commentletters - Comment letter---Proposed Recycled Water Policy

From: Edo McGowan <edo_mcgowan@hotmail.com>
To: <commentletters@waterboards.ca.gov>, <edo_mcgowan@hotmail.com>
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Subject: Comment letter---Proposed Recycled Water Policy

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SWRCB EXECUTIVE

To: Members of the State Water Resources Control Board
commentletters@waterboards.ca.gov

Fm: Dr Edo McGowan
Re: Comments on Proposed Recycled Water Policy and Draft Staff Report

There is nothing wrong with the use of recycled wastewater if it is properly treated prior to use. The operative words are---**properly treated**. As it stands now, recycled water is not properly treated for many of the proposed uses. This, in part, relates to the antiquated standards under which this water is produced, the consequences of which are several adverse impacts to public health and the environment. The problem is exacerbated by the lack of technical understandings within the staff of the State Water Board, and the retarded efforts at bringing up the standards to reflect current risks by CDPH. Thus this renders the currently proposed Recycled Water Policy incomplete because it does not properly recognize these deficiencies and thus fails to make corrections for these limitations. Consequently there is a subsequent increase in risks to public health. The Draft Staff Report, because of the staff's inability to appreciate these flaws, substantially under represents the situation and thus offers poor guidance to the Board. The results of the combined effort may cause the Board to make gross errors in setting policy, which upon reflection may be no policy at all, but may later be viewed as a set of missed opportunities.

Contrary to staff directive and statement that there are few potential adverse impacts, a review of the current literature would tend to show that there are potentially significant adverse impacts. This is at odds to the Draft Staff Report and accordingly, based on differences between experts, this should drive the issue to resolution via inclusion of these issues within an EIR where these issues must be addresses as potentially significantly adverse until proven otherwise.

This comment is based mainly on an adaption from the paper by Laguardia, et al., Alkylphenol Ethoxylate Degradation Products in Land-Applied Sewage Sludge (Biosolids) [1]. These degradation products are endocrine disrupters that bioaccumulate in crop as well as animal tissues.

The point here is that recycled water contains these materials and thus with constant irrigation, these materials are likely to build in concentration within soil profiles [1]. Additionally, for areas with sufficient slope to see runoff, these materials may move with the erosion profile or they may leach to the ground water [2-4]. They may also move with incidental runoff.

Endocrine disrupting chemicals (EDCs) and xenoestrogens alkylphenol ethoxylate (APEO) degradation byproducts are found in recycled water. Alkylphenol ethoxylates, widely used in commercial and household detergents in the United States, can degrade during the wastewater treatment process to more toxic, estrogenic, and lipophilic compounds. These include octylphenol (OP), nonylphenols (NPs), nonylphenol monoethoxylates (NP1EOs), and nonylphenol diethoxylates (NP2EOs).

The National Sewage Sludge Survey (NSSS) completed in 1988 by the United States Environmental Protection Agency (U.S. EPA) neglected to include potential xenoestrogens alkylphenol ethoxylate (APEO) degradation byproducts [octylphenol (OP), nonylphenols (NPs), nonylphenol monoethoxylates (NP1EOs), and nonylphenol diethoxylates (NP2EOs)], potential xenoestrogens.

In 1994, U.S. consumption of APEOs exceeded 250 000 t [5] and the amounts released to the environment have increased since that period. These surfactants are used in detergents, paints, pesticides, textiles, and personal care products. APEOs have been shown to degrade into more toxic and lipophilic compounds during the processing of sewage in wastewater treatment plants (WWTPs) [6].

Although APEO releases are mainly associated with WWTPs, these compounds have also been detected in non-WWTP effluents [7]. APEOs are biodegraded by a stepwise shortening of the ethoxylate chains, creating a complex mix of compounds including shorter chain ethoxylates, alkylphenoxy carboxylic acids (APECs), and alkylphenols (APs), such as OP and NPs. APECs and longer chain APEOs are quite water-soluble, thus they predominate in WWTP effluent [6].

Sediment cores taken from areas influenced by WWTPs (including Tokyo Bay, Japan, and the Strait of Georgia, British Columbia, Canada) have shown trends of increasing levels of NPs since the mid-1960s [8,9]. Bioaccumulation in roots and shoots of plants has been demonstrated thus this has a potential to impact human health. Accumulation was more predominant in the roots; thus this brings out questions for recycled water irrigation of various crops, especially root crops as well as fodder crops for food animals [10]. Animals may be exposed to relatively high concentrations of APEO because they persist in the environment and when ingested, they may be concentrated in fatty tissue and are subsequently released when the fat is mobilized during lactation, thus exposing consumers of dairy products and products of meat animals [11]. Because these materials accumulate, mere cessation of irrigation with recycled water does not preclude subsequent plantings from bioaccumulation these materials. Thus subsequent forage crops later fed to livestock may carry toxic amounts that will still move to the fatty tissues.

It is concluded, however, that little is known of factors affecting the tissue concentrations of these compounds in farm animals. The concentrations that are required to perturb physiological function in these species, the effects of prolonged exposure to low doses, the effect of cocktails of these materials and other pollutants or the responses of specific organs and physiological systems that are affected by such pollutants. Much of the available information pertaining to these compounds is derived from epidemiological studies of wildlife species and from laboratory animal studies. Thus while these studies have significant limitations, they are considered to be valuable indicators of potential effects in farm animal species. The results of such studies, together with the small amounts of data from studies of ruminants, indicate that there may be significant effects of exposure to environmental levels of on farm animal health [11].Thus, allowing the use of currently produced recycled water in a number of agricultural pursuites is much more than a mere gamble, it may represent a reckless disregard for accurate scientific analysis and a potential impact on the economy of the state as well as andimal and human health.

Because of the above, the pronouncements within the staff report that the impacts will be less than significant, such pronouncements need serious reappraisal and in fact, if staff recommendations are taken as fact by your Board, the staff report may see a serious error on the Board's part.

Groundwater contamination by APs and APEOs has also been reported in Switzerland, Israel, and the United States [2-4]. OP, Nps, NP1EOs, and NP2EOs have all been detected in drinking water,up to 34 ng/L [12,13]. Little research on biodegradation of APEO byproducts in soils has been performed. However, a Canadian study indicated that 60% of the original NPs and 30% of OP remained in the soil 60 days after application but decreased to nondetectable levels 90 days after application [14]. A Danish study also suggested that soil concentrations of NPs, NP1EOs, and NP2EOs remained constant during a 28-day testing period [15]. This 28 day increment fits well within cycling of irrigation schedules for most greenscape and cropping. According there is the potential to see a bioaccumulation not only in the soils but in the crops supported by these soils [10] see cites: Nowak and Rind).

However, if anaerobic conditions exist the degradation is vastly retarded. Thus the issue of ground water recharge must be carefully reconsidered by your Board. This tendency for retarded breakdown may affect constructed wetlands and the underlying groundwater.

Ying, et al [17] looked at sorption and degradation of five selected endocrine disrupting chemicals (EDCs) including bisphenol A (BPA), 17β-estradiol (E2), 17α-ethynylestradiol (EE2), 4-*tert*-octylphenol (4-*t*-OP) and 4-*n*-nonylphenol (4-*n*-NP) have been investigated in the laboratory using sediment and groundwater from an aquifer in Bolivar, South Australia. The sorption coefficients measured on the sediment were in the following order: 4-*n*-NP>4-*t*-OP>EE2>E2>BPA. The sorption coefficients (K_f values) for the five EDCs were 3.89, 21.8, 24.2, 90.9 and 195, respectively. The alkylphenols 4-*t*-OP and 4-*n*-NP had strong binding on the sediment while BPA had a weak affinity. Degradation experiments of the five EDCs showed that E2 and 4-*n*-NP degraded quickly under aerobic conditions with a half-life of 2 and 7 days, respectively. EE2 degraded slowly with an estimated half-life of 81 days in the aquifer material under aerobic conditions while the other two chemicals (BPA and 4-*t*-OP) remained almost unchanged. **Little or no degradation of the five EDCs except slow degradation for E2 was observed within 70 days under anaerobic conditions in native groundwater** [17]. If there is constant addition of recycled water, how then does this affect the situation?

Recently, concerns have been raised about the potential estrogenic effects of APs. Those with the hydroxyl group in the para position have been shown to displace 17â-estradiol from the estrogen receptor [18-20]. OP, NPs, and NP2EOs have been reported to induce vitellogenin production in maletrout and in minnows (*Pimephales promelas*) at low micrograms per liter concentrations [21,22]. Expression of intersex (testis-ova) in medaka (*Oryzias latipes*) was also observed following exposure to NPs at 50 íg/L [23]. Wild roach (*Rutilus rutilus*) associated with discharges from U.K. WWTPs exhibited a high incidence of intersexuality [24]. Two of these U.K. rivers, the Aire and Lea, were shown to contain xenoestrogens (NPs, NP1EOs, and NP2EOs) at up to 76 íg/L [25]. These compounds as noted above, also may bioaccumulate. Both Nps and NP1EOs were detected in fish tissue taken from the Kalamazoo River, Michigan [26],andthe Tyneand Tees Rivers in the U.K. [27]. OP was also detected in fish samples from the Tees [27].

Effects of APs and APEO-related compounds on aquatic organisms have been documented [21-23]. Comparatively, little research has been done to examine their effects on terrestrial biota. However, one study with earthworms (*Apporectodea calignosa*) reported a 21-day EC50 (reproduction) of 3.44 mg/kg forNPsin soil [29], which is also consistent with a 14-dayEC50 (reproduction) of 16mg/kgfor collembolan (*Folsomia candida*) [15]. On the basis of the earthworm study, Environment Canada recommended an EstimatedNoEffects Value (ENEV) for terrestrial risk due to NP exposure of 0.34 mg/kg [29].

Contamination of groundwater through the disposal of APEO-bound sewage effluent in shallow unconfined aquifers has been reported [30]. Cumulative effects of APEO byproducts in these complex mixtures of biosolid pollutants also merit attention as components of binary mixes (e.g., NP and methoxychlor) below LOEC levels (<10 ƒg/L) have been shown to induce vitellogenin production in rainbow trout [31].

Citations

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