What We Know About Microplastics in Wastewater Effluent
WHAT ARE THE QUESTIONS

● What you asked:
  o What do we know about microplastics in wastewater effluent?

● What I think you were asking:
  o How many studies have quantified microplastics in wastewater effluent?
  o How much is being exported from wastewater treatment plants?
  o How much is removed during the treatment process?
  o How does the amount coming out of wastewater treatment plants compare to other sources?
MICROPLASTICS POLICIES

- **SB1422–re: Drinking Water**
  - Charges the State Water Board with defining microplastics in drinking water and developing methods to analyze within two years

- **SB 1263–re: - Statewide Microplastics Strategy**
  - Charges the Ocean Protection Council to develop a Statewide Microplastics Strategy in Collaboration with the State Water Board
How many studies have quantified microplastics in wastewater effluent?

- At least 15 credible studies
  - 10 studies done in 2016/2017
- 7 countries
- LACSD did one of the best
HOW MUCH IS BEING EXPORTED FROM WASTEWATER TREATMENT PLANTS?

• Average over all studies was 13 microplastics/liter of effluent

• Roughly 50 million microplastics per 100 million gallons of discharge/day
  ○ 18 billion/year
  ○ 110 metric tons/year

• Six orders of magnitude difference
  ○ Range is from 0.00088 to 150 microplastics/liter of effluent
HOW COMPARABLE ARE THE RESULTS OF THOSE STUDIES?

- Different types of facilities/treatments
  - Influent source
  - Primary/Secondary/Tertiary

- The size of microplastics measured varies

- Variations in how microplastics are measured
  - Many different methods are used
MOST COMMON METHODS

1mm
Quantifies
1 hour/sample
$

10μm
Polymer type
8 hours/sample
$$

1μm
Polymer type
40 hours/sample
$$$$

Light Microscopy

Fourier-Transform Infrared (FTIR) Spectroscopy

Raman Spectroscopy
Types of Microplastics

- **Fragment** – hard, jagged particle
- **Fiber or line** – thin or fibrous, straight plastic
- **Pellet/Microbead** – hard, rounded, or spherical particle
- **Film** – thin plane of flimsy plastic
- **Foam** – lightweight, sponge-like plastic

Modified from: Sampling and Analysis Plan for Microplastic Monitoring in San Francisco Bay and Adjacent National Marine Sanctuaries
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HOW MUCH IS REMOVED DURING THE TREATMENT PROCESS?

● Small percentage makes it to receiving waters
  ○ One study estimated that 1.76 + 0.31 trillion microplastics entered the wastewater treatment plant annually
  ○ Only 0.03 + 0.01 trillion microplastics were released into the receiving environment

● Wastewater treatment is effective
  ○ Primary treatment is most effective
    ■ Removes up to 98% of microplastics
  ○ Secondary removes a little more
  ○ Tertiary has no effect on microplastics concentration
HOW DOES THIS COMPARE WITH OTHER SOURCES?

Source: Modified from Sampling and Analysis Plan for Microplastic Monitoring in San Francisco Bay and Adjacent National Marine Sanctuaries
SFEI WORKING ON THAT NOW

- Habitats they are addressing
  - Surface water
  - Sediment
  - Prey Fish
  - Wastewater effluent
  - Stormwater

- Where are they at
  - Completed field sampling
  - Should have results in 6 months
What is SCCWRP doing right now...

● Planning Microplastics Methods Workshop
  ○ Most of the leading researchers in the world are participating
  ○ Goal is to work towards standardizing methods

● SCCWRP is assuming leadership roles in the State
  ○ Ocean Protection Council – Ocean Litter Strategy
  ○ California Water Quality Monitoring Council

● Trends in North Pacific Gyre