ **Michael Anderson, Ph.D.**, University of California, Riverside (CA)
- ❑ **Richard Bull, Ph.D.**, MoBull Consulting (WA)
- ❑ **Jörg Drewes, Ph.D.**, Technische Universität München (Germany)
- ❑ **Charles Haas, Ph.D.**, Drexel University (PA)
- ❑ **Walter Jakubowski, M.S.**, WaltJay Consulting (WA)
- ❑ **Perry McCarty, Sc.D.**, Stanford University (CA)
- ❑ **Kara Nelson, Ph.D.**, University of California, Berkeley (CA)
- ❑ **Joan Rose, Ph.D.**, Michigan State University (MI)
- ❑ **David Sedlak, Ph.D.**, University of California, Berkeley (CA)
- ❑ **Tim Wade, Ph.D.**, U.S. Environmental Protection Agency (NC)

Panel Members



NWRI Panel Process

Coordinate with SWRCB/DDW and Panel Co-Chairs

- Address Panel charge/scope (i.e., tasks)
- Co-Chairs: Developed review approach with Panel
- Implement with Panel on SWA and DPR

General

- Use of in-person Panel meetings
- Use of web-enabled conference calls (as needed)
- Make assignments for between-meeting efforts
- Address input from Advisory Group
- Information from meetings is posted on project website

DPR Timeline for Meetings and Deadlines

◆ = Meeting
▶ = Deadline

DPR Advisory Group:

Expert Panel:

DPR Research:

Legislated Dates:

Meeting #8
(1/19/2016)

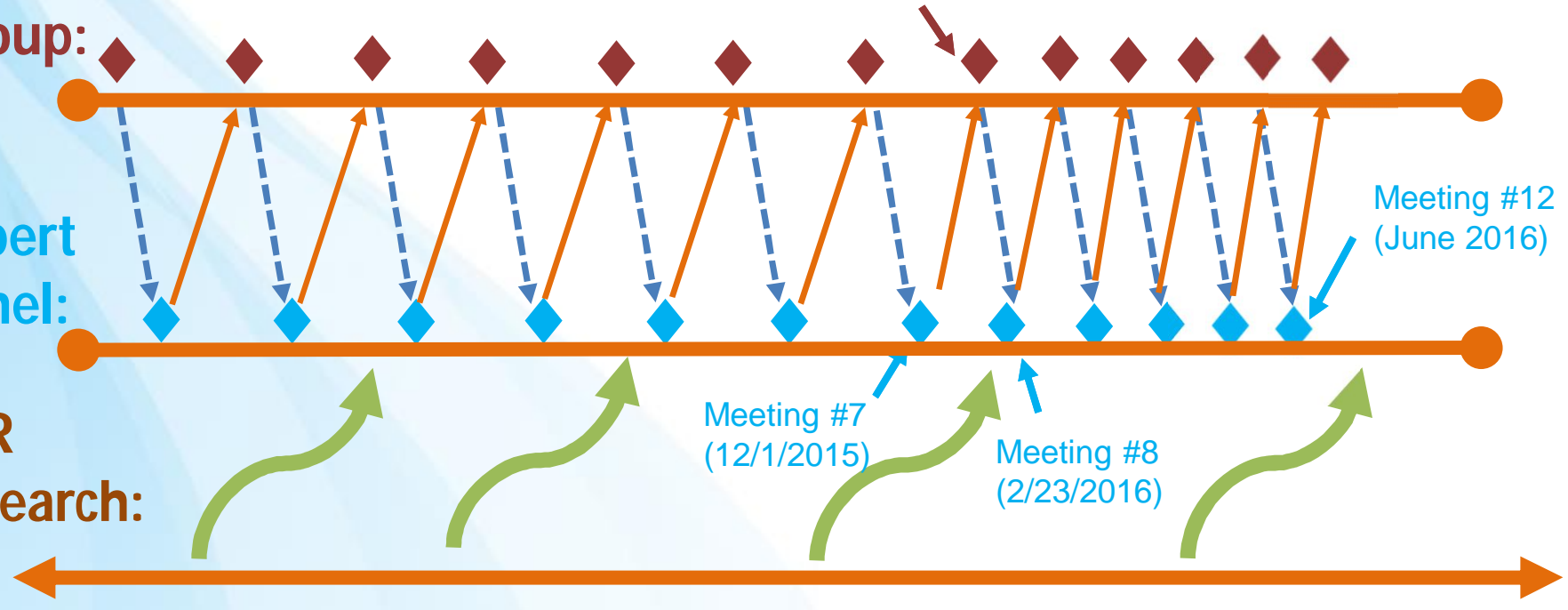
Meeting #12
(June 2016)

Meeting #7
(12/1/2015)

Meeting #8
(2/23/2016)

Draft Expert Panel DPR Report ▶

Final Report on DPR Feasibility ▶



Status of SWRCB/DDW DPR Advisory Group

**Jim Fiedler
(Santa Clara Valley Water District)
Advisory Group Member**

***December 15, 2015
Presentation to SWRCB
Sacramento, CA***

Topics Covered

- **Overview of Advisory Group**
 - Role
 - Members
- **Accomplishments**
- **Meetings**
 - Format
 - Use of committees
 - Topics of interest
- **Next Steps**

Advisory Group Role

1. Advise the Expert Panel on investigating feasibility of developing criteria for Direct Potable Reuse (DPR) *[CWC 13565(b)(1)]*
2. Make recommendations to DDW on other topics such as *practical considerations for regulations [CWC 13566(b)]*

Advisory Group Members

- **Chair:** Garry Brown, Orange County Coastkeeper
- Randy Barnard, SWRCB Division of Drinking Water
- Amy Dorman, City of San Diego
- Conner Everts, Environmental Justice Coalition for Water
- Jim Fiedler, Santa Clara Valley Water District
- Julie Labonte, San Diego Regional Chamber of Commerce
- Al Lau, Padre Dam Municipal Water District
- Bruce Macler, U.S. EPA
- Traci Minamide, LA Sanitation
- Edward Moreno, MD, MPH, Health Officer, Monterey County Health Dept.
- Keith Solar, San Diego County Taxpayers Association
- Fran Spivy-Weber, State Water Resources Control Board
- Ray Tremblay, Sanitation Districts of Los Angeles County
- Andria Ventura, Clean Water Action
- Mike Wehner, Orange County Water District

Advisory Group Meetings

- **Seven meetings** held between Jan 2014 and Oct 2015
 - Locations alternate between northern and southern California
 - Tours of facilities (OCWD GWRS, Silicon Valley Advanced Water Purification Center, Padre Dam, City of San Diego DPR demonstration)
 - Meeting #8 scheduled for Jan 19, 2016, in Orange County
 - Public meetings with 30-40+ attendees in person or on conference line
 - Received comments from community members and stakeholders
- **At each meeting:**
 - Review EP activities and progress
 - Update on DDW activities
 - Reports from ad hoc committees (operator training/terminology)
 - Presentations from research project Principal Investigators, including the WaterReuse Research Foundation DPR Initiative
 - Discuss future DPR topics of interest

Advisory Group Committees

- **Terminology Committee**

- Develop “recommended” descriptions for use by the EP and water agencies
- Draft list of terms and descriptions was prepared and reviewed by AG and collaborative partners
- Amy Dorman (City of San Diego) is Chair

- **Operator Training/Certification Committee**

- Working with CUWA and CA-NV Section of AWWA
- Focusing on developing an approach that can be established by either SWRCB or industry associations
- Traci Minamide (LA Sanitation) is Chair

Next Steps

- **Wrap up the Terminology and Operator Training committee efforts**
- **Establish “Briefing Paper” review process**
 - Effort led by Ray Tremblay (LACSD)
 - Coordinate with the EP & work with DDW staff
- **Address other topics of interest**
 - Assessing water agency “capacity” for DPR
- **Determine schedule of remaining meetings to:**
 - Provide recommendations to DDW by June 2016 (including suggestions for legislative changes)

Status of Expert Panel Efforts on Potable Reuse

**Adam Olivieri and Jim Crook
Panel Co-Chairs**

***December 15, 2015
SWRCB
Sacramento, CA***

Topics Covered

- ***Overview***
 - ***Potable Reuse – Indirect and Direct***
 - ***Panel charge for IPR-SWA and DPR***
- ***Status of Panel Review***
 - ***IPR – Surface Water Augmentation (SWA) Criteria Review***
 - ***DPR Feasibility of Criteria (approach)***

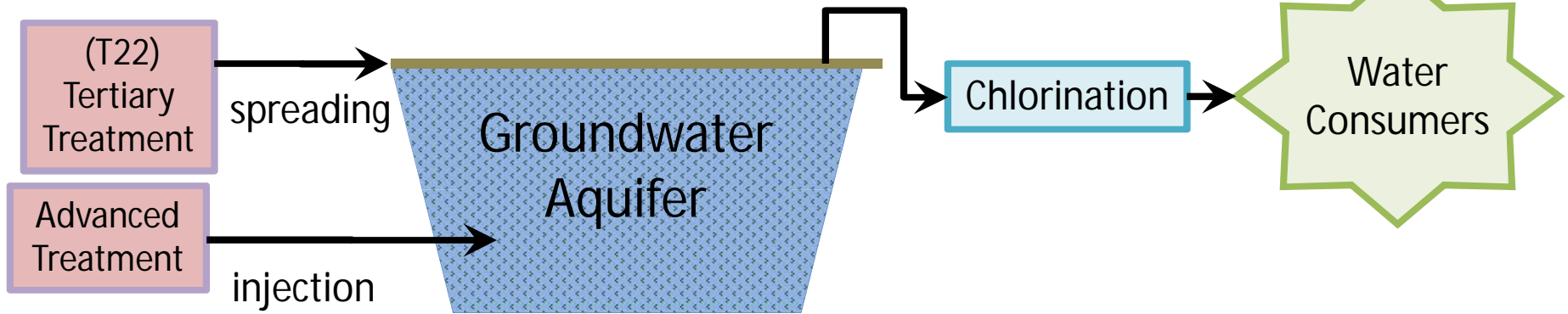
Potable Reuse

Indirect and Direct

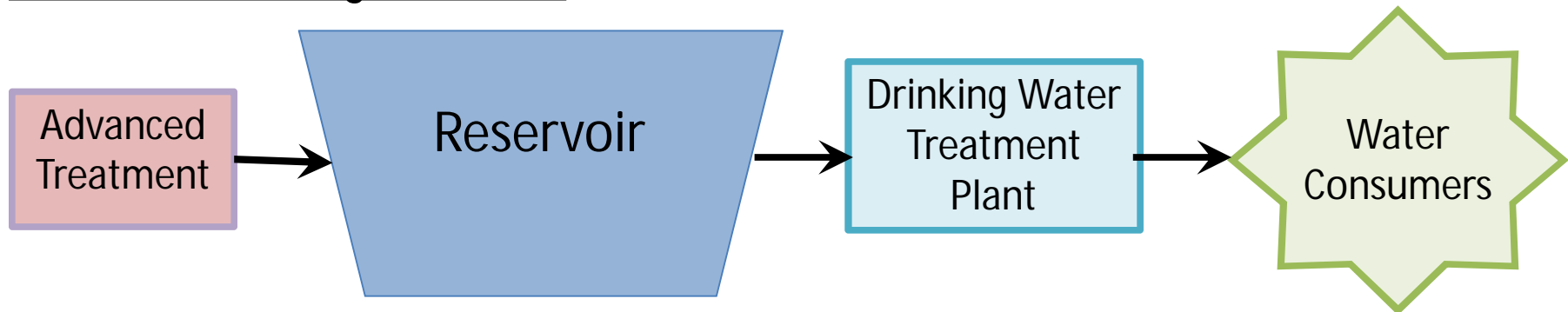
- ***Indirect potable reuse (IPR):***
 - Augmentation of a drinking water source (surface water or groundwater) with reclaimed water followed by an environmental buffer that precedes normal drinking water treatment (working definition)
- ***Direct potable reuse (DPR):***
 - Introduction of reclaimed water directly into a potable water supply distribution system downstream of a water treatment plant or into the raw water supply immediately upstream of a water treatment plant (per CWC)

INDIRECT POTABLE REUSE

Groundwater Replenishment

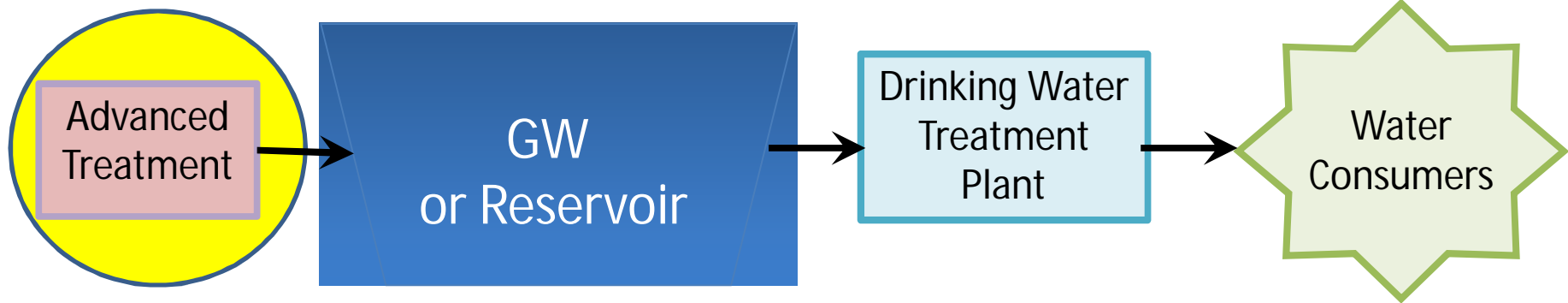


Surface Water Augmentation



What is Advanced Treatment?

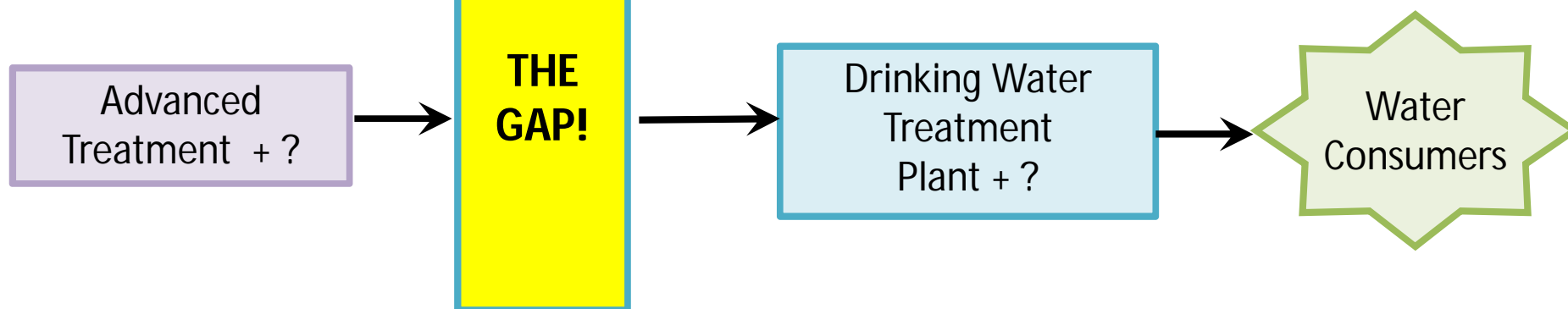
Surface Water Augmentation & ground water replenishment



Draft DDW regulations refer to Full Advanced Treatment as:

- Primary and Secondary treatment
- Microfiltration
- Reverse osmosis
- Advanced oxidation (e.g., Hydrogen peroxide / Ultraviolet Light)
- Disinfection
- Stabilization

Potable Reuse

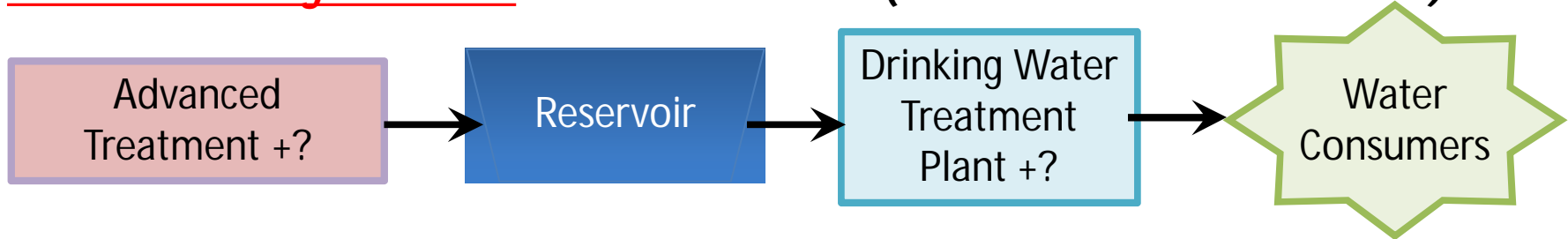


Treatment of water beyond Advanced Treatment and/or other requirements are needed in DPR to maintain functionality of the environmental buffer (the “Gap”)

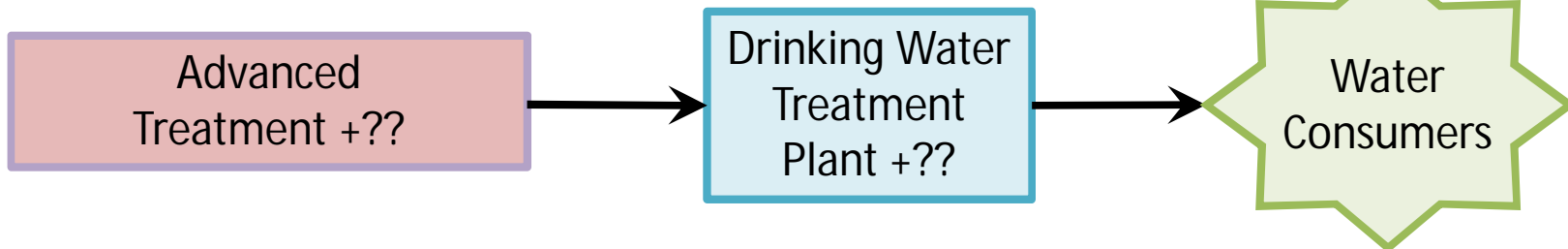
POTABLE REUSE

SWA (Reduced Environmental Buffer) and DPR

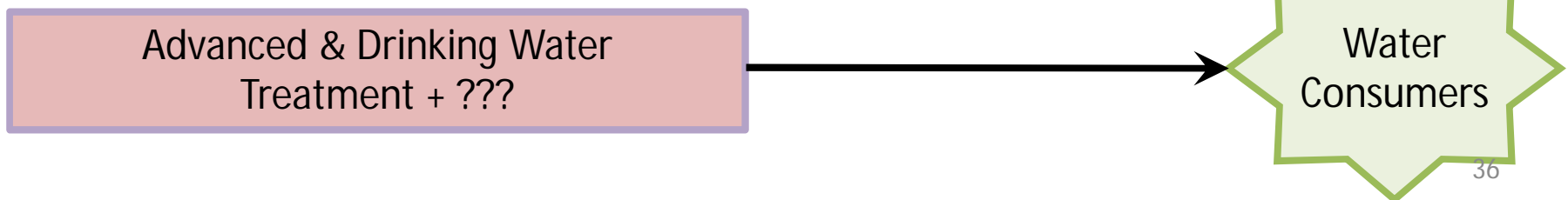
Source Water Augmentation ? – *Smaller reservoir (Reduced Environmental Buffer)*



DPR - Advanced Treated Water as Approved Raw Water Supply



DPR - Advanced Treated Water (ATW) as Approved Finished Drinking Water



Maintaining the Gap's Functionality

- **Means to maintain positive attributes of environmental buffer (Gap's Function):**
 - **More robust multiple treatment barriers**
 - **Enhanced monitoring for CECs or surrogates**
 - **Real-time or near real-time monitoring capability**
 - **Short term storage of product water to provide time for monitoring results prior to use as a potable supply**
 - **Alternative water supply source and means to quickly respond to off-spec water (time to respond)**

Panel Charge for IPR-SWA

Water Code, Chapter 7.3, Section 13562.

(B) Prior to adopting uniform water recycling criteria for surface water augmentation, the department shall submit the proposed criteria to the expert panel convened pursuant to subdivision (a) of Section 13565. **The expert panel shall review the proposed criteria and shall adopt a finding as to whether, in its expert opinion, the proposed criteria would adequately protect public health.**

IPR-SWA – Status of Panel Review

- **Completed Review of DDW staff proposed SWA Criteria (July 2014) and Revised SWA criteria dated September 17, 2015**
- **Major Issue –**
 - **Multiple Barriers - consistent with GWR regulations (as well as SDWA)**
 - **Define Environmental Buffer (Reservoir) - Response Time and Dilution (management of reservoir raw water supply)**
 - *Minimum 1:100 dilution or 1:10 dilution+1-log additional treatment of 1-day pulse of off-spec water (performance criteria)*
 - *Minimum 4 to 6 month hydraulic retention time (operational criteria)*
 - **Finding – proposed 9/17/15 criteria adequately protect public health**
 - **Final Panel Finding pending external peer review of DDW staff proposed SWA criteria**

Panel Charge for DPR

Water Code, Chapter 7.3, Section 13565. (a)(1)

- ... advising the department on public health issues and scientific and technical matters ... (on) ... the feasibility of developing uniform water recycling criteria for direct potable reuse.
- The expert panel shall assess what, if any, additional areas of research are needed to be able to establish uniform regulatory criteria for direct potable reuse.
- The expert panel shall then recommend an approach for accomplishing any additional needed research regarding uniform criteria for direct potable reuse in a timely manner.

DPR Briefing Paper Approach and Topics

- ***Briefing Paper Approach - Scope:***
 - ***Issue and background:*** (summarize pertinent available research/technical information)
 - ***Recommend practical engineering/monitoring solutions and/or research***
 - ***Provide overall conclusions and recommendations***

DPR Briefing Overarching Questions

- ***Overarching Questions:***
 - **Definition of DPR (continuum) including absence of an environmental buffer.**
 - **The availability and reliability of recycled water treatment technologies.**
 - **Multiple barriers and sequential treatment processes that may be appropriate at wastewater and water treatment facilities.**
 - **Available information on health effects.**
 - **Mechanisms to protect public health from off-spec water.**
 - **Monitoring needed to ensure the protection of public health.**
 - **Other scientific or technical issues that may be necessary, including the need for additional research.**

DPR Briefing Paper Topics

- **Briefing Paper Topics (examples of content):**
 - **1) Bioanalytical Tools (Bioassays)** – issues related to their use in advanced treated wastewater (ATW) and drinking water.
 - **2) Quantifying Treatment Facility Reliability** – description of multiple barriers (redundancy, inherent performance, and mechanical reliability); online monitoring tools (sensors, surrogates and indicators); and performance objectives (process and overall facility compliance).
 - **3) Analytical Methods/Tools** – measurement of chemical water quality in ATW and drinking water (emphasis on indicators and surrogates).
 - **4) Molecular and Other Pathogen Monitoring Methods** – for monitoring pathogens in ATW and drinking water.

DPR Briefing Paper Topics (cont'd)

- **Briefing Paper Topics (examples of content):**
 - **5) Antibiotic Resistant Bacteria (ARB) and Antibiotic Resistant Genes (ARG) in water** – state of the science, relative sources, potential exposure pathways (relevant), relative significance of concern.
 - **6) Comparative Health Risks** – associated with existing water supplies.
 - **7) Public Health Surveillance** – example programs, ongoing national and state programs, health endpoints, sensitivity and interpretation of data, non-health based data, and feasibility of a DPR surveillance program.



In Summary

- We have a strong and energetic team (including all of our partners)
- Process is moving swiftly within the constraints of the Legislative deadlines
 - Development of SWA regulations
 - Feasibility of developing criteria for DPR
- Many moving parts
- Lots of work to do