Public Comments
Report to the Legislature on DPR
Deadline:10/25/16 12:00 noon

Comments on

INVESTIGATION ON THE FEASIBILITY OF DEVELOPING UNIFORM WATER RECYCLING CRITERIA FOR DIRECT POTABLE REUSE (California State Water Resources Control Board, September 2016)

by Christopher Canaday (BA/BS, Humboldt State University; MA, University of Florida)
Biologist and Promoter of Ecological Sanitation
canaday2@gmail.com, inodoroseco.blogspot.com

Sustainable management of water resources is critical for the health and development of California and the world. I would like to offer the following comments on this draft document in the interest of contributing to the formulation of sustainable solutions, with suggestions for additions in green highlighting.

1. In the Introduction, I recommend that there be at least a passing reference to the fact that it would be preferable to have healthy, forested watersheds that provide sufficient water for the population. The word 'watershed' does not exist in this document.
2. Among the most worrisome substances that should be eliminated in the process of DPR are the pharmaceutical medicines, disinfectants, and cleaning products that the population consumes, but the words 'pharmaceutical', 'medicine', 'disinfectant', and 'cleaning' do not exist in the document. "Disinfection by-products" are also of great concern, but were only mentioned once. All of these get lumped into the category of "constituents of emerging concern (CEC)", despite the fact that many of these chemicals have been known to be toxic for a long time.

   The presence of antibiotics, disinfectants and other toxic chemicals in drinking water, even at low concentrations, is especially alarming given the rapidly accumulating evidence of the positive health effects of having a healthy microbiota (https://en.wikipedia.org/wiki/Human_microbiota). Dysbiosis of the microbiota is associated with conditions that include inflammatory bowel disease, irritable bowel syndrome, coeliac disease, allergy, asthma, metabolic syndrome, cardiovascular disease, and obesity (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4315779/). Entire populations that constantly drink and bathe in pharmaceuticals would also be a recipe for creating greater https://en.wikipedia.org/wiki/Antimicrobial_resistance , which is a major and growing threat to public health.
3. "The research recommendations are summarized as follows: (1.) To continue to improve on source control and final water quality monitoring, carry out an ongoing literature review to identify new compounds that may pose health risks, particularly to fetuses and children from short-term and long-term exposures." It is important to consider long-term effects, since people would be exposed to these contaminants potentially their whole lives.
4. "(4.) Investigate the feasibility of collecting raw wastewater pathogen concentration data associated with community outbreaks of disease, and implement where possible." This largely repeats #3.

5. "(5.) Identify suitable options for final treatment processes that can provide some "averaging" with respect to potential chemical peaks, particularly for chemicals that have the potential to persist through advanced water treatment." It seems that the goal should be to eliminate these chemicals, not average them. If averaging is desired, IPR via aquifer recharge would seem to be a feasible option.
6. I would suggest adding two more recommendations:
   7. Develop strategies to keep the population healthier, while at the same time decreasing the amounts of non-biodegradable pharmaceuticals, cleaning agents and other toxic chemicals that are used, in order to reduce the chemical and pathogen load to be treated.
   8. Promote the source separation of different wastewater flows, such that they each receive adequate treatment and productive reuse. Of these, the most important would be the Closed-loop Flushwater Recycling for toilets and the Closed-loop Recycling of Industrial Wastewater, since these waters do not need to be potable and they receive the most dangerous contaminants. Scholarships could be given to encourage students to study and fine-tune this. Tax credits could be investigated to encourage companies and individuals to practice such on-site water recycling.

   I have been promoting the idea of Closed-loop Flushwater Recycling for some time now, as can be seen in this link:
   http://forum.susana.org/forum/categories/40-greywater-blackwater-or-wastewater-reuse-irrigation-aquaculture/11393-closed-loop-recycling-of-flush-water-through-abr-and-constructed-wetland#11393
   I have not found a single case of anyone doing this, despite it being so logical, as it would reduce water consumption by up to 40% and keep people's pharmaceuticals out of the environment and out of other people's drinking water. The water in toilets does not need to be potable and I predict that a biological system with Anaerobic Baffled Reactors (ABR) and Vegetated Sand Filters would be the most efficient way to destroy pharmaceuticals and other micro-pollutants in the recycling water. (The Solaire Building in New York City flushes its toilets with recycled water, but not in a separate closed loop, instead all the wastewater gets mixed and most of the contaminants still go into the sewer; http://www.waterworld.com/articles/wwi/print/volume-21/issue-1/features/nyc-high-rise-reuse-proves-decentralized-system-works.html).

   In Argentina, Dr. Ronald Lavigne and I built a wetland system for recycling the industrial waters of a tannin factory back to the same factory.

   Please let me know if I can help on this front.
7. In the section entitled "Additional Knowledge Gaps", the text does not state what these gaps are.
8. "The Expert Panel and the Advisory Group provided recommendations that will need to be addressed regarding the non-treatment barriers that are part of enhancing the safety of DPR, including source control, wastewater treatment plant optimization, advanced operator certification, and technical, managerial, and financial capacity." The underlined factors are not non-treatment.

9. (p. 17) Treatment Wetlands (esp. subsurface, vertical-flow wetlands) would provide an excellent "environmental buffer" for DPR, somewhat similar to that of reservoirs or aquifers in IPR, but with much more intensive treatment and a much smaller space requirements and time delays. These would also help to average out peaks of any chemicals, and greatly increase the treatment diversity, taking into account the action of the diverse microbes found in the root zone of these wetland plants. I have extensive experience building such wetlands and I would be glad to help on this front.
10. "The Expert Panel's evaluation of treatment performance used a variety of approaches that foster an understanding of the efficacy of treatment options and show how they could be used to meet the health goals."
11. (p. 18) "A project delivering recycled water to a surface water reservoir, with the reservoir providing some benefits, but lacking the full complement of benefits provided by IPR with SWA and is therefore considered DPR by the Expert Panel". SWA means 'surface water augmentation', so this statement does not make much sense. In terms of non-biodegradable chemicals, there is very little difference between Direct and Indirect Potable Reuse, even though the time spent in aquifers and reservoirs may contribute to the die-off of pathogenic microbes.
12. (p. 23) "14. The State Water Board will work with the RWQCBs to determine how pretreatment programs associated with DPR can be improved to address CECs, monitoring of unauthorized discharges, characterization and reduction of chemical spikes, and other concerns related to DPR." This could largely be achieved by implementing closed-loop water recycling, as I mention in #6 above.
13. (p. 27) 'Ongoing' is not a milestone.
14. (p. 33) Who is carrying out these various research projects?
15. (p. 34) With respect to testing of RO and other membrane filters, would it not be enough to measure if these membranes withstand the normal amount of pressure at the moment of backwash? If this pressure were lower than expected, that would indicate rupture of the membrane.
16. (p. 34) "Investigation of possible alternative measures to the current bulk organic surrogate measures (e.g., TOC, chemical oxygen demand) for the control of trace organic compounds, which do not reflect the toxicity caused by the presence of trace organic compounds and, therefore, the safety of the reuse water." If we cannot currently test for these dangerous micro-pollutants, is it prudent to think about recycling wastewater back into people's faucets?
17. (p. 34) "Evaluation of whether TOC is the appropriate surrogate to ensure the safety of reuse water relative to trace organic compounds." This was answered in the previous point.
18. I was expecting a list of proven technological steps to convert sewage into drinking water and another list of the acceptable limits for proven indicators of micro- and macro-pollutants, but neither of these is presented in this document.