

# 2021 South Sound Science Symposium Project Summary

## Title: LOTT's Reclaimed Water Infiltration Study Update

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**Additional links to presentations, publications, posters:** [Reports and Background | LOTT Clean Water Alliance](#)

**Project Summary:** Producing Class A Reclaimed Water and using it to replenish groundwater are key components of LOTT's overall wastewater management strategy. The Reclaimed Water Infiltration Study is a multi-task, multi-year study, with expected completion at the end of 2021. The study asks: "What are the risks from infiltrating reclaimed water into groundwater because of chemicals that may remain in the water from products people use every day, and what can be done to reduce those risks?" The study area is primarily north Lacey, in and around the Hawks Prairie Recharge Basins, which receive reclaimed water from the Martin Way Reclaimed Water Plant.

Previously, LOTT reported on Task 1, water quality characterization. Findings showed that residual chemicals found at low levels (ppb, ppt) in reclaimed water were also found in surface water and groundwater, even in areas where reclaimed water was not infiltrated. Of the 122 residual chemicals tested, 87 were found in wastewater and 63 in reclaimed water. Surface waters and groundwater contained 22 and 16 of the 122 residual chemicals.

In Task 2, LOTT investigated groundwater movement near the Hawks Prairie site using a tracer test and a groundwater model. Findings confirmed that the shallow aquifer flows to the south and west, the deep aquifer flows to the east, and the subsurface is heterogeneous. There is also some permeability of the confining layer between the two aquifers. Groundwater velocities vary widely because of soil heterogeneity. The model is well-calibrated based on results from 24 shallow wells and 7 deep wells.

Task 3 (current phase), risk assessment, focuses on evaluating risks to people and the environment. Initial screening-level evaluations compared the highest concentration of each residual chemical found in reclaimed water, prior to infiltration, to a very conservative human or ecological health risk threshold. Chemicals considered bioaccumulative, persistent, or above the established thresholds passed from the screening evaluations to the risk assessments. These included 45 and 18 residual chemicals for human and ecological risk assessments, respectively (table).

The risk assessments are two-part and compare the modeling results of residual chemicals at a range of distances and travel times away from the infiltration site, including a distance of 200

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feet from the site boundary (the closest distance of any hypothetical drinking water well) to the conservative risk threshold. In part one, the modeled concentrations of residual chemicals consider only the physical mechanism of dispersion. For residual chemicals, whose modeled concentrations exceed the risk threshold, additional modeling will incorporate empirical observations made during the tracer test and information from literature to account for the mechanisms of sorption and biodegradation. Residual chemicals that exceed thresholds in part two of the risk assessments will be the focus of Task 4.

In task 4 (future phase), LOTT will conduct a cost benefit analysis. It will assess various alternatives to address potential risk, including levels of treatment and/or different uses for reclaimed water. This information will inform community conversations regarding the relative risk of residual chemicals in water used for groundwater infiltration.

Table. Residual chemicals retained from the screening evaluation, to advance to risk assessment. Residual chemicals for human health risk assessment includes those chemicals that are 10% of the risk threshold, shown parenthetically below.

Chemical Retained for Risk Assessment	Chemical Type	Human Health Risk Assessment	Ecological Risk Assessment
1,4 - Dioxane	Industrial chemical	X	
4-Nonylphenol	Surfactant	X	X
17- alpha Ethinyl estradiol	Estrogenic hormone	X	X
17-beta Estradiol	Estrogenic hormone		X
Albuterol	Anti-asthmatic pharmaceutical	X	
Acesulfame-K (11%)	Sugar substitute	X	
Atenolol (23%)	Beta blocker	X	
Carbamazepine	Anti-epileptic pharmaceutical	X	
Chloramphenicol	Antibiotic pharmaceutical	X	
Cotinine (16%)	Nicotine degradate	X	
Diazepam (11%)	Anti-anxiety agent	X	
Diclofenac (31%)	Anti-inflammatory medication	X	X
Dilantin (11%)	Anti-seizure medication	X	
Estradiol	Estrogenic hormone	X	
Estrone	Estrogenic hormone	X	
Fipronil	Insecticide		X
Fluoxetine (22%)	Antidepressant	X	
Gemfibrozil (14%)	Lipid regulator	X	X
Hormone group	Hormone	X (5)	
Lopressor (30%)	Beta blocker	X	
Meclofenamic acid	Anti-inflammatory		X
N-nitrodo dimethylamine (NDMA)	Industrial chemical	X	
Norethisterone	Estrogenic hormone	X	
Perfluoro-n-hexanoic acid	Per fluorinated chemical	X	
Perfluoropentanoic acid	Per fluorinated chemical	X	
PFAS group	PFAS	X (11)	X (6)
Primidone	Anti-epileptic pharmaceutical	X	
Quinoline	Pesticide	X	
Sucralose (31%)	Sugar substitute	X	X
Sulfamethoxazole (13%)	Sulfa antibiotic	X	
Theobromine	Alkaloid in chocolate and coffee		X
Theophylline (24%)	Anti-asthmatic	X	
Thiabendazole (46%)	Fungicide	X	
Triclosan	Anti-bacterial agent		X
Tris (2- chloroethyl) phosphate (TCEP) (48%)	Flame retardant	X	
Tris (chloropropyl) phosphate (TCP)	Flame retardant		X
Tris (1,3- dichloroisopropyl) phosphate (TDCPP)	Flame retardant	X	X