

## The Occurrence and fate of chemicals of emerging concern (CECs) in coastal urban rivers receiving discharge of treated municipal wastewater effluent

Asmita Sengupta<sup>1</sup>, Michael J. Lyons<sup>2</sup>, Deborah J. Smith<sup>2</sup>, Jorg E. Drewes<sup>3</sup>, Shane A. Snyder<sup>4</sup>, Ann Heil<sup>5</sup>, and Keith A. Maruya<sup>1,6</sup>

<sup>1</sup>*Southern California Coastal Water Research Project Authority, Costa Mesa, California, USA*

<sup>2</sup>*California Regional Water Quality Control Board, Los Angeles Region, Los Angeles, California, USA*

<sup>3</sup>*Advanced Water Technology Center (AQWATEC), Department of Civil and Environmental Engineering, Colorado School of Mines, Golden, Colorado, USA*

<sup>4</sup>*Chemical and Environmental Engineering, University of Arizona, Tucson, Arizona, USA*

<sup>5</sup>*Los Angeles County Sanitation Districts, Whittier, California, USA*

<sup>6</sup>*Address correspondence to [keithm@sccwrp.org](mailto:keithm@sccwrp.org).*

### ABSTRACT

To inform future monitoring and assessment of chemicals of emerging concern (CECs) in coastal urban watersheds, the occurrence and fate of more than 60 pharmaceuticals and personal care products (PPCPs), commercial/household chemicals, current use pesticides and hormones were characterized in two effluent-dominated rivers in southern California, USA. Water samples were collected during two low-flow events at locations above and below water reclamation plants (WRPs) discharge points, and analyzed using GC-MS and LC-MS/MS. Approximately 50% of targeted CECs were detectable at stations downstream from WRPs, compared to < 31% and <10% at the reference stations above the WRPs. Concentrations of chlorinated phosphate flame-retardants were highest amongst the CECs tested, with mean total aggregate concentrations of TCEP, TCPP and TDCPP of 3400 and 2400 ng/L for the two rivers. Maximum in-stream concentrations of pyrethroids (bifenthrin and permethrin), diclofenac and galaxolide exceeded risk-based thresholds established for monitoring of CECs in effluent dominated receiving waters. In contrast, maximum concentrations of PPCPs commonly detected in treated wastewater (e.g. acetaminophen, DEET and gemfibrozil) were less than 10% of established thresholds. Attenuation of target CECs was not observed downstream of WRP discharge until dilution by seawater occurred in the tidal zone, due in part to the short hydraulic residence times in these highly channelized systems (< 3 d). In addition to confirming CECs for future in-stream monitoring, these results suggest that conservative mass transport is an important boundary condition for assessment of the input, fate and effects of CECs in estuaries at the bottom of these watersheds.

**Due to distribution restrictions, the full-text version of this article is available by request only.**

Please contact [pubrequest@sccwrp.org](mailto:pubrequest@sccwrp.org) to request a copy.