

**Recommendations of the  
Advisory Group on Determining the Feasibility of  
Developing Uniform Water Recycling Criteria for  
Direct Potable Reuse**

**Convened by the State Water Resources Control Board**

**DRAFT** Final Report

**Prepared by:**

Advisory Group on Determining the Feasibility of  
Developing Uniform Water Recycling Criteria for Direct Potable Reuse

**Prepared for:**

State Water Resources Control Board  
Division of Drinking Water  
Sacramento, California, USA

**Submitted by:**

National Water Research Institute  
Under Agreement No. 13-21041

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June 15, 2016

Mark Bartson, P.E.  
Supervising Sanitary Engineer  
California State Water Resources Control Board  
Division of Drinking Water  
1001 I Street  
Sacramento, CA 95814

Dear Mr. Bartson:

On behalf of the Advisory Group on the Feasibility of Developing Criteria for Direct Potable Reuse (DPR), we are pleased to submit to the State Water Resources Control Board (State Board) the report entitled **Recommendations of the Advisory Group on Determining the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse**. This report addresses the requirement that the Advisory Group provide advice “regarding the development of direct potable reuse” [California Water Code 135639(b)(1)] and input for the development of the draft DPR feasibility report by the State Board for the California State Legislature [California Water Code 13563(a)(1)]. In performing its investigation of the feasibility of developing uniform water recycling criteria for DPR, the State Board must consider recommendations from both the DPR Expert Panel and DPR Advisory Group [California Water Code 13566(a)].

The Advisory Group believes that DPR, when implemented appropriately, has the potential to provide a reliable source of water supply that is protective of public health for communities in California. Uniform water recycling criteria for DPR that is protective of public health and the environment should be a priority of the State Board.

This report presents a consensus of the Advisory Group members, which represent a diversity of viewpoints from various stakeholder interest groups, including environmental nonprofits, public health officials, taxpayer advocate organizations, water and wastewater agencies, government agencies, and other organizations in California.

The main purpose of this report is to provide recommendations to the State Board specifically on the feasibility of developing regulatory criteria for DPR projects; however, the Advisory Group also included input on topics identified by stakeholders as important to the discussion of DPR, but not related directly to the feasibility of creating regulations. These recommendations cover a range of topics related to DPR, and many can be implemented by the State or local agencies. They were developed based on the experience and interests of the Advisory Group members.

The information in this report represents a culmination of 11 meetings of the Advisory Group that occurred over a 28-month timeframe. As required by the California Water Code and to ensure public transparency, the Advisory Group was subject to the Bagley-Keene Open Meeting Act (Article 9, commencing with Section 11120) of Chapter 1 of Part 1 of Division 3 of Title 2 of the Government Code. As a result, the process included public input during each of the Advisory Group meetings. This period of engagement was essential for the Advisory Group to fully explore the issues at hand and reach consensus on the recommendations provided in this report.

The Advisory Group hopes that the State Board will consider the information in this report when preparing its DPR feasibility report for the California State Legislature.

The Advisory Group members also thank the State Board for the opportunity to represent their stakeholder groups and for the State Board's support of the process. We also appreciate the State Board's investment of time, information, and resources towards this effort, which allowed Advisory Group members to participate at meetings and develop this report. The support provided by the State Board was critical to the success of the Advisory Group.

In addition, the Advisory Group appreciated the involvement of the DPR Expert Panel in the Advisory Group meetings, and found that interacting with the Panel Co-Chairs at the meetings was helpful in our deliberations on technical and policy issues related to DPR projects.

On behalf of the Advisory Group, I once again express our support and continued interest in implementing DPR projects in California that are protective of public health and the environment and cost-effective for ratepayers. We appreciate the opportunity to transmit our recommendations via this report to the State Board.

Sincerely,

Garry Brown

Chair, Advisory Group on the Feasibility of Developing Criteria for Direct Potable Reuse  
President and CEO, Orange County Coastkeeper

On behalf of the Advisory Group:

Randy Barnard, P.E., California State Water Resources Control Board  
Amy Dorman, P.E., City of San Diego  
Conner Everts, Environmental Justice Coalition for Water  
Jim Fiedler, P.E., Santa Clara Valley Water District  
Julie L. Labonte, P.E., San Diego Regional Chamber of Commerce  
Albert C. Lau, P.E., Padre Dam Municipal Water District  
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Edward Moreno, M.D., MPH, California Conference of Local Health Officers  
Keith Solar, Esq., San Diego County Taxpayers Association  
Frances Spivy-Weber, California State Water Resources Control Board  
Ray Tremblay, P.E., County Sanitation Districts of Los Angeles County  
Andria Ventura, Clean Water Action  
Michael Wehner, Orange County Water District

cc: Jeff Mosher, National Water Research Institute  
Adam Olivieri, Dr.P.H., P.E., Co-Chair, State Board Expert Panel on DPR  
James Crook, Ph.D., P.E., Co-Chair, State Board Expert Panel on DPR

## ABOUT NWRI

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The California State Water Resources Control Board's (State Board) Division of Drinking Water (DDW) convened the Advisory Group on Determining the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse in accordance with California Water Code Sections 13560-13569. The purpose of the Advisory Group is to advise the State Board and the Expert Panel on the feasibility of developing criteria for direct potable reuse (DPR) in the State of California.

The Advisory Group is made up of representatives from various stakeholder interest groups, including environmental nonprofits, public health officials, taxpayer advocate organizations, water and wastewater agencies, government agencies, and other organization in California.

Meetings of the Advisory Group were organized and facilitated by the National Water Research Institute (NWRI), a 501c3 nonprofit organization founded in 1991 by a group of California water agencies in partnership with the Joan Irvine Smith and Athalie R. Clarke Foundation to promote the protection, maintenance, and restoration of water supplies and to protect public health and improve the environment. NWRI also provided editorial support to prepare and finalize this report.

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## ACKNOWLEDGMENTS

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This report is the product of an advisory group administered by the National Water Research Institute, a 501c3 nonprofit organization based in Southern California. The Advisory Group on “Determining the Feasibility of Developing Criteria for Direct Potable Reuse” is a requirement of the California Water Code (Sections 13560-13569).

The following members of the Advisory Group attended one or more of 11 total meetings held from 2014 to 2016 and contributed to the final recommendations provided in this report:

- Chair: Garry Brown, Orange County Coastkeeper
- Randy Barnard, P.E., California State Water Resources Control Board
- Amy Dorman, P.E., City of San Diego (*joined May 2015*)
- Conner Everts, Environmental Justice Coalition for Water
- Jim Fiedler, P.E., Santa Clara Valley Water District
- Julie L. Labonte, P.E., San Diego Regional Chamber of Commerce
- Albert C. Lau, P.E., Padre Dam Municipal Water District
- Bruce Macler, Ph.D., U.S. Environmental Protection Agency
- Traci Minamide, P.E., BCEE, City of Los Angeles, LA Sanitation
- Edward Moreno, M.D., MPH, California Conference of Local Health Officers (*joined Jan. 2016*)
- Keith Solar, Esq., San Diego County Taxpayers Association
- Frances Spivy-Weber, California State Water Resources Control Board
- Ray Tremblay, P.E., County Sanitation Districts of Los Angeles County
- Andria Ventura, Clean Water Action
- Mike Wehner, Orange County Water District

The following individuals also served on the Advisory Group when it was initially formed, but left due to changes in their employment:

- Alisa Reinhardt, San Diego Regional Chamber of Commerce (replaced by Julie Labonte)
- Marsi Steirer, City of San Diego (replaced by Amy Dorman)

The Advisory Group is pleased to acknowledge the organizations and individuals whose support, assistance, and resources made this report possible.

### State Water Resources Control Board

The Advisory Group was formed at the request of the Drinking Water Program of the California Department of Public Health (CDPH) in 2013. The Drinking Water Program was officially transferred from CDPH to the State Water Resources Control Board (State Board) and renamed as the Division of Drinking Water (DDW) on July 1, 2014. Financial support for the Advisory Group was provided by the State Board through Agreement No. 13-21041.

The Advisory Group would like to thank the following State Board staff for their participation, insight, and assistance:

- Faraz Asad, P.E.
- Randy Barnard, P.E.
- Mark Bartson, P.E.
- Brian Bernados, P.E.
- Jing-Tying Chao, P.E.
- Cindy Forbes, P.E.
- Robert Hultquist, P.E.
- Karen Larsen
- Michael McKibben, P.E.
- Sherly Rosilela, P.E.
- Kurt Souza, P.E.
- David Spath, Ph.D., P.E.
- Erika Wolski, P.E.

The Advisory Group also thanks the following organizations for providing meeting space and support during this process:

- City of San Diego Public Utilities Department
- Municipal Water District of Orange County
- Orange County Water District
- Padre Dam Municipal Water District
- San Francisco Estuary Institute
- Santa Clara Valley Water District
- State Water Resources Control Board

#### **Advisory Group Administrators**

The Advisory Group also appreciates the outstanding services of staff at NWRI, who administered the Advisory Group process, organized and attended 11 Advisory Group meetings, and helped develop, prepare, and edit this Advisory Group report. The Panel thanks:

- Jeff Mosher (Advisory Group facilitation)
- Brandi Caskey (Administrative support)
- Suzanne Faubl (Advisory Group support and report development)
- Jaime Lumia (Administrative support)
- Gina Vartanian (Report development)

In particular, the Advisory Group recognizes the leadership of Jeff Mosher for overseeing this process.

#### **DPR Expert Panel**

The Advisory Group would also like to recognize the State Board's Expert Panel on Evaluating the Feasibility of Direct Potable Reuse for its insight, input, and commitment to undertaking this tremendous effort. The Expert Panel members include:

- *Panel Co-Chair:* James Crook, Ph.D., P.E., Environmental Engineering Consultant (Boston, MA)
- *Panel Co-Chair:* Adam Olivieri, Dr.P.H., P.E., EOA, Inc. (Oakland, CA)

- Michael Anderson, Ph.D., University of California, Riverside (Riverside, CA)
- Richard Bull, Ph.D., MoBull Consulting (Richland, WA)
- Jörg E. Drewes, Ph.D., Technical University of Munich (Munich, Germany)
- Charles Haas, Ph.D., Drexel University (Philadelphia, PA)
- Walter Jakubowski, M.S., WaltJay Consulting (Spokane, WA)
- Perry McCarty, Sc.D., Stanford University (Stanford, CA)
- Kara Nelson, Ph.D., University of California, Berkeley (Berkeley, CA)
- Joan B. Rose, Ph.D., Michigan State University (East Lansing, MI)
- David Sedlak, Ph.D., University of California, Berkeley (Berkeley, CA)
- Tim Wade, Ph.D., United States Environmental Protection Agency (Durham, NC)

### **WateReuse DPR Research Initiative**

Finally, the Advisory Group acknowledges the significant time, effort, and investment provided by the WateReuse Research Foundation (now the Water Environment & Reuse Foundation) and WateReuse California, which together launched the California DPR Initiative in June 2012 to assist DDW in its state-mandated task to determine the feasibility of developing regulatory criteria for DPR. These organizations invested in a DPR research portfolio that included more than 30 projects to investigate various aspects of the technical feasibility of DPR implementation, such as the reliability of treatment trains, microbial and chemical water quality, water quality and process monitoring, and facility operations.



## **DISCLAIMER**

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This report was prepared by the Advisory Group on Determining the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse, which is administered by the National Water Research Institute (NWRI) and sponsored by the California State Water Resources Control Board (State Board). Any opinions, findings, conclusions, or recommendations expressed in this report were prepared by the Advisory Group. NWRI and the State Board assume no responsibility for the content of this publication or for the opinions or statements of facts expressed herein. The mention of trade names of commercial products does not represent or imply the approval or endorsement of NWRI or the State Board. This report was published solely for informational purposes.

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## ACRONYMS

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|        |   |
|--------|---|
| ATW    | advanced treated water  |
| AWTF   | advanced water treatment facility   |
| CEQA   | California Environmental Quality Act  |
| CDPH   | California Department of Public Health (now DDW)                            |
| CEC    | constituent of emerging concern   |
| CFR    | Code of Federal Regulations   |
| COS    | cost of service   |
| COC    | constituent of concern  |
| CWC    | California Water Code   |
| DDW    | Division of Drinking Water (California State Water Resources Control Board) |
| DPR    | direct potable reuse  |
| DWTF   | drinking water treatment facility   |
| MCL    | maximum contaminant level   |
| NRC    | National Research Council   |
| NSF    | National Science Foundation   |
| NWRI   | National Water Research Institute   |
| PR     | potable reuse   |
| QA/QC  | quality assurance/quality control   |
| SDWA   | Safe Drinking Water Act   |
| SRT    | solids retention time   |
| SWA    | surface water augmentation  |
| TBL    | triple bottom line  |
| TMF    | technical/managerial/financial  |
| US EPA | United State Environmental Protection Agency                                |
| WE&RF  | Water Environment and Reuse Foundation                                      |
| WRR    | water recycling requirements  |
| WRP    | water reclamation plant   |
| WWTP   | wastewater treatment plant  |

## 1. INTRODUCTION

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### 1.1 Overview of Direct Potable Reuse

To ensure the public has safe, sustainable water supplies now and in the future, water utilities throughout the United States are considering direct potable reuse (DPR) as one strategy to meet the needs of their communities. DPR involves using advanced treatment technologies (such as membrane filtration and ultraviolet disinfection) to remove or destroy viruses, bacteria, chemicals, and other constituents of concern (COCs) as part of the process of converting – that is, purifying – wastewater into a clean, safe source of municipal drinking water.

Two forms of planned DPR exist:

- In the first form, advanced treated water (ATW) produced at an advanced water treatment facility (AWTF) is introduced into the raw water supply immediately upstream of a drinking water treatment facility (DWTF). To date, the few permitted and operational DPR projects in the United States use this form of DPR.
- In the second form, finished water is produced at an AWTF that also is permitted as a DWTF. This water is introduced directly into the drinking water supply distribution system. At present, projects using this configuration for DPR are in the development stage and have yet to be permitted and operated in the United States.

The first operational DPR project in the U.S. went online in Texas in 2014; at the same time, water utilities in other states—in particular, the arid southwest—have begun moving forward in planning and implementing similar projects. The challenge at present is that state guidance and regulations do not exist for DPR and current treatment technologies and monitoring strategies are being evaluated to determine their use for DPR.

### 1.2 Interest in DPR in California

Water agencies all across California have begun evaluating the possibility of implementing DPR projects to develop new water supplies that are local, reliable, and drought-resistant. There are a number of reasons for the growing interest in DPR in California, among them:

- **The State's support of recycled water as a means to augment water supplies.** For the last decade, the State of California has been a leader in encouraging the increased use of recycled water from municipal wastewater sources<sup>1</sup> to “move aggressively towards a sustainable water future.”<sup>2</sup> In particular, in February 2009, the State unanimously adopted, as Resolution No. 2009-0011, an updated water recycling policy with the goal of increasing the use of recycled water in the state over 2002 levels by at least 1 million acre-feet per year by 2020 and by at least 2 million acre-feet per year by 2030 (CWC, Section 13560).

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<sup>1</sup> [http://www.waterboards.ca.gov/water\\_issues/programs/water\\_recycling\\_policy/](http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/) (accessed 5/16/2016).

<sup>2</sup> [http://www.waterboards.ca.gov/water\\_issues/programs/water\\_recycling\\_policy/docs/recycledwaterpolicy\\_approved.pdf](http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/recycledwaterpolicy_approved.pdf) (accessed 5/16/2016).

- **Significant challenges impacting the availability of water resources in California.** California is experiencing a record-breaking drought. Since 2011, limited rainfall has left most of the State abnormally dry and, since 2014, a large part of the State has been classified as exceptionally dry. The Governor declared a drought state of emergency in 2014.<sup>3</sup> Drought creates challenges such as water shortages, mandatory conservation practices, groundwater overdraft, and changes to water allocations (which is particularly important to farmers, as California is considered the largest agricultural producer in the nation).
- **Proven advanced technologies to safely recycle wastewater.** Utilities in California have been recycling wastewater for more than 50 years. The last few decades have seen monumental leaps in innovative research and state-of-the art advanced treatment technologies for potable reuse, resulting in more efficient and effective water recycling processes to protect public health. These advanced technologies are proven. For example, the Orange County Water District in Fountain Valley, California, has been operating the largest indirect potable reuse project in the world since 2008.

### 1.3 State-Mandated Evaluation of the Feasibility of Developing DPR Criteria

As noted in Chapter 7.3 (entitled “Direct and Indirect Potable Reuse”) of the California Water Code<sup>4</sup>, the State Board is required to “establish uniform statewide recycling criteria for each varying type of use of recycled water where the use involves the protection of public health.” Furthermore, it is stated in Section 13560(c) that “If direct potable reuse can be demonstrated to be safe and feasible, implementing direct potable reuse would further aid in achieving the state board's recycling goals.”

In 2010, the California State Legislature signed into law SB 918, which requires the Division of Drinking Water (DDW) of the California State Water Resources Control Board (State Board) to report to the State Legislature by December 31, 2016, on the feasibility of developing statewide regulatory criteria for DPR. Per the California Water Code [Section 13561(b)], DPR is defined as “the planned introduction of recycled water either directly into a public water system, as defined in Section 116275 of the Health and Safety Code, or into a raw water supply immediately upstream of a water treatment plant.”

As part of this task, the State Board is required to convene an Expert Panel, as follows:

13565. (a) (1) On or before February 15, 2014, the department shall convene and administer an expert panel for purposes of advising the department on public health issues and scientific and technical matters regarding development of uniform water recycling criteria for indirect potable reuse through surface water augmentation and investigation of 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

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<sup>3</sup> <http://ca.water.usgs.gov/data/drought/> (accessed 5/16/2016).

<sup>4</sup> Appendix A contains a copy of Chapter 7.3 of the California Water Code, effective January 1, 2014. <http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13560-13569> (last accessed January 11, 2016).

recommend an approach for accomplishing any additional needed research regarding uniform criteria for direct potable reuse in a timely manner.

In addition to the Expert Panel, the State Board is also required to convene an Advisory Group, as follows:

13565 (b) (1) On or before January 15, 2014, the department shall convene an advisory group, task force, or other group, comprised of no fewer than nine representatives of water and wastewater agencies, local public health officers, environmental organizations, environmental justice organizations, public health nongovernmental organizations, the department, the state board, the United States Environmental Protection Agency, ratepayer or taxpayer advocate organizations, and the business community, to advise the expert panel regarding the development of uniform water recycling criteria for direct potable reuse and the draft report required by Section 13563.

The Advisory Group is working with the State Board and Expert Panel to meet the following State-mandated deadlines, as required in Section 13563 of the CWC:

- On or before June 30, 2016, DDW shall prepare a draft report summarizing the recommendations of the Expert Panel.
- By September 1, 2016, DDW shall complete a public review draft of its report.
- On or before December 31, 2016, DDW is to provide a final report to the Legislature on the feasibility of developing uniform water recycling criteria for DPR.

Please refer to Chapter 7.3 of the CWC (provided in Appendix A of this report) for a description of State Board, Expert Panel, and Advisory Group activities as pertaining to this effort.

## **1.5 DPR Advisory Group Members**

Members of the Advisory Group represent various stakeholder interests, including environmental nonprofits, public health officials, taxpayer advocate organizations, water and wastewater agencies, government agencies, and other organizations in California.

The current members of the DPR Advisory Group are:

- *Chair:* Garry Brown, Orange County Coastkeeper
- Randy Barnard, P.E., California State Water Resources Control Board
- Amy Dorman, P.E., City of San Diego
- Conner Everts, Environmental Justice Coalition for Water
- Jim Fiedler, P.E., Santa Clara Valley Water District
- Julie L. Labonte, P.E., San Diego Regional Chamber of Commerce
- Albert C. Lau, P.E., Padre Dam Municipal Water District
- Bruce Macler, Ph.D., U.S. Environmental Protection Agency
- Traci Minamide, P.E., BCEE, City of Los Angeles, LA Sanitation

- Edward Moreno, M.D., MPH, California Conference of Local Health Officers
- Keith Solar, Esq., San Diego County Taxpayers Association
- Francis Spivy-Weber, California State Water Resources Control Board
- Ray Tremblay, P.E., Los Angeles County Sanitation Districts
- Andria Ventura, Clean Water Action
- Michael Wehner, Orange County Water District

Brief biographies of current DPR Advisory Group members can be found in Appendix C. More information about the project, including agendas and minutes for all meetings, is available online at [http://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/RW\\_DPR\\_advisorygroup.shtml](http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RW_DPR_advisorygroup.shtml).

## 1.5 Report on the Recommendations of the DPR Advisory Panel

To fulfill its State-mandated charge to advise the Expert Panel, the Advisory Group met 11 times between 2014 and 2016. The list of meeting dates and locations is provided in Appendix D of this report. These meetings included direct interaction with members of the Expert Panel (usually one or both of the Panel Co-Chairs). The Advisory Group agreed to document its overall recommendations in this report, to be submitted to the State Board concurrently with the Expert Panel's final report, which documents the Expert Panel's assumptions, conclusions, and recommendations regarding the feasibility of developing uniform DPR criteria.

## 1.6 Organization of Report

This document is organized in the following chapters:

1. Introduction
2. Recommendations on Topics Directly Related to the Feasibility of Developing Regulatory Criteria for Direct Potable Reuse
3. Recommendations on Topics Not Directly Related to the Feasibility of Developing Regulatory Criteria for Direct Potable Reuse

In Chapter 2, the Advisory Group provides recommendations on the following topics:

- Advanced Water Treatment Operator Training and Certification
- Wastewater Source Control and Operation Optimization and Planning Requirements for DPR
- Research on Low-Dose Exposure to Chemicals
- Direct Potable Reuse Research Priorities for California
- Use of Bioassays to Evaluate Constituents of Emerging Concern and Unknowns in Recycled Water
- Building Capacity (Technical, Managerial, and Financial <TMF>)
- Monitoring and Outreach Related to Public Health and Safety of Direct Potable Reuse
- Changes to the Consumer Confidence Report (CCR)
- Regulatory Approach to Environmental Impacts

The Advisory Group also included input on topics identified by stakeholders as important to the discussion of DPR criteria and project implementation, but not directly related to the feasibility of creating regulations. Input is provided on the following topics in Chapter 3:

- Potable Reuse Terminology
- Scientific Quality and Public Availability of Support Documentation
- Communications and Public Outreach
- Determining the Feasibility of a Project (Triple Bottom Line)
- Environmental Justice
- Comparison of Direct Potable Reuse and Other Alternatives
- Convening an Expert Panel and Stakeholder Group to Advise the State Board in Developing Criteria
- Effects of Direct Potable Reuse on Environmental Flows
- Phasing of the Potable Reuse Regulations

The recommendations cover a range of topics related to the safety and implementation of DPR in California. These recommendations reflect the experience and interests of members of the Advisory Group, and are expected to benefit both (1) the State Board as it develops a DPR feasibility report for the California State Legislature and (2) utilities as they consider DPR as a water supply alternative.



## 2. RECOMMENDATIONS ON TOPICS RELATED TO THE FEASIBILITY OF DEVELOPING REGULATORY CRITERIA FOR DIRECT POTABLE REUSE

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The main purpose of this report is to provide recommendations to the State Board on the feasibility of developing regulatory criteria for DPR projects. Recommendations are provided on the following topics:

- Advanced Water Treatment Operator Training and Certification
- Wastewater Source Control and Operation Optimization and Planning Requirements for DPR
- Research on Low-Dose Exposure to Chemicals
- Direct Potable Reuse Research Priorities for California
- Use of Bioassays to Evaluate Constituents of Emerging Concern and Unknowns in Recycled Water
- Building Capacity (Technical, Managerial, and Financial <TMF>)
- Monitoring and Outreach Related to Public Health and Safety of Direct Potable Reuse
- Changes to the Consumer Confidence Report (CCR)
- Regulatory Approach to Environmental Impacts

### 2.1 Advanced Water Treatment Facility (AWTF) Operator Certification

A training and certification program is needed for operators employed at advanced water treatment facilities (AWTF) to ensure that potable reuse projects are operated properly to protect public health and to gain public acceptance of DPR. No operator certification program currently exists for either water or wastewater operators. The proposed certification program would apply only to operators of potable reuse projects that include an AWTF.

#### 2.1.1 Recommendations

The Advisory Group recommends that the program includes or accomplishes the following:

- a) The operator certification program should be applicable to indirect and direct potable reuse projects that use AWTFs. Operators working at recycled water facilities not involved in operation of AWTF or that use tertiary treated water for groundwater spreading would not need to obtain this certification.
- b) Certification should be offered as an add-on license available to both water and wastewater operators who are already certified at a specified level (i.e., a minimum of Level III is suggested for water and grade 2 wastewater operators).
- c) Operators should be required to (1) have work experience (e.g., Level III or Grade 2 certification) and (2) complete course work on AWT before taking the certification exam.
- d) The certification program needs to address the “grandfathering” of operators who are currently working at existing AWT facilities. For instance, operators at existing AWT facilities could be required to complete fewer course prerequisites to qualify to take the certification exam.

- e) In addition to topics related to the operations of wastewater treatment and advanced water treatment technologies, the certification program should include public health components, emergency response procedures, and drinking water regulations and other water supply issues.
- f) Consideration should be given toward requiring continuing education credits as part of maintaining certification for both grandfathered and non-grandfathered operators.
- g) Because certification for potable reuse operators is not included currently in the California Water Code, requirements for such certification should be included in the permit issued for each facility.
- h) Ideally, the certification program would be administered by the State Board; however, because developing the certification program and associated training is a long-term process, it may be beneficial for the State Board to partner with trade associations in developing and implementing an interim certification program. It is important for the State Board to be involved in the development and implementation of the certification process to establish the public's trust that trained and qualified operators are running the AWWTFs; however, the specific role of the State Board would need to be defined, including the degree of involvement (i.e. options include providing oversight, formal acceptance/approval, and/or audit authority).
- i) Funding and staff resources must be made available to support the role of the State Board.

### **2.1.2 Rationale for These Recommendations**

The Advisory Group recognizes that the protection of public health is paramount for the successful implementation of DPR projects; therefore, it is imperative that an AWWTF be operated by experienced and well-trained staff to ensure treatment processes function properly, regulatory requirements are met consistently, and the water produced is safe for public consumption. Also, public acceptance and trust are necessary to receive the support needed to use this resource as a drinking water supply. A statewide AWWTF operator certification program would help to build and maintain confidence in the quality of water produced at an AWWTF.

Regarding the developing of an interim certification program: The California Water Environment Association (CWEA) and the American Water Works Association (AWWA) California-Nevada section have formed ad hoc committees to focus on identifying the components of an AWWTF operator certification program, and the Water Environment and Reuse Foundation is managing several projects related to operator training for DPR systems.

This position is also reflected in the white paper entitled "Potable Reuse Operator Training and Certification Framework" prepared by the California Urban Water Agencies (CUWA) in conjunction with its partners: WaterReuse California (WRCA), CA-NV Section AWWA, California Water Environment Association (CWEA), California Association of Sanitation Agencies (CASA), and the State Water Resources Control Board's Division of Drinking Water (DDW).

## 2.2 Wastewater Source Control and Operation Optimization and Planning Requirements for Direct Potable Reuse

DPR requires an integrated treatment system from sewershed through the wastewater treatment, AWTF, DWTF, and distribution processes. Wastewater source control and treatment facility design and operation must be optimized for the integrated system to be protective of public health.

### 2.2.1 Recommendations

In future DPR regulations, the State Board should include provisions for “Wastewater Source Control” (§60320.106) and “Operation Optimization and Plan” (§60320.222) that are similar to those found in the regulations for Groundwater Replenishment Using Recycled Water for managing chemicals at the source.<sup>5</sup>

- Source control programs are used to augment federal pretreatment programs and are designed to control, limit, or eliminate discharge into wastewater of constituents that can be difficult to treat or that impair the final quality of treated water intended for DPR. Source control is a beneficial, efficient, and cost-effective strategy for managing constituents in a wastewater collection system. It also creates public confidence and opportunities to educate the community and partner with commercial and industrial dischargers to decrease or eliminate the presence of certain chemicals in wastewater.

Regarding the optimization of wastewater treatment, the Advisory Group recommends the following:

- Operations optimization and planning includes additional measures such as biological nitrogen removal, flow equalization, management of return flows from solids processing, and improved source control and pretreatment, which go beyond the usual wastewater treatment. These measures can be applied as needed on a case-by-case basis. It will not be necessary, however, to implement all potential process modifications at every existing WWTP for a DPR project. Each integrated treatment system needs to be reviewed holistically to determine the most feasible approach to ensuring water quality and efficient operations, with the ultimate goal of ensuring public health protection.

### 2.2.2 Rationale for These Recommendations

A crucial consideration for DPR projects is the quality of the feed water to the AWTF. The original focus of operating WWTPs or water reclamation plants (WRPs) was to meet requirements for discharge or non-potable reuse. A higher-quality feed water can improve the quality of the final DPR product water and the operations of the AWTF. The WWTP can also provide additional barriers to improve performance and resiliency; therefore, it is important to reconsider the function of the WWTP or WRP when they function as part of an integrated treatment system to produce drinking water. A number of process modifications can be implemented at existing WWTPs or WRPs to improve the quality of the final effluent, including: (1) influent wastewater flow equalization; (2) improved primary treatment; (3) improved secondary treatment performance via increased solids retention times (SRTs); (4) the addition of microbial selectors to achieve nitrification, denitrification, and/or biological phosphorus removal; and

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<sup>5</sup> <http://www.cdph.ca.gov/services/DPOPP/regs/Pages/DPH14-003EGroundwaterReplenishmentUsingRecycledWater.aspx>

(5) alternative management of return flows from solids processing facilities, including flow equalization, treatment, and/or elimination.

Pretreatment and source control are therefore important tools available to ensure the protection of public health and optimization of an integrated system. The regulations for Groundwater Replenishment Using Recycled Water contain provisions requiring WWTP optimization (§60320.222. Operation Optimization and Plan) and source control (§60320.206. Wastewater Source Control) that provide a framework (and flexibility) to go beyond the federal Clean Water Act and pretreatment program.

## **2.3 Research on Low-Dose Exposure to Chemicals**

A growing area of concern is the impacts of commonly used chemicals and constituents of emerging concern at extremely low doses and/or mixtures of these chemicals at low doses. Because the source water for potable reuse projects will contain higher concentrations of trace organic chemicals, there is a need to better understand the potential impacts they may have on public health and the ability to comply with future drinking water standards.

### **2.3.1 Recommendations**

Identify the levels of chemicals, including constituents of concern (COCs) and constituents of emerging concern (CECs) that are present in advanced treated water and compare them to levels in other drinking water sources. Investigate potential health effects from low dose exposures from these chemicals and COCs/CECs, especially if they are detected to occur more often in advanced treated water. Specifically

- Investigate the relative risk and potential for greater public exposure, including to low doses, and the possible need for treatment that would reduce cumulative exposure relative to other water sources.
- Consistent with the Recycled Water Policy, the State Board should continue to track the occurrence and potential health effects of unregulated substances

In addition, evaluate the quality of the source water and consider potential health implications, as well as related factors such as the cost of advanced water treatment. In examining this issue, consider the work on bioanalytical techniques evaluated by the State Board, guidance provided by the CEC Advisory Panel as part of the State Board's Recycled Water Policy, and the report from the DPR Expert Panel.

### **2.3.2 Rationale for these Recommendations**

More information is needed on the occurrence and effects of COCs and CECs. In addition, although significant data may be available on the human health and environmental impacts of some contaminants (such as endocrine disruptors, carcinogens, and those known to cause reproductive harm), the impacts of low dose/trace amounts and mixtures of multiple chemicals in water and the effects on vulnerable populations are less understood. Finally, while many COCs/CECs are not regulated in drinking water, they are likely to be regulated in the future.

If COCs/CECs such as pharmaceuticals, phthalates, and perfluorinated chemicals are found to be more concentrated or at higher levels in the advanced treated water produced by potable reuse facilities than

they are in other drinking water sources, this could impact the treatment and monitoring criteria the State Board sets for potable reuse. The regulations may in turn affect the costs and technologies required to meet future maximum contaminant levels (MCLs). An understanding of COCs/CECs can also drive greater source control and green chemistry policies to reduce the levels of these constituents entering the wastewater system.

## **2.4 Direct Potable Reuse Research Priorities for California**

More research may be needed to support the development of regulations for DPR. To assure that the most critical research priorities are met, the State Board will need to evaluate potential research needs. Several efforts are underway to help advance that process.

### **2.4.1 Recommendations**

The State Board should evaluate research topics that may be needed to support the development of DPR in California that is protective of human health and the environment. The DPR Expert Panel will provide a list of prioritized research recommendations as part of its report to the State Board. Also, the State Board has held workshops on recycled water research with other state agencies, utilities, and stakeholders. The outcomes of these efforts can inform research needs for state funding, including funding under Proposition 1, which authorized money from general obligation bonds for water projects (including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection).

In addition, the State Board can play an important leadership role in sponsoring and guiding research on potable reuse. Coordinating research efforts with research foundations such as the Water Environment & Reuse Foundation and the Water Research Foundation should be encouraged. In addition, research generated by NSF-funded research centers (e.g., the Engineering Research Center for Re-Inventing the Nation's Urban Water Infrastructure at Stanford University) also should help inform research priorities in California. Through these efforts, the State Board can help drive innovation in water treatment and monitoring to advance the potential to implement potable reuse projects in water-scarce areas of California and the southwestern United States.

### **2.4.2 Rationale for These Recommendations**

Although enough information exists to implement DPR projects safely, continued research will benefit the implementation of DPR in California. Because DPR is a relatively new concept, research can help to validate new and existing treatment technologies, test new analytical methods like online sensors, improve the understanding and prediction of the reliability of treatment and monitoring systems, improve operational efficiencies and energy usage, and promote continuous improvements in existing and new technologies. The State Board has held several Recycled Water Research Needs Workshops that have produced a list of priority topics and projects; the workshop participants have provided feedback on the relative importance of different research topics. The results of these efforts underscore the need for an ongoing research program.

In addition, the DPR Expert Panel will provide research recommendations based on its effort to determine the feasibility of uniform statewide criteria for DPR. Research by the water community, such as the efforts by the Water Environment & Reuse Foundation and the Water Research Foundation, will

continue to address research needs identified by member agencies and prioritized by advisory committees within these organizations. Lastly, federally funded research focused on water treatment, quality, and monitoring, such as that performed by the US EPA and NSF, may help inform future research needs.

## **2.5 Use of Bioassays to Evaluate Constituents of Emerging Concern and Unknown Chemicals in Recycled Water**

Bioassays could provide an additional tool to evaluate the safety of recycled water for potable water in conjunction with conventional chemical testing and on-line monitoring systems. Additional research and development efforts are needed to determine whether bioassays could be applied to examine risks for unregulated chemicals and unknown mixtures of chemicals.

### **2.5.1 Recommendations**

The State Board should further study the use of bioassays for monitoring CECs and unknown chemicals in DPR projects. Based on the DPR Expert Panel's presentation relating their findings on bioassays, the Advisory Group agrees that current chemistry-based water quality and indicator-based treatment performance monitoring techniques are able to assess CECs in potable reuse projects. Currently, there are a number of challenges that must be addressed before bioassays can be implemented beyond research efforts. These limitations include: extraction procedures; quality assurance and quality control; standardized methods; treatment of false positives and false negatives; and the ability to interpret the results relative to human health. As the science of bioassays continues to develop, this technique may have the potential to supplement our current monitoring capabilities in the future. The State Board should continue to support research on the use of bioassays to move the science forward for possible future use in evaluating CECs/COCs.

### **2.5.2 Rationale for These Recommendations**

Most CECs are not regulated, and many cannot be measured analytically at low levels in wastewater or recycled water. Bioassays may offer the potential to provide a method (or methods) to assess the risks of unknown chemicals in recycled water, including the effects of a mixture of chemicals. It will be important to track the development of bioassays by research scientists and the efforts of the US EPA's Office of Research and Development. The limitations on bioassays are daunting, including analytical methods and interpretation procedures, and need to be adequately addressed through research efforts. The State Board may want to consider research on a limited scale to evaluate the usefulness of current bioassay techniques in assessing the performance of advanced water treatment technologies; however, the burden of addressing all bioassay research needs is beyond the reach of the State Board and will require federal and international efforts.

## **2.6 Building Capacity (Technical/Managerial/Financial <TMF>)**

DPR will involve the funding, design, construction, and operation of complex AWTFs, often at agencies that have limited experience operating these types of facilities. Project proponents must have the Technical, Managerial, and Financial Capacity (TMF) to ensure successful implementation of projects.

### 2.6.1 Recommendations

An assessment of technical, managerial, and financial (TMF) capacity will be needed for utilities to implement a DPR project. DPR regulations should include language similar to §60320.100(f) and §60320.200(f) in Title 22, California Code of Regulations, Division 4, Chapter 3, whereby a project sponsor must demonstrate to DDW that it possesses adequate capacity using an approach similar to the managerial and technical capability requirements in Health and Safety Code §116540. These standards would apply to all DPR projects irrespective of size of the project proponent's agency.

For DPR projects that are pipe-to-pipe (e.g., when ATW is directly introduced into a drinking water distribution system without treatment through a DWTF), the regulations should include all the requirements in Health and Safety Code §116540 (i.e., including financial capability).

### 2.6.2 Rationale for These Recommendations

The 1996 Safe Drinking Water Act required states to incorporate TMF capacity into public water systems to ensure that they are sustainable and able to comply with all applicable drinking water laws and regulations (i.e., federal TMF requirements). In response to the federal TMF requirements, California enacted §116540 of the Health and Safety Code.

For the regulation on *Groundwater Replenishment Using Recycled Water*, the State Board applied this requirement in part by only requiring a demonstration of technical and managerial capability. This approach would be appropriate for DPR projects that include a DWTF (e.g., recycled water is blended with raw water prior to treatment at a DWTF). For pipe-to-pipe DPR projects, it may be appropriate to require that all the requirements in Health and Safety Code §116540 be met.

Larger systems generally are able to meet their TMF requirements for successful operations. Most attention has been on small systems that may lack adequate TMF. The US EPA and State Board provide funding and support for technical assistance to these systems to improve and develop TMF capacity. With respect to potable reuse, additional TMF capacity may be necessary to ensure adequate operations to protect public health. It is not adequate to be merely capable of meeting normal, established drinking water regulations. The additional public health responsibilities associated with the operation of a potable reuse facility may require a higher TMF capacity.

The State Board has developed a TMF Assessment Form for public water systems, which is available at: [http://www.waterboards.ca.gov/drinking\\_water/certlic/drinkingwater/TMF.shtml#TMF\\_Assessment](http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/TMF.shtml#TMF_Assessment)

The State Board has already established TMF requirements for groundwater replenishment reuse projects (GRRP). The relevant regulations are found in §60320.100 (surface application) and §60320.200 (subsurface application) of General Requirements: "(f) Prior to operating a GRRP, a project sponsor shall demonstrate to the Department and Regional Board that a project sponsor possesses adequate managerial and technical capability to assure compliance with this Article."

For GRRPs, the State Board has indicated that project sponsors can use portions of the TMF form to demonstrate compliance with the managerial and technical capability requirements in the groundwater replenishment regulations.

## **2.7 Monitoring and Outreach Related to Public Health and Safety of Direct Potable Reuse**

The public must have confidence that DPR is safe. Public confidence can be validated by robust, comprehensive, and continuous monitoring regimes of the components that constitute DPR.

### **2.7.1 Recommendations**

Public confidence that DPR is safe and protective of public health is essential to the success of DPR projects. A robust, comprehensive, and continuous monitoring regiment should be required and include source water quality, wastewater quality, and treatment performance. The monitoring regiment should include a methodical and robust search for CECs and other potentially harmful constituents.

In addition, monitoring requirements and water quality results should be made available to the public. Data and results should be routinely posted to the utility's website, as well as included in Consumer Confidence Reports (CCRs). This recommendation supplements the public notification and CCR requirements in the Safe Drinking Water Act. Water quality data and relevant public health information should also be made available on a continuous basis. This information will help build public confidence.

### **2.7.2 Rationale for These Recommendations**

"What gets measured gets done" is a common viewpoint in the regulatory community. More specifically, what is measured and reported gets done. As noted in Section 2.8, the following are needed for public acceptance: (1) transparency regarding operations and water quality results, and (2) communication with the public. The public will require assurance that monitoring is robust and constant. The context of the monitoring and reporting requirements of the Safe Drinking Water Act for drinking water systems, both to the regulatory agencies and to the public, is well-known. The public benefits from the required notification for regulatory violations and from the treatment and water quality information in annual CCRs. Wastewater treatment systems do not have these specific requirements.

## **2.8 Changes to the Consumer Confidence Report (CCR)**

Public confidence is also enhanced by transparency and accountability. The Safe Drinking Water Act requires drinking water agencies to annually provide information on water sources, treatment, water quality, and regulatory compliance to their customers through a Consumer Confidence Report (CCR). It is appropriate to include information relating to the additional elements for potable reuse in the CCR.

### **2.8.1 Recommendation**

The Advisory Group recommends that the CCR requirements be extended to systems that undertake DPR, and that the following information related to the DPR project be included in the utility's annual CCR: water sources, descriptions of treatment technologies, water quality and monitoring results, and compliance status.



## **2.8.2 Rationale for These Recommendations**

Public transparency and consumer confidence regarding potable reuse facility operations and water quality are necessary to gain and maintain community approval of DPR projects. The CCR provides information to the customers of water utilities and to the public in general on the sources, treatment, storage, and distribution of their drinking water supply. The CCR also provides information on water quality monitoring requirements and results, regulatory compliance status, and drinking water constituent information. The requirement that utilities must transparently provide this information is essential to build and maintain public confidence in their water supply. Inclusion of information on the additional treatment, monitoring, operational and compliance elements associated with potable reuse is appropriate in this context.

## **2.9 Regulatory Approach to Environmental Impacts**

DPR projects may affect the environment. Stakeholders and permitting agencies can work together to ensure DPR projects meet all regulatory requirements, with the goal of minimizing impacts to the environment.

### **2.9.1 Recommendations**

The various local, state, and federal agencies and partners involved in regulating the disposal of waste streams (such as concentrate from reverse osmosis treatment systems) from AWTFs should provide and facilitate a coordinated approach to permitting.

### **2.9.2 Rationale for These Recommendations**

There is support among regulators, the regulated community, and concerned citizens to reduce, eliminate, or mitigate environmental impacts from water supply projects. In the case of DPR, the environmental impacts from the disposal of reverse osmosis (RO) treatment system brines will need to be considered. Concentrate management from AWTFs is a critical issue to be considered in the permitting of those facilities. While the concentrate may pose a low risk of environmental harm (or even have beneficial uses), the myriad of regulations and regulatory agencies that may be involved can be challenging. A coordinated approach that includes and aligns local, state, and federal agencies working together with project proponents could be a productive approach to assessing and permitting RO concentrate disposal as well as the handling of other concentrates, ultimately, to approving DPR projects.

### 3. RECOMMENDATIONS ON TOPICS NOT DIRECTLY RELATED TO DETERMINING THE FEASIBILITY OF DEVELOPING REGULATORY CRITERIA FOR DIRECT POTABLE REUSE

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The main purpose of this report was to provide feedback related to the feasibility of developing regulatory criteria for DPR; however, the Advisory Group also included input on topics identified by stakeholders as important to the discussion of DPR, but not related directly to the feasibility of creating regulations. These recommendations cover a range of topics related to DPR, and many can be implemented by the State or local agencies.

Recommendations are provided on the following topics:

- Potable Reuse Terminology
- Scientific Quality and Public Availability of Support Documentation
- Communications and Public Outreach
- Determining the Feasibility of a Project (Triple Bottom Line)
- Environmental Justice
- Comparison of Direct Potable Reuse and Other Alternatives
- Convening an Expert Panel and Stakeholder Group to Advise the State Board in Developing Criteria
- Effects of Direct Potable Reuse on Environmental Flows
- Effects of Direct Potable Reuse Projects on Water Rates
- Phasing of the Potable Reuse Recommendations

#### 3.1 Potable Reuse Terminology

The many technical terms related to potable reuse are often applied inconsistently by various stakeholder groups. The lack of uniform and accepted terminology leads to confusion and a lack of precision when discussing concepts related to DPR projects.

##### 3.1.1 Recommendations

Use the terms presented in the “Terminology for Potable Reuse” document (Appendix A) to the extent practical when developing new potable reuse regulations and when preparing reports and other documentation pertaining to potable reuse.

##### 3.1.2 Rationale for These Recommendations

The terminology document is intended to reflect the multitude of terms associated with potable reuse. Definitions and alternative terms are provided to demonstrate the breadth of meaning associated with each term. Members of the public have been exposed to some of this terminology through the outreach efforts of individual agencies.

## **3.2 Scientific Quality and Public Availability of Support Documentation**

It is important that the information used to make decisions on DPR projects be scientifically credible. Furthermore, to maintain a process that is transparent, the information should be made available to the public.

### **3.2.1 Recommendation**

To the extent feasible, the studies, reports, data, interpretations and other supportive information used to develop DPR criteria, regulations, and permits should have gone through a scientific review process. In addition, the materials used by the State Board in developing the criteria, regulations, and permits for DPR projects should be made fully available to the public.

### **3.2.2 Rationale for These Recommendations**

The scientific information used to support potable reuse public health goals and treatment approaches has to be of suitable quality to answer questions and address uncertainties before DPR regulations and operating permits are developed. The data and their interpretation must be reliable. Peer review and publication generally are accepted within the scientific community as a means to ensure the reliability and quality of information; however, many studies and reports do not lend themselves to publication in peer-reviewed scientific journals. Consequently, the Advisory Group does not recommend that the State require all information used to develop criteria and operational components be published in peer-reviewed journals or undergo a formal peer review. Rather, we recommend that, to the extent feasible, the data and interpretation in the reports and studies used to develop criteria, regulations, and permit requirements be scientifically based.. To further support transparency and public trust, this information should be made fully available to the public.

## **3.3 Communications and Public Outreach**

Public understanding and acceptance is critical for communities considering a DPR project. Communicating effectively with the public is essential to a project's success.

### **3.3.1 Recommendations**

Utilities should develop a proactive and comprehensive educational outreach program early in the development of a DPR project. The WaterReuse Research Foundation (now the Water Environment & Reuse Foundation) has published a "Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse," which includes communication plans for both state-level and community-level outreach. The Advisory Group supports the use of this type of information. In addition, with the development of regulations, the State Board should consider creating a senior level position to provide public education efforts.

### **3.3.2 Rationale for These Recommendations**

Although the Advisory Group does not believe that the State Board should write a requirement for public outreach in the DPR permit criteria, public acceptance is one of the primary challenges for communities considering the implementation of a DPR project.

DPR is unlikely to proceed in a community unless there is public acceptance that the treatment processes are safe and reliable. In addition, it should be shown that DPR is the best option for that community, especially because the customers will need to accept the rate increases accompanying the financing of an AWTF. A well-planned and well-executed public educational effort by project proponents is essential to obtain public acceptance.

In addition, the Advisory Group understands that it will take time to formally develop DPR regulations. In the near term, the State Board can permit DPR projects on a case-by-case basis. A broad coalition of support in a community is needed to garner public acceptance of DPR.

### **3.4 Determining Feasibility of a Project (Triple Bottom Line)**

Water supply project options, including DPR projects, can benefit from a financial, social and environmental analysis.

#### **3.4.1 Recommendations**

Agencies should consider a triple bottom line (TBL) analysis for economic, social, and environmental factors as part of determining the feasibility of implementing a DPR project.

#### **3.4.2 Rationale for These Recommendations**

Sustainability is a consideration for any new water supply project. Sustainability, however, should include a commitment to be transparent about a project's impact on costs, the public, and the environment. The TBL analysis is one way to measure these factors.

Traditionally, TBL analyzes sustainability by measuring impacts on the "three Ps" (that is, Profit, People, and Planet,) as follows:

- Profit: typically measures an organization's traditional profit and loss, but in this context, it more accurately refers to project cost.
- People: measures the social responsibility of the project.
- Planet: measures the environmental responsibility of the project.

For water projects in general, including potable reuse projects, a TBL analysis should take the following into account:

- Economic/Profit component: measure the cost of a particular project, compared to other available water supply alternatives.
- People/Social component: identify a community's available water supply alternatives, with a goal toward providing water for the needs of the community.

- Environmental/Planet component: identify the environmental benefits of reuse and recycling compared to other alternatives, including water supply alternatives that provide water for ecosystems.

### **3.5 Environmental Justice**

All communities should have access to safe, clean, and affordable water. In addition, it is important to protect communities from experiencing disproportionate impacts from DPR projects that benefit the larger society. These considerations must be part of proper implementation of DPR projects and the state's strategy to ensure equitable access to potable water.

#### **3.5.1 Recommendations**

An independent research organization such as the Water Environment & Reuse Foundation (WE&RF) should focus a study on environmental justice issues that may affect the viability and equitable access to potable reuse as a means of providing sustainable, affordable, and safe drinking water supplies to small systems and disadvantaged communities. This effort entails evaluating the effects of building projects on local neighborhoods and the needs of water-scarce areas that may not have the resources or expertise necessary to implement these technologies.

Specifically consider:

- The potential impacts of any potable reuse infrastructure on local or fence-line communities (i.e., the neighborhood adjacent to the potable reuse facility that would be directly affected by the daily operations of the facility)
- Assess whether communities that depend on small water systems, and/or disadvantaged communities without a strong financial base, can implement potable reuse technologies to ensure sustainable water supplies. It is important to understand the technical, fiscal, and other challenges that such communities would face and identify opportunities to address those challenges.

#### **3.5.2 Rationale for These Recommendations**

Regarding the potential impacts of potable reuse infrastructure on local or fence-line communities: While such studies may be captured under CEQA requirements for individual projects, research on a broader scale on the potential for disproportionate impacts on these communities would better inform such analyses.

Regarding the potential for disadvantaged communities to implement potable reuse technologies: These communities face the greatest challenges in providing safe and affordable drinking water to residents now and for ensuring sustainable water supplies in the future. While implementing potable reuse projects in large, well-funded water districts could potentially allow for reallocation of traditional water sources, many rural disadvantaged communities struggle to have access to those supplies. Consequently, in a state that has embraced the concept of "the human right to water," it will be necessary to explore the challenges faced by disadvantaged communities in implementing potable reuse strategies. In addition, the State Board should identify the most viable strategies (if any), and how these

challenges might ultimately be addressed. Finally, the State Board should look for applicable lessons from abroad that might inform California water policy.

### **3.6 Comparison of Direct Potable Reuse and Other Alternatives**

Any community considering DPR should conduct an analysis to compare other available supply alternatives for generating additional potable water. Due to differing characteristics of each community, the analysis should be done on a case-by-case basis and should become a component of the public information process.

#### **3.6.1 Recommendations**

The differences between DPR, IPR, ocean desalination, groundwater desalination, stormwater capture, graywater, and other alternative water sources should be evaluated by project proponents. Public outreach campaigns by utilities should include dialogue on alternative source water strategies.

#### **3.6.2 Rationale for These Recommendations**

As California addresses its water management problems, coastal communities may need to choose from a number of alternatives, such as DPR, IPR, ocean desalination, groundwater desalination, stormwater capture, graywater, and other alternative water sources. These sources of water often require advanced treatment technologies. All potentially provide new local, drought-resilient sources of drinking water. A discussion within the community of the differences between these water sources is needed to better understand these options.

### **3.7 Convening an Expert Panel and Stakeholder Group to Advise the State Board in Developing Criteria**

The State Board may wish to solicit feedback from other interested groups if it is determined that it is feasible to develop regulatory criteria for DPR.

#### **3.7.1 Recommendations**

If the DPR Expert Panel advises the State Board that it is feasible to develop uniform water recycling criteria for DPR, then the State Board may benefit from the involvement of another Expert Panel in further assisting the State Board in developing criteria and regulations. In addition, it may be useful to form a stakeholder group to provide insights and a different perspective on options for regulatory criteria.

#### **3.7.2 Rationale for These Recommendations**

The State Board has consulted both an Expert Panel and Advisory Group in evaluating the feasibility of developing criteria for DPR, as required in the California Water Code. Both the DPR Expert Panel and Advisory Group have been effective forums for gathering technical input and addressing stakeholder views on the challenges, issues, and merits of DPR. Beyond December 2016, the State Board may wish to convene a new Expert Panel and a Stakeholder Group as forums for further technical review and public engagement as progress is made on DPR criteria and, potentially, the regulations.

### **3.8 Effects of Direct Potable Reuse on Environmental Flows**

DPR projects can affect local hydrologic conditions. It is important to understand how changes in hydrology will affect local environmental conditions.

#### **3.8.1 Recommendations**

Greater understanding is needed of the potential environmental impacts of not replacing wastewater diverted from the environment for potable reuse. This knowledge should be used to inform decision making when permitting recycled water projects. The analysis should include whether current regulatory requirements, such as under Water Code 1211, California Environmental Quality Act, and Triple Bottom Line evaluations, are adequate to address competing water needs, such as the protection of endangered species and ecosystems, groundwater recharge, and drinking water supplies in communities downstream of water reuse projects.

#### **3.8.2 Rationale for These Recommendations**

Maintaining surface water flow and groundwater recharge is a tremendous challenge in some areas of the State. Climate change, drought, and competing uses of water will continue to stress current water supplies. In addition to the competing uses described above, flow problems have wide-ranging repercussions beyond water quantity. For instance, changes in flow and related temperature fluctuations may play significant roles in increasing cyanobacteria and macrophyte production in the Sacramento-San Joaquin River Delta. While the State has implemented restrictions on water reuse to protect both competing human and environmental needs, expanding potable reuse in some parts of the state may add challenges to already stressed water sources. Better understanding is necessary on a regional level to ensure that potable reuse projects are implemented in a manner that does not reduce drinking water accessibility in other communities or create environmental harm.

### **3.9 Effects of Direct Potable Reuse Projects on Water Rates**

Designing, permitting, constructing, and operating DPR projects can be complex, time-consuming, and costly. Consequently, water suppliers that implement DPR projects potentially will need to assess potential impacts on water rates and charges associated with these projects.

#### **3.9.1 Recommendations**

Utilities should evaluate the cost of a DPR project, including all technical requirements and barriers needed, and the corresponding impacts on water rates and charges, and compare it with the cost of water supply alternatives and their impacts on water rates and charges.

#### **3.9.2 Rationale for These Recommendations**

Current California law requires that water suppliers establish water rates and charges that do not exceed the cost of service (COS) to water service customers. Determining COS is a methodical process in which revenue requirements should lead to a fair and equitable allocation of costs in proportion to the service each customer receives.

New sources of water supply, such as potable reuse, are more costly than traditional water supply options, such as imported water or groundwater pumping. However, in many areas, traditional water supply options are at best fully allocated and at worst over allocated. Potable reuse often is assumed to be the least costly alternative for new water supplies; however, each project is unique, so this assumption should be empirically proven for each project. It is important to realize that potable reuse projects will range along a spectrum of configurations from “indirect” DPR projects that may include a smaller environmental buffer to “direct” DPR projects in which treated drinking water is introduced directly into a water supply system without treatment through a DWTF. The latter scheme could include many costly technical barriers or controls.

Further, to be credible, an analysis of the costs of a potable reuse project and its impact on water rates and charges must be compared to other water supply alternatives and their impacts on water rates and charges. This analysis must be done on an “apples-to-apples” basis (i.e., subsidized-to-subsidized or unsubsidized-to-unsubsidized); however, it would be appropriate to include the avoided costs of other regulatory mandates. One example is the avoided cost of upgrading to secondary wastewater treatment at the Point Loma Wastewater Treatment Plant when calculating the costs of the City of San Diego’s potable reuse project. Alternative supplies of water would not provide that avoided cost.

Further, while risk and reliability can be difficult to price, it would be appropriate to take these issues into consideration. While potable reuse and desalination are costlier than other water supply sources, they are drought-proof and can be a reliable source that carries less risk than other comparative supplies. Risks may include allocations and supply cutbacks or natural disasters that may reduce or stop supply deliveries.

### **3.10 Phasing of the Potable Reuse Regulations**

Given the broad spectrum of potable reuse applications, a phased regulatory approach could be beneficial. This incremental approach could allow for the permitting of more projects throughout the state, and at the same time give the industry and regulators the opportunity to build on the lessons learned from ongoing projects.

#### **3.10.1 Recommendations**

Ensure that a viable regulatory pathway exists to permit potable reuse projects with environmental buffers that do not meet regulatory requirements for GRRP, SWA, or DPR. Options to consider include provisions for groundwater basins (e.g., travel time) and for surface reservoirs (e.g., dilution or retention time) or issuing a case-by-case (or “one-off”) permit. These options could be based on information provided in the Expert Panel’s Feasibility Report.

When assessing the feasibility of DPR, the State Board should consider the following:

- Identify strategies and establish guidelines that the State Board can employ for future potable reuse regulations to address the lack of an environmental buffer (i.e., a groundwater basin or surface water reservoir). Such strategies and guidelines might include:
  - Additional treatment barriers.
  - Online and high-frequency monitoring capabilities for chemicals and pathogens or possible surrogates and indicators.



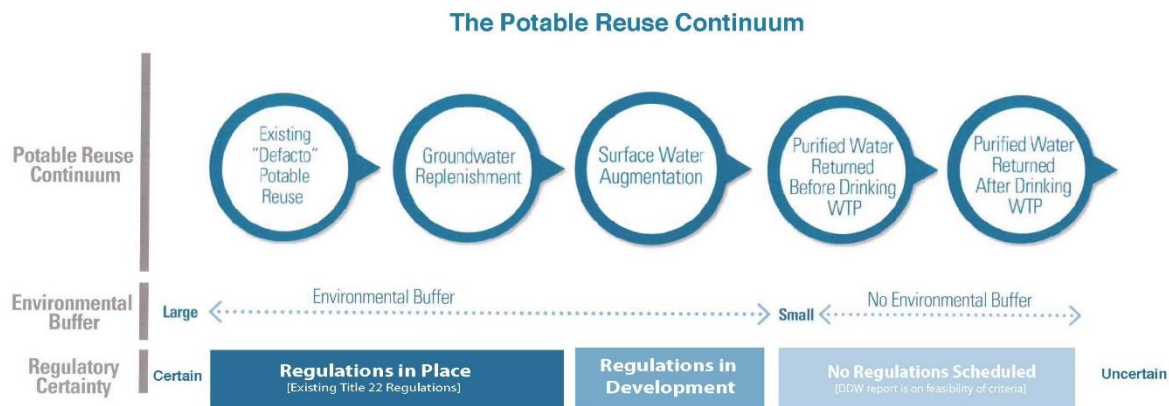
- Corrective and operational actions to address instrumentation or treatment lapses and off-specification water.
- Pretreatment practices that are coupled with potable reuse goals.
- Programs that engage the public in sewershed protection.
- Consider developing separate criteria for the continuum of potable reuse alternatives:
  - Projects with surface water reservoirs that do not meet the reservoir criteria in the SWA regulations.
  - Projects with no environmental buffer, but that include a DWTF prior to distribution.
  - Projects with no environmental buffer and no DWTF prior to distribution.
- If the expert panel determines that development of regulations is feasible, then DDW should within six months create and share with the public a work plan and time line for next steps for developing regulations for DPR, including further research and pilot projects that may be needed.

As DDW develops DPR regulations, DDW should be able to consider DPR projects on a case-by-case basis. In addition, any future legislation should not delay the consideration by regulators of new potable reuse projects.

Finally, the definitions of SWA and DPR in the California Water Code may need to be revised based on the findings of the DPR Expert Panel. Specific terminology should be considered that distinguishes among the various types of potable reuse projects.

### 3.10.2 Rationale for These Recommendations

Potable reuse projects can be categorized along a continuum depending on the type and size of the environmental buffer and whether a DWTF is part of the treatment system. As illustrated in Figure 3-1, this continuum begins with “de facto” potable reuse, involving large environmental buffers, and proceeds to the middle of the spectrum to planned IPR applications that include environmental buffers of varying sizes. As the environmental buffers are reduced further, the far end of the spectrum illustrates DPR applications that lack an environmental buffer and, ultimately, projects in which finished drinking water is produced by the AWTF.



**Figure 3-1: The Potable Reuse Continuum**

In California, potable reuse regulations are advancing along this continuum, starting with the regulations on Groundwater Replenishment Using Recycled Water, which became effective in 2014.<sup>6</sup> SWA regulations are expected to be adopted in late 2016. The definition of an environmental buffer in SWA projects could provide an important distinction between IPR and DPR projects. Such a distinction will determine which regulations projects are subject to. Because utilities are interested in DPR projects (which do not include environmental buffers), the Advisory Group recommends developing new potable reuse regulations for projects that fall somewhere between SWA and DPR. New regulations should build upon (1) the experience accumulated from existing groundwater replenishment projects and (2) the demonstration of work completed to support SWA regulations. The result would be the development of regulations that are scientifically based, protective of public health, and safely expand the scope of potable reuse in California.

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<sup>6</sup> <http://www.cdph.ca.gov/services/DPOPP/regs/Pages/DPH14-003EGroundwaterReplenishmentUsingRecycledWater.aspx>

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## APPENDIX A: CALIFORNIA WATER CODE SECTIONS ON POTABLE REUSE

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### CALIFORNIA WATER CODE

#### CHAPTER 7.3 DIRECT AND INDIRECT POTABLE REUSE

#### SECTION 13560-13569

13560. The Legislature finds and declares the following:

(a) In February 2009, the state board unanimously adopted, as Resolution No. 2009-0011, an updated water recycling policy, which includes the goal of increasing the use of recycled water in the state over 2002 levels by at least 1,000,000 acre-feet per year by 2020 and by at least 2,000,000 acre-feet per year by 2030.

(b) Section 13521 requires the department to establish uniform statewide recycling criteria for each varying type of use of recycled water where the use involves the protection of public health.

(c) The use of recycled water for indirect potable reuse is critical to achieving the state board's goals for increased use of recycled water in the state. If direct potable reuse can be demonstrated to be safe and feasible, implementing direct potable reuse would further aid in achieving the state board's recycling goals.

(d) Although there has been much scientific research on public health issues associated with indirect potable reuse through groundwater recharge, there are a number of significant unanswered questions regarding indirect potable reuse through surface water augmentation and direct potable reuse.

(e) Achievement of the state's goals depends on the timely development of uniform statewide recycling criteria for indirect and direct potable water reuse.

(f) This chapter is not intended to delay, invalidate, or reverse any study or project, or development of regulations by the department, the state board, or the regional boards regarding the use of recycled water for indirect potable reuse for groundwater recharge, surface water augmentation, or direct potable reuse.

(g) This chapter shall not be construed to delay, invalidate, or reverse the department's ongoing review of projects consistent with Section 116551 of the Health and Safety Code.

13561. For purposes of this chapter, the following terms have the following meanings:

(a) "Department" means the State Department of Public Health.

(b) "Direct potable reuse" means the planned introduction of recycled water either directly into a public water system, as defined in Section 116275 of the Health and Safety Code, or into a raw water supply immediately upstream of a water treatment plant.

(c) "Indirect potable reuse for groundwater recharge" means the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system, as defined in Section 116275 of the Health and Safety Code.

(d) "Surface water augmentation" means the planned placement of recycled water into a surface water reservoir used as a source of domestic drinking water supply.

(e) "Uniform water recycling criteria" has the same meaning as in Section 13521.

13561.5. The state board shall enter into an agreement with the department to assist in implementing this chapter.

13562. (a) (1) On or before December 31, 2013, the department shall adopt uniform water recycling criteria for indirect potable reuse for groundwater recharge.

(2) (A) Except as provided in subparagraph (C), on or before December 31, 2016, the department shall develop and adopt uniform water recycling criteria for surface water augmentation.

(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.

(C) The department shall not adopt uniform water recycling criteria for surface water augmentation pursuant to subparagraph (A), unless and until the expert panel adopts a finding that the proposed criteria would adequately protect public health.

(b) Adoption of uniform water recycling criteria by the department is subject to the requirements of Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code.

13562.5. Notwithstanding any other law, no later than June 30, 2014, the department shall adopt, by emergency regulations in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code, requirements for groundwater replenishment using recycled water. The adoption of these regulations is an emergency and shall be considered by the Office of Administrative Law as necessary for the immediate preservation of the public peace, health, safety, and general welfare. Notwithstanding Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code, emergency regulations adopted by the department pursuant to this section shall not be subject to review by the Office of Administrative Law and shall remain in effect until revised by the department.

13563. (a) (1) On or before December 31, 2016, the department, in consultation with the state board, shall investigate and report to the Legislature on the feasibility of developing uniform water recycling criteria for direct potable reuse.

(2) The department shall complete a public review draft of its report by September 1, 2016. The department shall provide the public not less than 45 days to review and comment on the public review draft.

(3) The department shall provide a final report to the Legislature by December 31, 2016. The department shall make the final report available to the public.

(b) In conducting the investigation pursuant to subdivision (a), the department shall examine all of the following:

(1) The availability and reliability of recycled water treatment technologies necessary to ensure the protection of public health.

(2) Multiple barriers and sequential treatment processes that may be appropriate at wastewater and water treatment facilities.

(3) Available information on health effects.

(4) Mechanisms that should be employed to protect public health if problems are found in recycled water that is being served to the public as a potable water supply, including, but not limited to, the failure of treatment systems at the recycled water treatment facility.

(5) Monitoring needed to ensure protection of public health, including, but not limited to, the identification of appropriate indicator and surrogate constituents.

(6) Any other scientific or technical issues that may be necessary, including, but not limited to, the need for additional research.

(c) (1) Notwithstanding Section 10231.5 of the Government Code, the requirement for submitting a report imposed under paragraph (3) of subdivision (a) is inoperative on December 31, 2020.

(2) A report to be submitted pursuant to paragraph (3) of subdivision (a) shall be submitted in compliance with Section 9795 of the Government Code.

13563.5. (a) The department, in consultation with the state board, shall report to the Legislature as part of the annual budget process, in each year from 2011 to 2016, inclusive, on the progress towards developing and adopting uniform water recycling criteria for surface water augmentation and its investigation of the feasibility of developing uniform water recycling criteria for direct potable reuse.

(b) (1) A written report submitted pursuant to subdivision (a) shall be submitted in compliance with Section 9795 of the Government Code.

(2) Pursuant to Section 10231.5 of the Government Code, this section is repealed on January 1, 2017.

13564. In developing uniform water recycling criteria for surface water augmentation, the department shall consider all of the following:

(a) The final report from the National Water Research Institute Independent Advisory Panel for the City of San Diego Indirect Potable Reuse/Reservoir Augmentation (IPR/RA) Demonstration Project.

(b) Monitoring results of research and studies regarding surface water augmentation.

(c) Results of demonstration studies conducted for purposes of approval of projects using surface water augmentation.

(d) Epidemiological studies and risk assessments associated with projects using surface water augmentation.

(e) Applicability of the advanced treatment technologies required for recycled water projects, including, but not limited to, indirect potable reuse for groundwater recharge projects.

(f) Water quality, limnology, and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff.

(g) Recommendations of the State of California Constituents of Emerging Concern Recycled Water Policy Science Advisory Panel.

(h) State funded research pursuant to Section 79144 and subdivision (b) of Section 79145.

- (i) Research and recommendations from the United States Environmental Protection Agency Guidelines for Water Reuse.
- (j) The National Research Council of the National Academies' report titled "Water Reuse: Potential for Expanding the Nation's Water Supply through Reuse of Municipal Wastewater."
- (k) Other relevant research and studies regarding indirect potable reuse of recycled water.

13565. (a) (1) On or before February 15, 2014, the department shall convene and administer an expert panel for purposes of advising the department on public health issues and scientific and technical matters regarding development of uniform water recycling criteria for indirect potable reuse through surface water augmentation and investigation of 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.

(2) The expert panel shall be comprised, at a minimum, of a toxicologist, an engineer licensed in the state with at least three years' experience in wastewater treatment, an engineer licensed in the state with at least three years' experience in treatment of drinking water supplies and knowledge of drinking water standards, an epidemiologist, a limnologist, a microbiologist, and a chemist. The department, in consultation with the advisory group and the state board, shall select the expert panel members.

(3) Members of the expert panel may be reimbursed for reasonable and necessary travel expenses.

(b) (1) On or before January 15, 2014, the department shall convene an advisory group, task force, or other group, comprised of no fewer than nine representatives of water and wastewater agencies, local public health officers, environmental organizations, environmental justice organizations, public health nongovernmental organizations, the department, the state board, the United States Environmental Protection Agency, ratepayer or taxpayer advocate organizations, and the business community, to advise the expert panel regarding the development of uniform water recycling criteria for direct potable reuse and the draft report required by Section 13563. The department, in consultation with the state board, shall select the advisory group members.

(2) Environmental, environmental justice, and public health nongovernmental organization representative members of the advisory group, task force, or other group may be reimbursed for reasonable and necessary travel expenses.

(3) In order to ensure public transparency, the advisory group established pursuant to paragraph (1) shall be subject to the Bagley-Keene Open Meeting Act (Article 9 (commencing with Section 11120) of Chapter 1 of Part 1 of Division 3 of Title 2 of the Government Code).

(c) On or before June 30, 2016, the department shall prepare a draft report summarizing the recommendations of the expert panel.

(d) The department may contract with a public university or other research institution with experience in convening expert panels on water quality or potable reuse to meet all or part of the requirements of this section should the department find that the research institution is better able to fulfill the requirements of this section by the required date.

13566. In performing its investigation of the feasibility of developing the uniform water recycling criteria for direct potable reuse, the department shall consider all of the following:

- (a) Recommendations from the expert panel appointed pursuant to subdivision (a) of Section 13565.
- (b) Recommendations from an advisory group, task force, or other group appointed by the department pursuant to subdivision (b) of Section 13565.
- (c) Regulations and guidelines for these activities from jurisdictions in other states, the federal government, or other countries.
- (d) Research by the state board regarding unregulated pollutants, as developed pursuant to Section 10 of the recycled water policy adopted by state board Resolution No. 2009-0011.
- (e) Results of investigations pursuant to Section 13563.
- (f) Water quality and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff.

13567. An action authorized pursuant to this chapter shall be consistent, to the extent applicable, with the federal Clean Water Act (33 U.S.C. Sec. 1251 et seq.), the federal Safe Drinking Water Act (42 U.S.C. Sec. 300f et seq.), this division, and the California Safe Drinking Water Act (Chapter 4 (commencing with Section 116270) of Part 12 of Division 104 of the Health and Safety Code).

13569. The department may accept funds from nonstate sources and may expend these funds, upon appropriation by the Legislature, for the purposes of this chapter.



## APPENDIX B: TERMINOLOGY FOR DIRECT POTABLE REUSE

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To be provided

## APPENDIX C: BIOGRAPHICAL SUMMARIES OF ADVISORY GROUP MEMBERS

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### **Randy Barnard, P.E.**

*Recycled Water Unit Chief, Division of Drinking Water, California State Water Resources Control Board*

Randy Barnard has over 23 years of experience working with new and advanced water treatment technologies. He has worked with wastewater, recycled water, potable water, and nuclear reactor coolants. Barnard has spent 13 years with California's Division of Drinking Water, and for the last 6 years has been their regulatory authority on recycled water issues. His position manages the review of potable and recycled water projects, including: recycled water treatment and distribution, surface water augmentation, and groundwater recharge projects across California. He provides technical expertise to local, state, and federal governmental agencies, and various private projects worldwide on issues related to the delivery of safe potable and recycled water supplies. Barnard holds a California Professional Engineering License in Chemical Engineering and a B.S. in Chemical Engineering from University of California, San Diego.



### **Garry Brown**

*Founder and President CEO, Orange County Coastkeeper*

In 1999, Garry Brown founded Orange County Coastkeeper, a grassroots environmental organization that works to protect and preserve the marine habitats and watersheds of the region through education, advocacy, restoration, research, and enforcement. Brown previously served as an assistant city manager, as an advocate and executive director for trade associations in the real estate and building industries, and twice as president of a chamber of commerce. In 2001, he founded the Orange County League of Conservation Voters and in 2006 he commenced publishing "Coastkeeper Magazine." He serves on the Board of Directors for numerous environmental organizations, including Nature Reserve of Orange County, American Green Power, and The Harbor Safety and Oil Spill Response Committee for Port of Los Angeles/Long Beach. He also chairs the Orange County Transportation Authority Environmental Cleanup Committee. Brown holds a B.A. in Government from the University of Redlands.



### **Amy Dorman, P.E.**

*Project Delivery Manager, Pure Water San Diego, City of San Diego Public Utilities Department*

Amy Dorman has 25 years of experience in the engineering industry, and has worked for the City of San Diego for more than 20 years. She is the Project Delivery Manager for the City's long-term potable reuse program, the Pure Water San Diego Program, and oversees the delivery of Pure Water facility projects from planning through start-up and commissioning. As part of Program planning, Dorman has provided oversight of the Program feasibility studies, drafted the initial 20-year Program schedule, and is overseeing the pre-design of the purified water pipeline. Prior to her work on the Pure Water San Diego Program, she was



involved with several projects that now serve as the basis for the Program, including the Water Purification Demonstration Project and Recycled Water Study. Dorman earned a B.S. from University of California at Berkeley and an M.B.A. from San Diego State University.

### **Conner Everts**

*Facilitator, Environmental Water Caucus*

Conner Everts is executive director of the Southern California Watershed Alliance and co-chair of the Desal Response Group. He is chair of Public Officials for Water and Environmental Reform (POWER). Everts was elected to the Casitas Municipal Water District and was president of the Ojai Basin Management Ground Water Agency. He was the convener of the California Urban Water Conservation Council and on is on the state task forces on TMDLs, Desalination, and the SWRCB recycled water stakeholder process. He feels his most important work is as elder advisor to the Environmental Justice Coalition for Water and with the Southern California Steelhead Coalition; in this capacity he helps remove dams on streams where he caught fish as a youth.



### **Jim Fiedler, P.E.**

*Chief Operating Officer, Santa Clara Valley Water District*

Jim Fiedler leads Santa Clara's water supply program, which includes water importation, surface reservoir operations and storage, groundwater management, raw and treated water delivery, drinking water treatment, water recycling and purification, and conservation programs. A member of the water district staff since 1982, Fiedler has more than 35 years of leadership and engineering experience in the area of water supply, flood protection and watershed stewardship. He serves as the Chair of the San Francisco Estuary Institute (SFEI) Board of Directors and on the board of the WaterReuse Association, and is Past President of National Association of Flood and Storm Management Agencies (NAFSMA) and a past Board member of the San Francisco Bay Planning Coalition. Fiedler holds a B.S. in Civil Engineering from Loyola Marymount University in Los Angeles and an M.S. in Civil Engineering from Stanford University. He is a registered civil engineer in the State of California.



### **Julie L. Labonte, P.E.**

*Senior Vice President and Director of Programs-Americas, MWH Global*

Julie L. Labonte has more than 26 years of experience in utility engineering in both the private and public sectors. In her current position with MWH Global, she helped guide the strategies of the company's program management practice. She is now the MWH Program Consultant Manager for the multi-billion dollar San Diego Pure Water Program, the leading potable reuse infrastructure program in the nation. Before joining MWH, Julie was Director of the San Francisco Public Utilities Commission's \$4.7 billion Water System Improvement Program (WSIP), one of North America's largest water capital improvement programs, incorporating 87 projects and involving over 500 City staff and consultants. Labonte was named the 2013 Government Civil Engineer of the Year in the U.S. by the American Society of Civil Engineers and received the Outstanding Civil Engineer in the Public Sector in the State of California award from the same organization in 2011. She is involved with Water for



People and is also on the board of Africa Development Promise, a NGO that aims to transform the lives of rural East Africans through the building of profitable and sustainable agricultural cooperatives. Labonte holds a B.S. in civil engineering from United States International University in San Diego, and master's degrees in civil engineering and environmental engineering from San Diego State University and University of California at Berkeley, respectively. She is a registered civil engineer in the State of California.

**Albert C. Lau, P.E.**

*Director of Engineering and Planning, Padre Dam Municipal Water District*

Albert Lau has more than 20 years of experience in water utilities in both the public and private sectors. He currently plans, organizes, and executes the daily operations of the Engineering Department for Padre Dam, including the capital improvement program, development services, and construction management. Additionally, he is responsible for developing and implementing the potable reuse program, including the Advanced Water Purification Demonstration Project. Lau is a member of the Regional Advisory Committee for the San Diego Integrated Regional Water Management Program, which provides leadership in regional water resources management and planning. He serves as Vice Chair for the Technical Advisory Committee for the Metro Wastewater JPA and is a member of the Cal-Nevada Advanced Operators Certification Committee. Lau has a B.S. in Civil Engineering from California Polytechnic University, Pomona; an M.S. in Civil Engineering from University of Colorado, Boulder; and an M.B.A. from San Diego State University. He is a registered civil engineer in California.



**Bruce Macler, Ph.D.**

*Toxicologist, US Environmental Protection Agency*

Bruce Macler has provided expertise on toxicology and risk assessment for environmental water issues for the US Environmental Protection Agency since 1989. He manages regulatory workgroups and an extensive research program on drinking water treatment, coordinates water-related emergency response, and is involved in public outreach and communications. Prior to joining the EPA, Macler held academic and research positions at NASA, University of California (UC) Berkeley, and State University of New York (SUNY) Stonybrook. He has authored more than 90 articles and research publications on biotechnology, microbial risk assessment and drinking water regulations, and teaches and lectures widely. He holds a B.S. and Ph.D. in Biochemistry from UC Berkeley.



**Traci Minamide, P.E., BCEE***Chief Operating Officer, LA Sanitation (City of Los Angeles)*

Traci Minamide assists the General Manager of LA Sanitation (LASAN) with an emphasis on waste water treatment and water reclamation. She has served the City for more than 25 years in many capacities including water planning, industrial pretreatment, environmental regulations, wastewater treatment, and water reclamation. Minamide holds a B.S. in Civil Engineering from California State Polytechnic University at Pomona, an M.S. in Environmental Engineering from Loyola Marymount University, and a certificate in Executive Management for State and Local Government from Harvard University. She is a licensed civil engineer in the State of California and a Board Certified Environmental Engineer through the American Academy of Environmental Engineers and Scientists. She currently serves on the Board of Directors for the California Association of Sanitation Agencies.

**Edward Moreno, M.D., M.P.H.***Monterey County Health Officer and Director of Public Health*

As County Health Officer for Monterey, California, Edward Moreno enforces health and safety code and local ordinances that protect public health. His work focuses on protecting individuals, families, and communities from threats such as food and water borne illnesses, natural and man-made disasters, toxic exposures, and preventable injuries. As the representative of the California Conference of Local Health Officers, he provides a public health perspective on matters related to direct potable reuse. He received a B.S. from the University of Notre Dame, an M.D. from University of California, San Francisco and a M.P.H. from California State University, Fresno.

**Keith R. Solar, Esq.***Managing Shareholder, San Diego Office, Buchanan Ingersoll & Rooney, LLP*

Solar represents public and private clients in connection with water rights and water-related issues, with particular emphasis in desalination and potable reuse. Since 2002, he served as special counsel to the City of Carlsbad, and since 2012, he has represented IDE Americas, Inc., each with respect to the Claude “Bud” Lewis Carlsbad Desalination Plant, a 54 million gallons per day seawater desalination plant, designed and operated by IDE, which is the largest in the Western Hemisphere. Solar has extensive experience related to negotiating and documenting the purchase, sale, and lease of adjudicated groundwater rights and real property acquired for associated water rights. He has also worked on projects related to the acquisition, disposition, and lease of privately owned or municipal water systems, and on many technical and legal issues related to desalination facilities. In 2014 and 2015, he was named “Water Law – Attorney of the Year in California” by Corporate INTL Magazine. Solar holds an A.B. from Indiana University and a J.D. from McGeorge School of Law at University of the Pacific.



**Frances Spivy-Weber***Vice Chair, California State Water Resources Control Board*

Frances Spivy-Weber was first appointed to the State Water Resources Control Board in 2007, reappointed and elected Vice-Chair of the Board in 2009, and reappointed by Governor Brown in 2013 to a four-year term. Before being appointed to the Board, she served as the executive director of the Mono Lake Committee since 1997. From 1983 to 1992, Weber served as the director of international programs for the National Audubon Society. She previously was a legislative assistant for the Animal Welfare Institute from 1978 to 1982. Spivy-Weber is currently serving as Chair of the Water Policy Center Advisory Council with the Public Policy Institute of California, and is a member of the Advisory Board of Synergy. She previously served as a member of the Bay-Delta Public Advisory Committee and co-chair of its Water Use Efficiency Committee. She was also co-chair of the Southern California Water Dialogue and convener of the California Urban Water Conservation Council. She has served on many boards, including the Water Education Foundation, California Council of Land Trusts, and Clean Water Action/Clean Water Fund.

**Raymond L. Tremblay, P.E.***Department Head, Facilities Planning Department, Sanitation Districts of Los Angeles County*

Raymond Tremblay has been a member of the Sanitation Districts' engineering staff since 1993 and has served in various capacities in wastewater treatment and solid waste facilities planning, construction, operation, and regulatory compliance. He became Department Head in 2013 and is responsible for planning and environmental review for new facilities, property management, and all information services for the Districts. He previously served as Monitoring Section Head for water quality at all wastewater treatment facilities and as Assistant Department Head of the Technical Services Department. Tremblay serves on the Board of Directors for the Urban Water Institute, the WaterReuse Association, and Water Environment & Reuse Foundation. He is a Registered Civil Engineer in the State of California and is a Board Certified Environmental Engineer by the American Academy of Environmental Engineers and Scientists.

**Andria Ventura***Program Manager, Clean Water Action/Clean Water Fund*

Andria Ventura left a 13-year career in publishing in 1995 to work on environmental issues for the New Jersey Environmental Federation, Clean Water Action's New Jersey chapter. As an organizer she worked on a wide array of issues including drinking water protection, the state's Source Water Protection program, and stopping incineration. She also served on her town's environmental commission. Ventura joined the California staff in May 2003, after a two-year hiatus in Hawaii volunteering with the Waikiki Zoo's elephant program and working at the Oceanic Institute. She manages our toxics program which includes overseeing our water cleanup, drinking water contaminants and standards, and chemical policy programs. Ventura represents Clean Water Action on the Californians for a Healthy and Green Economy (CHANGE) Coalition and the BizNGO Policy Working Group, an organization that focuses on reforming state and national policies to adopt safer chemicals and sustainable materials.



**Michael P. Wehner**

*Assistant General Manager, Orange County Water District (Fountain Valley, CA)*

Mike Wehner has almost 40 years of experience in water quality control and water resources management. Initially he spent 20 years with the Orange County Health Care Agency. Since 1991, he has worked for the Orange County Water District (OCWD), where he currently serves as Assistant General Manager. His responsibilities include managing the Water Quality and Technology Group, which includes the Laboratory, Hydrogeology, Water Quality, Research and Development, and Health and Regulatory Affairs Departments. In this capacity, he is involved with numerous aspects of OCWD's Groundwater Replenishment System (the nation's largest IPR project), including by providing technical guidance on treatment and quality and managing monitoring programs for the purification facility. He also managed OCWD's 8-year Santa Ana River Water Quality and Health Study, which evaluated the impact of using effluent-dominated river waters for groundwater recharge. Wehner currently serves on independent advisory panels for potable reuse projects for Los Angeles Department of Water and Power, Monterey Regional Water Pollution Control Agency, City of San Diego, and Singapore Public Utilities Board (PUB). He received a Master's of Public Administration from California State University, Long Beach, and a B.S. in Biological Sciences from University of California, Irvine.



## APPENDIX D: ADVISORY GROUP MEETING DATES AND LOCATIONS

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All meetings of the Advisory Group were open to the public.

### **Meeting 1**

February 21, 2014, at CalEPA Building in Sacramento, California

### **Meeting 2**

July 11, 2014, at Orange County Water District in Fountain Valley, California

### **Meeting 3**

November 10, 2014, at Santa Clara Valley Water District's Silicon Valley Advanced Water Purification Center in San Jose, California

### **Meeting 4**

February 20, 2015, at City of San Diego North City Water Reclamation Plant in San Diego

### **Meeting 5**

May 1, 2015, at Cal EPA Building in Sacramento, California

### **Meeting 6**

July 29, 2015, at Padre Dam Municipal Water District in Santee, California

### **Meeting 7**

October 22, 2015, at San Francisco Estuary Institute in Richmond, California

### **Meeting 8**

January 19, 2016, at Orange County Water District in Fountain Valley, California

### **Meeting 9**

March 3, 2016, at San Francisco Estuary Institute in Richmond, California

### **Meeting 10**

April 8, 2016, at Orange County Water District in Fountain Valley, California

### **Meeting 11**

June 15, 2016, at CalEPA Building in Sacramento, California