

California Direct Potable Reuse Initiative

REPORTING ON OUR PROGRESS

Thank You to Our Sponsors!

Spring/Summer 2014

WATEREUSE RESEARCH

WATEREUSE CALIFORNIA

Off to a Great Start!

The WateReuse Research Foundation, in partnership with WateReuse California, launched the DPR Initiative in June of 2012 to advance DPR as a water supply option in California. This was driven by the establishment in recent years of statewide goals for the use of recycled water, and a mandate from the California legislature to come up with a feasibility study by 2016 to investigate developing uniform water recycling criteria for DPR.

Since then, the DPR Initiative has raised almost $6 million for cutting edge DPR research. This includes $500,000 in matching funds from The Metropolitan Water District of Southern California (MWD) to fund four projects on public acceptance, critical control points, source water control, and development of an operations plan. Additionally, we forged a valuable partnership with the Water Research Foundation, resulting in WRF along with six of its member agencies funding and managing two research projects (worth $600,000) from the list of 22 identified as essential by experts at a WRRF workshop. WRRF welcomed this additional support to augment the leadership shown by California municipal water agencies and other stakeholders. Not included in that total is a $2.1 million grant application to the State of California that has been approved for a DPR demonstration project. This work in San Diego is expected to start this fall.

We are extremely grateful for the support of almost 50 public water agencies, consulting engineering firms, and suppliers who have pledged funds to advance DPR as a water supply option in California.

WateReuse Research Foundation DPR Research Program

The Beginnings

This Initiative was built upon a solid DPR Research Program that started in 2011 when WRRF began funding research identified by WateReuse's *Direct Potable Reuse: A Path Forward*, the 2012 NRC report on potable reuse, and the investors of the California DPR Initiative. The six resulting projects initiated in 2011 and 2012, representing over $3.8 million in research, created a solid foundation exploring the viability of DPR. Significant findings and conclusions will arise from these initial DPR projects and will help steer future DPR research.

Launching of the DPR Initiative

WRRF and WRCA hosted a DPR Research Needs Workshop at West Basin's Edward C. Little Water Recycling Facility in December 2012 to identify research gaps to be addressed in new research. Attended by more than 50 (Appendix A) international leaders in potable reuse, the workshop divided the experts in industry, academics, consulting, and regulators into four strategic breakout groups (Operations, Quality Assurance, Treatment Technology, and Public Acceptance). Descriptions for 22 projects resulted and were ranked by the workshop attendees.

This ranked list was submitted to the Foundation's Research Advisory Committee (RAC) for review and selection at their January 2013 meeting. The RAC further developed four projects addressing regulatory, utility, and community concerns. This 2013 DPR research approved by the Board (WRRF-13-02, 13-03, 13-12, 13-13) totals $1,000,000 and is funded by the CA DPR Initiative donors as well as Metropolitan Water District of Southern CA. This program is further enhanced by collaboration with the Water Research Foundation (WRF), who is funding and managing an additional two projects (WRF4536 and 4506) at $600,000.

The RAC again met in January 2014 and added more important research to address key questions in DPR. The RAC built off of existing projects and recommended research to develop four new projects to be started in 2014. These projects were approved by the Board in March and add another $1 million to the DPR program to address technical and public acceptance concerns with DPR. The nine projects funded by the DPR Initiative are represented below.

Current DPR Research

Project #	WRRF Project Manager	Research Project Title	Principal Investigator	WRRF DPR Initiative	In Kind Contribution
WRRF-13-02	Stefani McGregor	Model Public Communication Plan for Advancing DPR Acceptance	Mark Millan, Data Instincts; Patsy Tennyson, Katz & Associates	$337,125	$272,606
WRRF-13-03	Justin Mattingly	Critical Control Point assessment to quantify robustness and reliability of multiple treatment barriers of DPR scheme	Troy Walker, Hazen & Sawyer	$300,000	$238,969
WRRF-13-12	Stefani McGregor	Evaluation of Source Water Control Options and the Impact of Selected Strategies on DPR	TBD	$150,000	TBD
WRRF-13-13	Justin Mattingly	Development of Operation and Maintenance Plan and Training and Certification Framework for Direct Potable Reuse (DPR) Systems	Troy Walker, Hazen & Sawyer	$250,000	$85,000
WRRF-13-15 (WRF4536)	John Whitler (WRF)	Blending Requirements for Water from Direct Potable Reuse Treatment Facilities	TBD	$325,000	TBD
WRRF-13-14 (WRF4508)	John Whitler (WRF)	Assessment of Techniques to Evaluate and Demonstrate the Safety of Water from Direct Potable Reuse Treatment Facilities	TBD	$275,000	TBD
WRRF-14-01	Justin Mattingly	Integrated Management of Sensor Data for Real Time Decision Making and Response	TBD	$300,000	TBD
WRRF-14-02	Stefani McGregor	Establishing additional log reduction credits for WWTPs	TBD	$400,000	TBD
WRRF-14-03	Justin Mattingly	Develop Methodology of comprehensive (fiscal/triple bottom line) analysis of alternative water supply projects compared to DPR	TBD	$250,000	TBD

CDPH Expert Panel

On March 5, NWRI convened a kickoff conference call with CDPH staff, expert panelists, and WRCA/WRRF staff. The objectives of the call were to (1) Provide an overview of the CDPH's mandate regarding the Expert Panel, (2) Review the Panel's scope of work, and (3) Review DPR research efforts to date and future research needs. The Foundation staff provided a 30 minute overview of our DPR research, initiating in 2011 and gaining new momentum in with the launch of the DPR Initiative. A preliminary report was drafted by Jeff Mosher and shared with the Foundation Board at the March 26 meeting. A formal response from the Expert Panel is expected in the end of April to advise the Foundation on remaining research gaps. The Foundation will assemble an ad-hoc RAC group to review the report and develop new research to add to our 2014 program.

CDPH Expert Panel Members

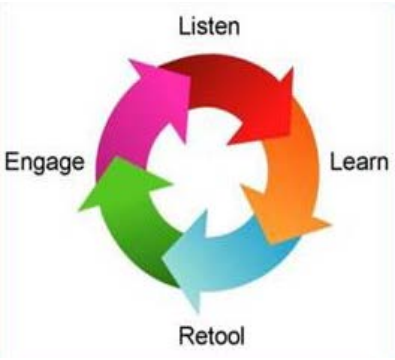
Rhodes Trussell, Trussell Technologies (Chair)
Michael Anderson, UC Riverside
Dick Bull, MoBull Consulting
Jörg Drewes, Technische Universität München
Chuck Haas, Drexel University
Walter Jakubowski, WaltJay Consulting
Perry McCarty, Stanford University
Kara Nelson, UC Berkeley
Adam Olivieri, EOA, Inc.
Joan Rose, Michigan State University
David Sedlak, UC Berkeley
Tim Wade, US EPA.

Advisory Committee Representatives

Ray Tremblay, LACSD
Jim Fiedler, Santa Clara Valley Water District
Marsi Steirer, City of San Diego
Mike Wehner, Orange County Water District
Al Lau, Padre Dam Municipal Water District
Keith Solar, San Diego County Taxpayers Association
Traci Minamide, LA Bureau of Sanitation
Garry Brown, Orange County Coastkeeper
Andria Ventura, Clean Water Action
Conner Everts, Environmental Justice Coalition for Water
Fran Spivy-Weber, SWRCB
Alisa Reinhardt, San Diego Regional Chamber of Commerce
Charles Mosher, Mariposa County Health Department
Bruce Macler, U.S. EPA
Mark Bartson, CDPH

Project Status Summaries

WRRF-13-02: Model Public Communication Plan for Advancing DPR Acceptance



The objective of this project is to establish a framework communication plan and develop an implementable, strategic communication plan to achieve DPR acceptance for the State of California. The contractor-led portion of this high profile project officially commenced on October 15, 2013. The Data Instincts project team led by Mark Millan meets weekly by phone and is active on several fronts at this time:

- A literature review and summary were completed.
- One-on-one interviews were conducted with individuals at a variety of agencies/utilities who are considering potable reuse to learn what concerns/challenges they face.
- PAC Workshop #1 was held March 19th in Newport Beach
- Target audience lists were assembled and draft questions for one-on-one interviews with representatives of these target audiences were prepared, both were reviewed by the PAC at Workshop #1. The PAC and project team also discussed which Legislators, Health Officials, and Special Interest groups would have the most valuable input, and a priority list was developed for the team to use when assembling interview subjects.
- One on one interviews with Legislators are currently taking place, and the team is working to schedule interviews with Health Officials and Special Interest groups.
- Next steps: The two model communities selected are San Diego and Santa Clara. The team will survey and interview these communities to test and refine their messaging. A second workshop is being held in July to review findings from all of the interviews and focus groups and begin to plan for Phase II (development of a toolkit of materials to be used for outreach)

LEFT: *A delegation from the Model Public Communication Plan for Advancing DPR Acceptance Project (WRRF-13-02) traveled to Brisbane to meet with the Australian Water Recycling Centre of Excellence on March 24-26. Project PI Mark Millan, Research Manager Stefani McGregor, and PAC members Dave Smith and Ron Wildermuth toured the Bundamba Advanced Water Treatment Plant and received an overview of South-East Queensland history on challenges around water supply and water reuse from Don Alcock, Sue Keay, and Greg Oliver of the AWRCoE. The tours were followed up by a two day forum with presentations from both groups and their respective project teams and provided an opportunity to explore for cross-linkages and collaboration between AWRCoE and WRRF projects (NDEEP and 13-02); and to share knowledge around drivers and needs of the industries in both countries.*

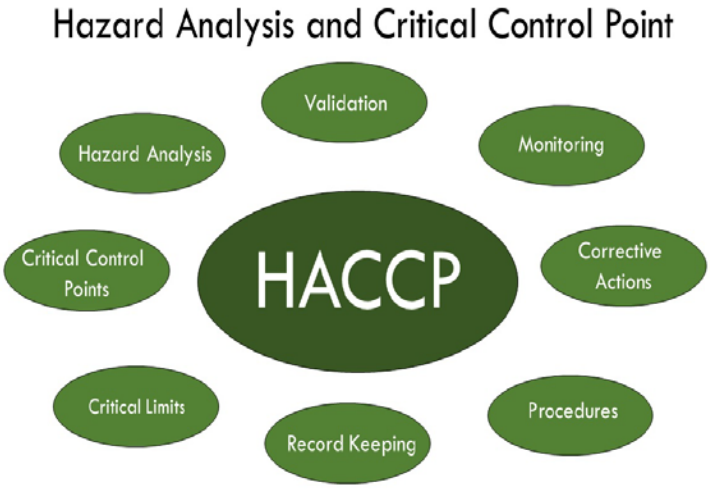
WRRF-13-03: Critical Control Point Assessment to Quantify Robustness and Reliability of Multiple Treatment Barriers of DPR Scheme

Objectives:

1. Conduct hazard assessment for key unit operations for two or more direct potable reuse (DPR) treatment trains, including the following:
    a. MF/UF – RO – UV/H_2O_2 – Cl_2 – Engineered Storage
    b. O_3 – BAC – GAC – UV – Cl_2 – Engineered Storage
2. Develop best design, monitoring, and operational practices by evaluating critical process control points in each of the DPR treatment trains evaluated to meet overall system robustness and reliability.
3. Develop standard design approaches and response strategies (i.e., operations plan and standard operating procedures) to mitigate upset events to strive towards 'fail-safe' operation of a DPR plant.

Research Approach:

- Conduct hazard assessment for key unit operations and determine critical control points
- Conduct bench/pilot level challenge test studies
- Conduct Monte Carlo risk analysis and develop standard design approaches, operational procedures, and response strategies



The contractor-led portion of the project officially commenced on December 3, 2013. The Hazen & Sawyer project team is led by Troy Walker and Ben Stanford.

- A multi-disciplinary Hazard Analysis and Critical Control Points (HACCP) team has been assembled to assist in the delivery of the project outcomes.
- The first HACCP workshop was held on February 25th and 26th resulting in the first determination of critical control points and monitoring options determined.
- Critical Control Points (CCP) for both processes (FAT membrane treatment and Ozone/BAC/GAC/UV) were identified.
- Key items for utility data gathering were identified and actions for collection.
- Detailed water quality risk assessment to be undertaken separately (more value for the team to work on CCP selection).
- A "kick-off" conference call was conducted on April 10th between the project team, PAC, and PM.
- In addition, the literature review is underway and operating data from participating utilities is continually being gathered.

WRRF-13-12: Evaluation of Source Water Control Options and the Impact of Selected Strategies on DPR

The goals are to evaluate upstream wastewater treatment impacts (e.g. N/dN-nitrification/denitrification, industrial source control) on DPR source water quality and DPR process, and to evaluate impact of hydraulic control mechanisms (e.g. flow equalization and source water storage buffers) on influent water quality and flow variations that "stress" the DPR process.

Proposal selection has occurred and contracting is in process so that an award should be announced shortly.

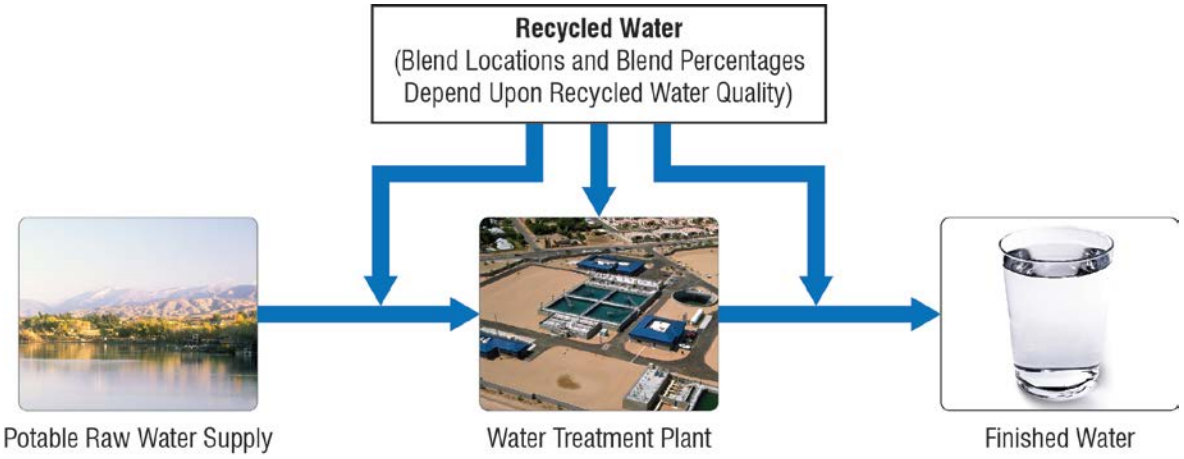
WRRF-13-13: Development of Operation and Maintenance Plan and Training and Certification Framework for Direct Potable Reuse (DPR) Systems

The object of this project is to develop a standard operations and maintenance plan for various DPR treatment processes, including appropriate portions of the upstream secondary wastewater treatment processes providing feedwater to the DPR processes. A DPR Training and Certification framework for DPR system operators will also be developed.

Proposal selection has occurred and contracting is in process so that an award should be announced shortly.

WRF 4536: Blending Requirements for Water from DPR Treatment Facilities

The objective of this project is to optimize with respect to water quality, the blending of DPR water with existing water supplies based on existing information. Phase II will conduct case studies of selected blending strategies. Proposal selection has occurred and contracting is in process so that an award should be announced shortly. Water Research Foundation will fund and manage this project.



Blending Locations proposed for analysis (taken from awarded team's (TBA) proposal)

WRF 4508: Assessment of techniques for evaluating and demonstrating safety of DPR product water

The objectives of this project are to evaluate known techniques/methodologies (and potentially develop new technologies) for the assessment of DPR water safety (work with public outreach group to identify key criteria by which public would evaluate safety); to evaluate the effectiveness of currently accepted and alternative treatment trains for the production of DPR water using the developed techniques; and to develop tools and methods for utilities to demonstrate water safety to the public, elected officials, etc. Proposal selection has occurred and contracting is in process so that an award should be announced shortly. Water Research Foundation will fund and manage this project.

Treatment technologies are available to achieve any desired level of water quality (taken from EPA, 2012)

The **2014 DPR projects** were approved by the Board on March 26, 2014. Project managers are currently working on forming PACs and refining RFPs. RFPs can be expected this summer. Please contact Julie Minton or the project manager (see table on page 2) if you would like to serve on the PAC or if your utility would like to participate on the project (e.g. provide in-kind support). Additional DPR projects will be announced later in the year.

WRRF-14-01: Integrated Management of Sensor Data for Real Time Decision Making and Response

The objectives of this project are as follows:

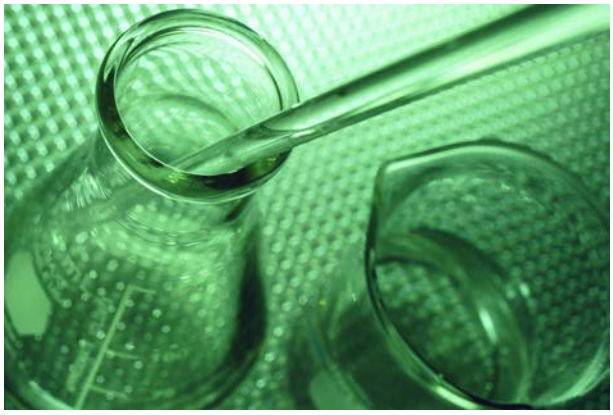
- Develop an operation support tool that integrates diverse sensors within the treatment process for immediate feedback/alerts. Integrate existing sensors as an early warning system for a Direct Potable Reuse (DPR) treatment process to provide:

- Real time sensor network for tracking system performance and key quality parameters,
- A tool for early detection of system anomalies prior to any compromise in water quality.
- Build on criteria developed in WRRF-13-03 and 13-13 for decision making based on established critical control points.
- Develop framework for sensor data integration based on above criteria.

WRRF-14-02: Establishing additional log reduction credits for WWTPs

The objectives are as follows:

- Obtain more accurate picture of the microbial treatment requirements by addressing the major source of uncertainty—the concentration of pathogens in raw wastewater and secondary effluent.
- Establish if there is any correlation between the number of pathogens in raw wastewater and secondary effluent.
- Establish removal credit for biological treatment provided (e.g., activated sludge) for protozoa, bacteria, and viruses.
- Determine validity of pathogen log-removal requirements identified by CDPH for potable reuse projects.



WRRF-14-03, Develop Methodology of comprehensive (fiscal/triple bottom line) analysis of alternative water supply projects compared to DPR

The objective of this project is to develop and demonstrate an assessment method (spreadsheet, database, or other) to provide information to decision makers in considering the full economic, social, and environmental impacts of a DPR water supply versus other alternative supplies.