RRWPC

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State Water Resources Control Board
Sent via Email to: commentletters@waterboards.ca.gov
Attn: Ms. Jeanine Townsend: Clerk to the Board

December 21, 2017

RRWPC Expanded Comments on SWRCB's:
Proposed Recycled Water Policy Amendment: Early Public Consultation

Dear State Water Board Members:

Thank you for the opportunity to expand our prior comments on the proposed amendment to the Recycled Water Policy. Over the last ten years, RRWPC has submitted numerous comments to your Board on this issue and had already submitted limited comments at the end of November, 2017. We have added information and citations to this addendum that we would like attached to our prior submission. We hope you will read and staff respond to these new comments.

Introduction and RRWPC's significant concerns:

In the last twenty-five years, the studies and information on endocrine disruption has burgeoned. Rachel Carson expressed early concerns about evidence she witnessed, and 25 years after her passing, Theo Colborn organized the Wingspread Conference where scientists from all over the world came together to make a statement based on their combined understanding of an apparent crisis in wildlife survival, reproduction, and disease. Our major concerns summarized below are a substantive, but partial list of the issues. We request that they be addressed from an environmental perspective. In our view, to ignore them is not an option if ramifications of this amended recycled water policy on public and wildlife health is to be addressed. They include:

- Exposures to wastewater pollutants cannot be viewed in a vacuum. It is likely that most humans in developed countries already carry an unmeasured body burden of toxins that have accumulated from many different sources, and which combine to often cause serious and life-threatening diseases. Only a fraction of the 85,000 chemicals in use have been tested for safety, and it's been demonstrated that human & wildlife exposures are ubiquitous.

- Endocrine disrupting chemicals have been found to not obey the premise that the dose makes the poison. Rather the other way around; the smallest exposures in the parts per million, billion, or trillion levels can cause the most harm due to altered gene expression.
- Many toxic substances should be regulated at the source. Unfortunately, few of the thousands of chemicals on the market are actually regulated, and when they are, the regulations often aren't enforced. For 40 years, the Toxic Substances Control Act went mostly unenforced and new chemicals were inadequately tested. While legislation was updated and improved in 2016, the current federal administration appears to have no motivation to enforce it and may dismantle it altogether.
- Risk assessment regulatory process is ten or more years behind schedule and in some cases, much more. The chemical and pharmaceutical industries have armies of consultants gumming up the process. Needless to say, cumulative risk assessment is not happening. Neither is analysis based on low dose exposures and altered gene expression.
- Sometimes innocent non-endocrine disrupting chemicals can combine into toxic substances. The total mass of chemicals present in the waste stream at any given time cannot be known. It is unlikely that a satisfactory number and kind of surrogates can be found to represent the total whole.
- Pesticides are ubiquitous in our environment and most (all?) are endocrine disrupting substances. Fish and aquatic life are particularly vulnerable because they are exposed 24/7. When authorizing wastewater irrigation, there are many pathways for runoff to reach the waterway including, air born transport through spray, runoff from excessive watering, seepage from river/creek banks through erosion process, and more. Rather than develop very stringent rules for application, your Panel simply declared that irrigating tertiary water on urban landscapes is safe and incidental runoff not controlled.
- When runoff occurs, it's generally in summer, when flows are lower, nutrients and algae blooms are greater, temperatures are higher, and recreation is prevalent. This is a time when the waterway's capacity to absorb toxic substances safely is at its lowest point. What specific practices can be put in place to eliminate this?
- Federal law does not regulate wastewater irrigation and Title 22 does not address endocrine disruption protections. It does allow the irrigation of food crops (as described in article submitted with initial comments) even though it has been demonstrated in numerous studies that the irrigation water is taken up by the plant into the edible portion, thus exposing humans to remnant toxins.
- Pregnant women and their fetuses, young children and infants, people with compromised immune systems and elders are all much more susceptible to diseases and vulnerable to the defects created by these toxins. How can they be protected under the circumstances?
- It is highly possible that people who eat a lot of fish and seafood are unknowingly taking pollutants into their bodies, adding to their body burden of toxins they are already carrying around. Because of the lengthy gestation period between exposure and disease occurrence, and because of the multitude unknown exposures over that time period, it is seldom possible (never?) to determine the exact cause of many diseases.
- Remnant pharmaceuticals that still exist in the wastewater can affect bird's ability to reproduce in several ways, including young not able to hatch, babies were deformed, male young were feminized, female young were more masculine, chicks' immune systems were impaired, and parents forgot how to parent. Studies demonstrated that the Great Lakes top 16-17 predators were vanishing and studies indicated that assaults on the

endocrine system were to blame. (Alanna Mitchell: *Winged Warnings: Built for Survival, birds in trouble from pole to pole*; Environmental Health News August 25, 2014)

- Extensive reporting has appeared on the 50% decrease in male sperm counts along with noted problems with the quality of the sperm. These problems have been attributed to endocrine disruption along with other reproductive problems. Similarly, the occurrence of estrogen in waterways is a big problem for fish and there have been scientific reports on the feminization of male fish downstream of wastewater treatment plants.

It is critical for the survival of both human and wildlife species that these issues be addressed. A recent finding by The Lancet Commission on Pollution and Health concluded that 9 million human deaths annually worldwide are due to diseases caused by pervasive toxic chemicals. This is 15 times the number killed in wars. (Julian Cribb: News Chemistry re: cosmosmagazine.com/chemistry/ "*Major Journal sounds alarm over global mass poisoning*" December 21, 2017) With wildlife species, their decimated numbers have been noted before they disappear. Rachel Carson's *Silent Spring* addresses the issue extensively as a result of massive DDT applications in the mid-20th Century. How many more birds and fish (etc.) will California lose as a result of expanded wastewater irrigation?

And the costs of dealing with human health issues is expensive. It has been estimated by Elizabeth Grossman for National Geographic (March 5, 2015) that *Chemical Exposure Linked to Billions in Health Care Costs* (in Europe). "*Exposure to hormone-disrupting chemicals is likely leading to an increased risk of serious health problems costing at least $175 billion (U.S.) per year in Europe alone, according to a study published Thursday*." Linda Birnbaum, director if the U.S. National Institute of Environmental Health Sciences states: "*If you applied these numbers to the U.S., they would be applicable, and in some cases higher*." Is California prepared to provide extensive and expensive health care services in order to recycle water? Will you assess the numbers as part of this assessment/amendment?

Low Dose and non-monotonic effects of endocrine disrupting chemicals….

RRWPC understands that there is enormous public pressure to seek out new water resources in California, and wastewater reuse is being seen by many as an important, and perhaps cheaper source than other potential options. This desire to expand water resources is not supposed to come at the cost of public health protection however, and the State promises that it won't, and yet we are concerned that the Scientific Panel and others have not adequately considered the issue of low dose impacts and non-monotonic dose responses and curves. The web review of Our Stolen Future, with 2006 updates gives the following explanation of this reaction with endocrine disrupting substances: ***http://www.ourstolenfuture.org/NewScience/lowdose/nonmonotonic.htm***

"*At the heart of today's approach to chemical regulation is an assumption about the relationship between dose and response. Higher doses are supposed to cause greater harm. This assumption--that "the dose makes the poison"--is used to plan tests of chemicals to identify which ones are dangerous and to determine the level of exposure beneath which contamination should pose no risk*."

"*This old assumption may be true for many chemicals and for many classic health effects, but it is demonstrably misleading for endocrine disrupting chemicals. What this means is that countless experiments that have been done to test the safety of chemicals in use may have lulled us falsely into a sense of security, because they will miss effects that follow what is called a "non-monotonic" dose-response curve*."

"*In a non-monotonic dose response curve (NMDRC), the shape of the dose response curve reverses as the level of contamination goes up. Some NMDRC are shaped like U's, with high responses at low and at high levels of contamination. Others are shaped like inverted U's with*

the greatest response in intermediate ranges. The puzzling but observable fact is that low doses may actually cause greater impact than high doses for a specific response."

Much (or all) of the literature and studies cited by State's Scientific Panels and consultants, fails to describe this unique situation; rather they claim that the exact causation chain from exposure to disease needs much more study, using this as a basis for not considering this scientific truth. Conventional risk assessment assumes that 'the dose makes the poison' and in their view, advanced new wastewater technology for pollutant removal can solve the problem. There is such a sense of urgency for expanded water supplies however, that institutions involved seem to favor short cuts while avoiding immediate confrontation of impacts until 'more information is available'. In other words, supporters seem anxious to move forward with this, without fully considering another kind of risk assessment in regards to endocrine disruption.

Rachel Carson, in her book "Lost Woods" (page 243) says:
"*The question of genetic damage from harmful elements in the environment is one that particularly interests me. Elsewhere I have made the suggestion that pesticide chemicals should be viewed with great suspicion as possible agent of genetic damage to man. This suggestion has been challenged by some on the grounds that there is no proof that these chemicals are having such an effect.* ***I don't believe we should wait for some dramatic demonstration before making a thorough study of the potential genetic effect of all chemicals that are widely introduced into the human environment. By the time such a discovery is made otherwise, it will be too late to eradicate them.***" (emphasis added) We restate that no endocrinologist has been included on the Scientific Panel and no full discussion made about low dose effects even though extensive studies are available. We wonder why not?

Dr. Rachel Carson knew that some of the pesticide chemicals then in use had mutagenic effects on lower organisms, others have ability to cause chromosome damage. In this instance, she felt they should be withdrawn from use altogether. (Theo Colborn and many scientists associated with her carried on much of the work envisioned by Dr. Carson.)

On page 244 Dr. Carson states: "*Yet again and again, in this whole field of environmental influences in relation to life, and this includes our theme of pollution and its impact on life, we meet a strange reluctance to concede that man is, himself, susceptible to harm. It may be admitted freely, for example, that an agricultural chemical entering a river could kill thousands of fish; but it will be denied that this chemical could do any harm to the person who might drink the water. Reports of the decimation of whole populations of birds are shrugged off with the thought that it can't happen to us*."

We note the example of Roundup containing glyphosate. For years, government representatives told everyone it was safe, until it was determined that it wasn't. Similarly, the idea that small doses are safe is being promoted by public relations consultants hired to persuade the public that small amounts of chemicals are safe in regards to recycled wastewater. Scientific evidence produced by independent researchers should be the ONLY basis for determining the validity of the assumptions, AFTER all concerns have been addressed.

State consultants sometimes refer to the status of endocrine disruption as being a new field, and for which much study needs to be done to identify ED chemicals. Yet over 1400 probable endocrine disrupting chemicals have been identified and the list, along with links to studies conducted on each contaminant, can be found on The Endocrine Disruption Exchange (TEDX) website at https://endocrinedisruption.org/interactive-tools/tedx-list-of-potential-endocrine-disruptors/search-the-tedx-list The site mentions: "*Government agencies, non-profit groups, scientists, and businesses have different criteria for labeling a chemical as an endocrine disruptor. We provide a master list of potential endocrine disruptors, defined as chemicals with*

at least one study demonstrating endocrine disrupting properties, in order to serve a broad array of needs."

I have never read, in the 20 years of reading articles and studies on endocrine disruption, that any wastewater treatment system (including reverse osmosis and advanced filtration), takes out ALL endocrine disruption chemicals. Yet EDC chemicals that are bioactive in the parts per billion or parts per trillion levels, and sometimes even less, with some cases having no threshold dose, can bring about negative health impacts that should be addressed.

Possible health outcomes from EDCs….

These chemicals (EDCs for short), are implicated in many diseases affecting the pituitary gland, hypothalamus, thyroid, cardiovascular system, mammary glands, pancreas, ovaries, uterus, prostate, and testes, as well as the brain and fat tissue. They are consequently believed to be involved in childhood leukemia and other cancers, allergies, asthma and other respiratory problems, genital malformations in baby boys, early puberty in girls, ADHD, lowered IQ, autism, obesity, diabetes, cardio-pulmonary diseases, immune-system dysfunction, and Parkinsonism; evidence is mounting that EDs may also play a role in development of Alzheimer's disease and other mental illnesses.

These serious impacts, while they may not show up immediately, are most likely to harm if exposure has taken place in the womb and/or early stages of development. Children are more vulnerable because:

- Children have greater exposures to toxins in relation to their low body weight.
- Children's metabolic pathways are immature and a child's ability to metabolize toxic chemicals is different from adults.
- Children lack the enzymes that break down and remove toxins from the body.
- Children's early developmental processes are easily disrupted in the first years after birth.
- Children have more time to develop chronic diseases. Many diseases triggered by toxic chemicals, such as cancer and neurodegenerative diseases, evolve through multistage, multiyear processes that may be initiated by exposures in infancy.
- Finally, there is often a long delay between exposure to chemicals and resulting disease that makes tracing causative factors for particular diseases very challenging. In some cases the time lapse can be generational, but this in not generally discussed in wastewater reuse literature.
- So how can you prioritize the protection of children if you don't address the issues in this letter?

Profound and extensive information on endocrine disruption available….

Current knowledge on EDCs is already profound. While even the endocrinologists admit that there is much that still needs to be discovered about endocrine disruption, nevertheless, much has been learned already. Going through some of the many articles I have, here are some of the findings.

In the article submitted earlier, "*Does the Dose make the poison*?"

Brian Bienkowski for Environmental Health News (2-4-14): "*Chemicals that mimic estrogen in waterways have been linked to a variety of effects on wildlife. But new research using water from several rivers in Virginia and Pennsylvania is the first to show that they attach to proteins that control how heart valves grown in fish.*

This tells us that endocrine-disrupting chemicals could lead to improper heard development. We were quite surprised since this is something that others hadn't observe before," said study co-author Luke Iwanowicz, a research biologist the U.S.Geological Survey based in West Virginia."

PLOS Biology has published a special collection of seven articles, *Challenges in Environmental Health: Closing the Gap between Evidence and Regulation*. This series has just begun and can be found at: Regulating toxic chemicals for public and environmental health by **Liza Gross, Linda S. Birnbaum**

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They state: "*Over the decades that US Policy on chemicals stagnated, scientists documented the damage whole classes of chemicals inflicted on living organisms and the environment that sustains them. Although we still have safety data on just a fraction of the 85,000-plus chemicals now approved for use in commerce, we know from field, wildlife, and epidemiology studies that exposures to environmental chemicals are ubiquitous. Hazardous chemicals enter the environment from the factories where they're made and added to a dizzying array of consumer products – including mattresses, computers, cookware, and plastic baby cups to name a few – and from landfills overflowing with our cast-offs. They drift into homes from nearby agricultural fields and taint our drinking water and food. Today, hundreds of industrial chemicals contaminate the blood and urine of nearly every person tested, in the US and beyond*."

Articles were commissioned to discuss the failure of regulations to keep hazardous chemicals out of our food, air, and drinking water. They discuss the need to abandon conventional risk assessment in regard to endocrine disruption, along with the fundamental precept that '*the dose makes the poison'*. The author argues that regulations still assume that toxic effects occur at a threshold level and increase with the dose. And we believe that this is the case with the current and formerly amended Recycled Water Policy. Another article, examines that having extensive scientific evidence doesn't guarantee that extremely toxic products will be removed. This year President Trump removed ban on chlorpyrifos, that can damage the brain.

The authors go on to state, "*The ideal solution {to protect the public from toxic exposures} to protecting children and pregnant women is an overall reduction in the use of agricultural pesticides to reduce exposure at home and at work, as well as at school*."

Thank you for the opportunity to present our ideas to you. We look forward to your response.

Brenda Adelman

For RRWPC