Executive Summary

Southern California Coastal Water Research Project was created by a Joint Powers Agreement among local coastal governments in southern California in 1969. It is governed by a Commission composed of representatives of the signatory agencies that meets quarterly to track scientific and financial progress. A Consulting Board composed of distinguished scientists reviews proposed and ongoing studies. We thank all of these people for the time and effort put forward on our behalf.

In fiscal year 1989-90, SCCWRP revenues were $1,617,000 and expenditures were $1,560,800. Slightly over 90% of revenues were received from County Sanitation District No. 2 of Los Angeles County, City of Los Angeles, County Sanitation District No. 1 of Orange County, City of San Diego, City of Oxnard, South East Regional Reclamation Authority, and the Aliso Water Management Agency.

SCCWRP research activities are divided into three major areas: sources, fates, and effects. What follows are summaries of the articles in the annual report grouped by these categories.

SOURCES

Characteristics of Effluents from Large Municipal Wastewater Treatment Plants in 1989

We report 1989 effluent constituent concentrations and mass emission estimates for Hyperion Wastewater Treatment Plant (City of Los Angeles), Joint Water Pollution Control Plant (County of Los Angeles County), County Sanitation Districts of Orange County Wastewater Treatment Plants 1 and 2, and Point Loma Wastewater Treatment Plant (City of San Diego). Effluents from these facilities constituted 90% of the volume of municipal effluents discharged directly into the Southern California Bight.

The amount of effluent receiving secondary treatment increased from 42% of the combined discharge in 1988 to 45% of the combined discharge in 1989; the combined volume of effluent discharged to the Bight increased 2%. Despite increases in volume, the concentrations and mass emissions of most constituents declined because of improved primary treatment, increased secondary treatment, and improved source control.

The combined flow from the largest facilities increased nearly 30% between 1971 and 1989 as a result of population increases. The combined mass emissions of suspended solids declined 68%, trace metals declined 90%, and chlorinated hydrocarbons declined more than 99%. Reductions in contaminant emissions were due to increased source control and solids removal (land disposal of sludge), improved sludge and primary treatment, and increased secondary treatment.

Characteristics of Effluents from Small Municipal Wastewater Treatment Plants, Electrical Generating Stations, and Industrial Facilities in 1989

We report 1989 effluent constituent concentrations and mass emission estimates for 14 small municipal facilities (13 marine outfalls), four petroleum industry outfalls, and 14 electrical generating station outfalls. The combined flow from the small municipal wastewater facilities was 10% of the total wastewater discharged to the Southern California Bight. The combined mass emissions were less than 10% for most effluent constituents. More than 90% of the effluent from these facilities received secondary treatment. From 1973 to 1989, the number of small facilities declined from 20 to 14. Total flow doubled during this period, but the mass emissions of suspended solids, oil and grease, and BOD decreased.

Petroleum industry effluents are the only industrial wastes currently discharged to the Bight. The concentrations of trace metals in petroleum industry effluents are generally higher than concentrations in municipal effluents, but petroleum industry mass emissions are lower because of small discharge volumes. In 1989, the Chevron El Segundo Refinery discharged 9 mgd of process water and refinery wastes, 88% of the total volume discharged to the Bight, and 91 metric tons (mt) of oil and grease. In 1973, industrial and refinery facilities discharged 72 mgd of process water and refinery wastes, and 1,290 mt of oil and grease.

Fifteen electrical generating stations use seawater for cooling. The volume of seawater used declined 19% from 1987 to 1989 due partly to reduced electrical output. Utilities are importing more power generated outside of southern California. The volume of cooling water discharged in 1989 was similar to the volume discharged in 1973.

Mass Emission Estimates for Selected Constituents from the Los Angeles River

The Los Angeles River is the largest single source of gauged runoff to the Southern California Bight. Discharge from the river comprises surface runoff, groundwater runoff, storage releases, and point source discharges. Between September 1986 and April 1988, we collected 54 runoff samples from the river near its mouth during storms and low flows. The samples were analyzed for a variety of constituents whose concentrations were generally positively correlated with river discharge.

We estimated the annual load of constituents delivered to the ocean for high and low flow conditions. High flows occurred about 10% of the year, but accounted for 40-60% of the annual discharge. Except for cadmium, 70-95% of the estimated annual constituent loads were discharged during high flow days. Comparisons to historical data suggest that the concentrations and mass emissions of lead, DDT, and PCB have declined over the last two decades.

Three water reclamation plants discharge sand-filtered, secondary effluents into the Los Angeles River. Effluents from the plants constituted about 40% of the annual volume of water discharged by the river. The combined mass emissions of most constituents accounted for less than 30% of the estimated loads delivered to the Bight.

FATES

Potential Applications of Waste-Specific Molecular Markers

Molecular markers are chemicals that have a unique source. Their detection in environmental samples indicates that particles from that source are present. We are exploring two molecular markers of municipal wastes, coprostanol and linear alkylbenzenes (LABs). Coprostanol is a fecal steroid produced mainly from cholesterol by bacteria in the guts of mammals. The LABs are a synthetic mixture of aromatic hydrocarbons that are present in small amounts in detergents and municipal wastewaters. The types of alkylbenzenes found in detergents have changed over time. This is reflected in sediments on the Palos Verdes Shelf near the Los Angeles County Joint Water Pollution Control Plant (JWPCP) outfall.

Concentrations of LABs in effluent from JWPCP are unusually high because the plant receives influent from one of the few industrial producers of these compounds. The ratio of LABs to coprostanol differs among municipal discharges and may be used to determine the fate of effluent particles. We are exploring the use of molecular markers to track effluent particles through the marine environment, to age-date sediments affected by municipal wastes, and to differentiate the relative contributions of different municipal wastewater discharges in the same area.