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Submitted on DPR's public comment website:
<https://cdpr.commentinput.com/?id=udemDJ5jp>

Subject: BACWA Comments on DPR's Investigation of Total Release Foggers and Intent to Begin Reevaluation, dated May 28, 2026

Dear Ajay Kumar:

On behalf of the Bay Area Clean Water Agencies (BACWA), we thank you for the opportunity to provide comments on the Department of Pesticide Regulation's (DPR's) [Investigation of Total Release Foggers and Intent to Begin Reevaluation](#). BACWA is a joint powers agency whose members own and operate publicly-owned treatment works (POTWs) and sanitary sewer systems that collectively provide sanitary services to over seven million people in the nine-county San Francisco Bay Area. Every day, BACWA members provide treatment for millions of gallons of pesticide-containing wastewater that is then discharged to fresh or saltwater bodies, including local creeks and rivers, bays, and the Pacific Ocean. We take our responsibilities for safeguarding receiving waters seriously.

BACWA has a strong interest in total release foggers (TRFs) due to their down-the-drain pathways, the high aquatic toxicity of many of their active ingredients, and their ability to pass through POTWs and remain present in effluent. Much of our insights about both TRFs and indoor down-the-drain pesticide pathways are due to the research conducted by DPR's Surface Water Protection Program, including:

- A TRF wash-off study with UC Riverside demonstrating transfer from contact, as well as wash-off with water that is greatly increased in the presence of detergent¹
- Assessments of common TRF ingredients available to the public²
- On-going multiyear wastewater influent and effluent monitoring study across California³

¹ Dery, M., Dinh, B., Budd, R., Choe, D.-H. 2022. Wash-off potential of pyrethroids after use of total release fogger products. Sci. of the Total Env. 847, 157340. <http://dx.doi.org/10.1016/j.scitotenv.2022.157340>

² Xie, Y., Budd, R., Teerlink, J., Luo, Y., Singhasemanon, N., 2021. Assessing pesticide uses with potentials for down-the-drain transport to wastewater in California. Sci. Total Environ. 773, 145636. <https://doi.org/10.1016/j.scitotenv.2021.145636>.

³ DPR Surface Water Ambient Monitoring Reports, 2025 and 2026, DPR Monitoring Study No. 322, Monitoring

- Special studies including sub-sewershed monitoring to elucidate upstream sources of cypermethrin and permethrin (2 active ingredients in TRFs).⁴

We appreciate DPR's data-driven and thoughtful approach to understand the linkages between indoor pesticide use and surface water impacts.

Many of the TRF active ingredients are pyrethroids. BACWA is especially concerned with pyrethroids due to their high aquatic toxicity and ability to pass through POTWs, leading to their presence in effluent and biosolids. BACWA asks that the TRF re-evaluation (1) include use in accordance with label instructions (in addition to consumer misuse) and (2) include an assessment of transport to the sewer and subsequent water quality impacts. We further note the apparent availability of alternatives that may be more effective and reduce both human health risks and risks to aquatic life.

Consumer use in accordance with label instructions also results in human exposure

DPR's initial investigation focused on errors in use, improper handling, and accidental human exposure due to the lack of a shutoff mechanism. For the re-evaluation, it will also be important to assess human exposure due to labeled uses of TRFs.

As noted in the investigation, there is evidence of exposure symptoms following ventilation. One study showed that cypermethrin dispersed from a TRF remained in a residence at a concentration as high as 30 g/m³ after 4.5 hours.⁵ That and the DPR/UC Riverside study also indicate that the active ingredients are readily transferable from an array of surfaces onto cotton cloths.

A 1990 study asked participants to conduct a standard jazzercise routine following the use of TRFs in rooms of a new hotel (to allow for repeatability and avoid previous pesticide applications).⁶ Per label directions, the rooms were ventilated for 2 hours before the participants entered the room. Following the jazzercise routine, the shirts, tights, gloves and socks were all analyzed; the TRF active ingredients were detected on all exposed clothing, indicating substantial human exposure even while following label instructions.

BACWA requests a parallel evaluation of down-the-drain pathways and associated aquatic life risk

BACWA seeks to ensure that the re-evaluation include modeling of down-the-drain pathways of the TRF active ingredients, including the 5 pyrethroids (cypermethrin, esfenvalerate, etofenprox, permethrin, tetramethrin) as well as pyrethrins, pyriproxyfen, and S-methoprene. Based on

pesticides in wastewater influent and effluent.

⁴ Budd, R., et al., 2023. Sub-sewershed Monitoring to Elucidate Down-the-drain Pesticide Sources, *Env. Sci. & Tech*, 57, 5404-5413. <https://doi.org/10.1021/acs.est.2c07443>.

⁵ Keenan, J.J., Vega, H., Krieger, R.I., 2009. Potential exposure of children and adults to cypermethrin following use of indoor insecticide foggers. *J. Environ. Sci. Health B* 44, 538–545. <https://doi.org/10.1080/03601230902997733>.

⁶ Ross, J., Thongsinthusak, T., Fong, H.R., Margetich, S., Krieger, R., 1990. Measuring potential dermal transfer of surface pesticide residue generated from indoor fogger use: an interim report. *Chemosphere* 20, 349–360. [https://doi.org/10.1016/0045-6535\(90\)90066-3](https://doi.org/10.1016/0045-6535(90)90066-3).

DPR's on-going wastewater monitoring study, of greatest concern may be cypermethrin, which is observed in >90% of influent samples. While cypermethrin is not detected in the effluent, the reporting limit is more than an order of magnitude greater than the EPA's aquatic life benchmark for freshwater invertebrates, indicating effluent with no detection could still contain a concentration of cypermethrin harmful to aquatic organisms. DPR's 2021 assessment of uses with down-the-drain transport to the sewer, DPR estimated that TRFs comprise 40% of cypermethrin used by consumers. DPR's 2023 sub-sewershed study concluded that "The elevated level of cypermethrin above lateral concentrations provides evidence that applications of total release foggers may serve as a major source for pesticides to transfer down the drain."

The DPR/UC Riverside TRF wash-off study found that significantly more active ingredient was lifted off a surface with water and detergent rather than with water alone. Therefore, in the TRF jazzercise study referenced above, if the exposed clothing was subsequently washed with detergent, one would expect a significant quantity of active ingredient to be washed directly into the sanitary sewer. Further, upon bathing, the residue on the participants' heads and other bare skin would have also transferred to the sewer.

There are alternatives that appear to be more effective while reducing exposure to humans and the environment

As noted in the DPR/UC Riverside TRF wash off study, there are no studies indicating the effectiveness of TRFs in the field, and other studies suggest these products are ineffective either due to resistance to the active ingredient and/or the inability of fogger products to penetrate the "pests' harborage sites." Such field studies assessed residential use of TRFs for control of bedbugs and cockroaches.^{7, 8, 9}

Meanwhile, there appear to be alternatives available that are more targeted while also being more protective of both human health and aquatic life. A 2010 UC Riverside study compared human exposure to TRFs, perimeter sprays, spot sprays, and crack-and-crevice sprays.¹⁰ The authors found that "Crack-and-crevice application...appears to be the most effective application type when one is trying to decrease potential exposure and maintain efficacy of treatment." Indoor crack-and-crevice applications would also result in far less transport to the sanitary sewer and are likely of similar price and availability.

Thank you for this opportunity to provide feedback regarding the re-evaluation of TRFs. BACWA looks forward to continued partnership between our Pesticides Workgroup and DPR to

⁷ Jones, S., Bryant, J., 2012. Ineffectiveness of over-the-counter total-release foggers against the bed bug (Heteroptera: Cimicidae). *J. Econ. Entomol.* 105, 957–963. <https://doi.org/10.1603/EC12037>.

⁸ DeVries, Z.C., Santangelo, R.G., Crissman, J., Mick, R., Schal, C., 2019. Exposure risks and ineffectiveness of total release foggers (TRFs) used for cockroach control in residential settings. *BMC Public Health* 19, 1–11. <https://doi.org/10.1186/s12889-018-6371-z>.

⁹ DeVries, Z.C., Santangelo, R.G., Crissman, J., Suazo, A., Kakumanu, M.L., Schal, C., 2019. Pervasive resistance to pyrethroids in German cockroaches (Blattodea: Ectobiidae) related to lack of efficacy of total release foggers. *J. Econ. Entomol.* 112, 2295–2301. <https://doi.org/10.1093/jee/toz120>.

¹⁰ Keenan, J.J., Ross, J.H., Sell, V., Vega, H.M., Krieger, R.I., 2010. Deposition and spatial distribution of insecticides following fogger, perimeter sprays, spot sprays, and crack-and-crevice applications for treatment and control of indoor pests. *Regul. Toxicol. Pharmacol.* 58, 189–195. <https://doi.org/10.1016/j.yrtph.2010.05.003>.

protect California's waterways.

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Respectfully Submitted,



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