COMPARISON OF PRIMARY AND SECONDARY TREATMENT

Floyd K. Mitchell

Approximately 87 percent of the more than 1 billion gallons of treated municipal wastewaters discharged daily into southern California coastal waters are primary treatment effluents. The remaining 13 percent receive secondary treatment. Recent Federal legislation requires that all municipal was be treated by secondary treatment processes by 1977. Furthermore, California State effluent standards for ocean discharges are such that secondary effluent may not meet all of the standards. Because municipal discharges are the predominant source of man's input of pollutants to the Bight and because of the possibility that the character of these inputs will be changed in the near future, it is of interest to compare the pollutant concentrations in primary and secondary effluents.

As a beginning, we have reviewed data from the Hyperion Treatment Plant of the City of Los Angeles. At this plant, 235 mad is treated by primary treatment only and 100 mad receives both primary and secondary treatment. Table 1 presents a summary of recent data on both primary and secondary effluents at Hyperion; the California State effluent standards are listed for comparison. Primary effluent exceeds eight of the State standards, while four standards are exceeded by secondary effluent. Most of the standards exceeded by both treatments are trace constituent standards.

Another method of reducing wastewater trace constituents is by source control of inputs to the sewer. A recent report to the California State Water Resources Control Board by the City of Los Angeles included estimated best practical reductions in trace materials inputs by source control. These estimated reductions and other information from the same source have been used to compile the information presented in Table 2. The possible effects of source control are significant. Primary treatment plus source control meets more of the trace constituent standards than does secondary treatment without source control. Secondary treatment with source control meets all but two of the standards. The concentrations of suspended solids and oil and grease concentrations in primary effluent are not likely to change with source control, and these values will exceed State standards either way.

TABLES

Table 1.
1971-1973 Hyperion Treatment Plant process performances.

			Effluent Concntration (mg/L)**			**State Standards**	
Wastewater Constituent	**Raw Wastewater Concntration* (mg/L)**	**Primary**		**Secondary**	**Less than or equal to 50% of time (mg/L)**		**Less than or equal to 10% of time (mg/L)**
Chemical oxygen demand	539	315		31	--		--
5-day biological oxygen demand	269	165		9	--		--
Suspended solids	290	103		9	50		75
Oil and grease	72	28		0.5	10		15
Phenolic compounds	0.14	0.09		0.009	0.5		1.0
MBAS (detergents)	--	6.1		0.9	--		--
Ammonia nitrogen	34.3	20		9.6	40		60
Phosphate phosphorus	7.7	10.1		3.3	--		--
Cyanide	0.33	0.3		0.13	0.1		0.2
Copper	0.39	0.25		0.08	0.2		0.3
Zinc	0.66	0.42		0.23	0.3		0.5
Silver	0.018	0.019		0.012	0.02		0.04

Nickel	0.30	0.24		0.15	0.1		0.2
Lead	0.03	0.07		0.08	0.1		0.2
Arsenic	0.015	0.017		0.013	0.01		0.02
Cadmium	0.01	0.02		0.013	0.02		0.03
Chromium	0.55	0.37		0.013	0.005		0.01
*Data from 1971 only.							
**Mean values for 3-year perod. Concentrations in bold type do not meet State 50% standard.							

Table 2.
Predicted concentrations (mg/L) of trace constituents in final effluents produced by various treatment/source control options.

			Options[1]				**State Standards**	
Constituent	**Primary Treatment**	**Primary Treatment Plus Source Control**[2]	**Secondary Treatment**	**Secondary Treatment**[3] **Plus Source Control**[2]	**Physical/Chemical Treatment**[4]	**Less than or equal to 50% of Time**		**L th eq 10 Ti**
Arsenic	**0.017**	**0.017**	**0.013**	**0.013**	0.001-**0.09**	0.01		0
Cadmium	**0.02**	0.017	0.013	0.011	0.001	0.02		0
Chromium	**0.37**	**0.06**	**0.085**	**0.014**	**0.03-0.10**	0.005		0
Copper	**0.25**	0.06	0.08	0.013	0.01-0.04	0.2		0
Lead	0.07	0.06	0.085	0.007	0.01-0.15	0.1		0
Mercury	**0.003**	**0.003**	0.001	0.001	**0.002-0.014**	0.001		0.
Nickel	**0.24**	0.08	**0.15**	0.034	**0.14**	0.1		0
Silver	0.02	0.01	0.012	0.001	--	0.02		0
Zinc	**0.42**	0.18	0.23	0.071	0.01-0.15	0.3		0
Cyanide	**0.30**	0.02	**0.13**	0.008	**0.1-0.67**	0.1		0
Phenols	0.11	0.09	0.009	0.004	--	0.5		1

1. Concentrations that do not meet the mean State standard are in **bold type**.

2. Results of bench scale tests by Hyperion laboratories.

3. Activated sludge.

4. To obtain these values, we reduced the values in the fifth column by estimating the best practical percent remo control.

5. Values taken from the Project's 3-yr. report, p. 127.