

## CHARACTERISTICS OF MUNICIPAL WASTEWATERS, 1971 to 1973

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Municipal wastewaters are the major man made source of most pollutants to southern California coastal waters. Hence, it is important to follow fluctuations in the concentrations of various constituents in the final effluents of local treatment plants. It is also of interest to know to what degree these effluents meet the 1972 standards for ocean discharge set by the California Water Resources Control Board.

In the past year, we have reviewed the 1971-73 monitoring data of the five major southern California treatment plants. Using these data, we have estimated the 1972 and 1973 mean yearly concentrations of 28 wastewater constituents or characteristics in the final effluents of these plants; the 1973 values are given in [Table 1](#). (1971 data was presented in the Project's 3 year report.)

Several points of interest can be gleaned from a comparison of the 1971 and 1973 mass emission rates (MER's) for each discharger ([Tables 2](#) and [3](#)):

- On the average, ten of the thirteen MER's for the "general" constituents measured at the Los Angeles County Joint Water Pollution Control Plan (JWPCP) on Palos Verdes Peninsula decreased by 26 percent (range: 15 to 40 percent) since 1971. The exceptions were total phosphate, which remained the same, phenols, which increased by 10 percent and cyanide, which almost tripled.
- Similarly, on the average, MER's of nine of the twelve metals measured decreased by 26 percent (range: 15 to 40 percent) in this 2 year period at JWPCP. The exceptions were silver, which only decreased by half, and nickel, which increased by 7 percent. Arsenic was not measured in 1971, and the analytical technique for this element has only recently become reliable.
- In 1970, the discharge of DDT wastes by Montrose Chemical Company into the JWPCP system was halted. This resulted in a dramatic decrease of 83 percent in the total DDT mass emission rate since 1971. The MER for total PCB (which apparently enters the system through numerous sources) also decreased by 75 percent.
- In the final effluent of Hyperion's 5 mile outfall, the MER's for nine of the thirteen general constituents decreased by 24 percent (range: 10 to 45 percent). Total suspended solids increased by 6 percent, and both oil/ grease and total phosphate increased by 28 percent. Volatile suspended solids were not measured in 1971, but MER's of these substances decreased by 10 percent from 1972 to 1973.
- MER's for cadmium, copper, nickel, lead, and zinc in Hyperion's 5 mile effluent decreased on the average by 40 percent (range: 25 to 60 percent), while MER's for iron, mercury, and chromium remained about the same.

Arsenic and selenium MER's doubled, and manganese and silver MER's increased by five and twenty times, respectively; however, difficulties with the 1971 analysis may have resulted in erroneously low results, which would largely account for these apparent increases.

- According to the monitoring data, the reported input of total DDT increased by a factor of 4, and total PCB by a factor of 2.5 during these 2 years at the Hyperion 5 mile outfall. Again, we suspect that the 1971 values were too low.
- Orange County Sanitation Districts reported concentrations of only five of the general constituents total suspended solids, volatile suspended solids, 5 day BOD, oil grease, and ammonia nitrogen. All of the MER's for these increased by an average of 20 percent (range: 3 to 35 percent) the flow at this plant has also increased 20 percent in the 2 year period.
- Seven metals were measured at the Orange County plant. The MER's for silver and lead decreased by 25 and 10 percent, respectively. All of the rest increased: cadmium, chromium, copper, and nickel apparently increased by 50 percent or more, and zinc increased by 25 percent. Again, the 1971

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- The total DDT MER at Orange County apparently increased by 10 percent, while the total PCB MER decreased by 25 percent. Intercalibration experiments are in progress to assist in evaluation of these data.
- All of the trace metals except selenium were measured in the Point Loma Treatment Plant effluent. Despite a 10 per cent increase in flow, the trace metal MER's decreased by an average of 50 percent (range: 20 to 70 percent) except for mercury, which tripled.
- Oxnard measures four of the general constituents total suspended solids, 5 day BOD, oil/grease, and chemical oxygen demand. All of the reported MER's for these parameters increased on an average of 40 percent (range: 15 to 60 percent).
- Despite the predominant decreases in the JWPCP MER's and increases in many of the MER's of the other dischargers, monitoring data indicates that, during 1973, JWPCP discharged 50 percent or more of the total amount of each of the general constituents, 50 percent of the trace metals, 30 percent of the total PCB, and 90 percent of the total DDT released to the ocean by these five wastewater treatment facilities.

The State of California has two sets of concentration limits for various municipal waste parameters. One set consists of concentrations that are not to be exceeded more than 50 percent of the time, the other, concentrations not to be exceeded more than 10 percent of the time. Monthly mean concentrations are available for all dischargers except Ventura County, which only has quarterly data for trace metals and chlorinated hydrocarbons. Based on these data, we performed a review of the major dischargers' capability to meet the State water quality standards in 1973. [Table 4](#) presents the results for the 50 percent standard and [Table 5](#), for the 10 percent requirement. These tables indicate the degree to which each discharger exceeded the concentration limits for any given parameter during the year: The number on the left of the column is the percentage of time\* that the limit was exceeded, and the number to the right is the average of the concentrations that exceeded the limit.

In 1973, the 50 percent standards for silver and arsenic were met by all discharges, except that of the Hyperion's 7 mile outfall. On the other hand, none of the dischargers met either standard for total suspended solids, oil/grease, and total chromium.

JWPCP effluent, with its high load of industrial input, did not meet either the 50 percent or 10 percent State requirements for any parameter, except silver. Orange County Sanitation District had a similar problem meeting these standards, except for those for silver and ammonia-nitrogen.

The Hyperion 5 mile effluent exceeded the standards for cyanide, total chromium, mercury, and nickel; the 7 mile effluent exceeded all the standards except for cyanide by at least a factor of 10 and was 1,800 times too high in total chromium. Point Loma effluent also exceeded the standards for three metals total chromium, cadmium, and zinc, and Oxnard effluent exceeded the standards for total chromium and zinc.

The three major dischargers JWPCP, Hyperion, and Orange County all exceeded both limits for total identifiable chlorinated hydrocarbons. (No reliable monitoring data on these constituents is available for Oxnard and Point Loma.)

An extensive examination of the monitoring data from the five dischargers for the 3 year period 1971 to 1973 will be presented in an upcoming technical memorandum.

In considering the municipal wastewater inputs, it is important to realize that a discharger's failure to meet the State standards does not necessarily mean that the discharge is damaging to the marine environment. The standards are based on available scientific information. But, as pointed out throughout this report, there are a number of uncertainties about the fates and effects of each wastewater constituent, and in many cases, it was necessary to set the standard without sufficient information: It is our goal to provide as much of this information as possible.

## TABLES

**Table 1.**

Average concentrations of general constituents, trace metals, and chlorinated hydrocarbons in the final effluent of municipal waste dischargers, 1973.

	JWPCP	Hyperion		Orange County	Point Loma	Oxnard
		5-mi	7-mi			
<b>Flow (mgd)</b>	359	339	4.82	152	99.6	12.1
<b>General constituents (mg/L)</b>						
Total suspended solids	258	81.3	7,500	154	157	127
Volatile suspended solids	177	62.4	4,620	104	118	--
5-day biological oxygen demand	226	98.4	--	167	179	171
Chemical oxygen demand	587	222	--	--	--	516
Oil and grease	59.2	17.9	922	40.2	36.2	23.4
Nitrate nitrogen	0.24	0.16	--	--	--	--
Ammonia nitrogen	59.5	13	--	35.7	20.6	--
Organic nitrogen	17.3	5.3	--	--	--	--
Total nitrogen	77.6	18.5	--	--	35.2	--
Total phosphate	47.8	24.9	--	--	38.3	--
Detergent (MBAS)	6.26	4.3	--	--	5.84	--
Cyanide	0.34	0.16	0.11	--	--	--
Phenols	3.63	0.060	--	--	0.31	--
<b>Trace metals (mg/L)</b>						
Silver	0.011	0.030	0.8	0.013	0.011	0.0092
Arsenic	0.015	0.012	0.27	--	0.010	--

Cadmium	0.027	0.018	0.98	0.078	0.033	0.0062
Total Chromium	0.72	0.29	18.2	0.35	0.052	0.024
Copper	0.47	0.14	13.6	0.49	0.12	0.08
Iron	6.44	0.70	76.8	--	0.69	1.18
Mercury	0.0012	0.0026	0.14	--	0.0029	0.0012
Manganese	0.093	0.054	0.37	--	0.066	0.098
Nickel	0.31	0.17	3.57	0.26	0.046	0.068
Lead	0.21	0.045	1.57	0.17	0.06	0.067
Selenium	0.010	0.017	0.45	--	00	--
Zinc	1.78	0.25	27.0	0.58	0.36	0.27
<b>Chlorinated hydrocarbons (ug/L)</b>						
Total DDT	7.50	0.65	4.03	0.34	--	2.4
Total PCB	2.59	2.00	25.4	10.7	--	--
Dieldrin	0.054	0.0013	0.49	1.20	--	

**Table 2.**

Mass emission rates of general constituents, trace metals, and chlorinated hydrocarbons in the final effluents of major municipal wastewater dischargers, 1971.

	JWPCP	Hyperion		Orange County	Point Loma	Oxnard
		5-mi	7-mi			
Flow (mgd)						
General constituents (metric tons/yr)						
Total suspended solids	167,000	36,000	45,500	26,000	13,700	1,320
Volatile suspended solids	122,000	--	25,200	19,700	10,600	629
5-day biological oxygen demand	168,000	53,500	--	34,100	27,300	2,480
Chemical oxygen demand	346,000	122,000	--	--	--	--
Oil and grease	38,000	6,550	6,330	--	4,600	282
Nitrate nitrogen	169	138	--	--	--	39.7
Ammonia nitrogen	41,000	7,010	--	5,560	--	--
Organic nitrogen	13,900	3,440	--	2,510	--	--
Total nitrogen	54,900	10,700	--	8,070	--	--
Total phosphate	22,700	9,030	--	--	--	248
Detergent (MBAS)	3,570	2,210	--	--	658	18.2
Cyanide	61.6	115	1.7	14.4	--	--
Phenols	1,640	46.100	--	35.9	--	0.99
Trace metals (metric tons/yr)						
Silver	10.8	0.690	0.17	3.59	2.48	--
Arsenic	--	2.95	0.54	--	--	--

Cadmium	15.4	22.1	1.51	10.8	7.45	0.33
Total Chromium	462	134	13.4	39.5	27.3	0.99
Copper	267	106	79.3	62.8	43.5	1.49
Iron	4,890	336.00	308	215	149	8.28
Mercury	0.72	1.29	0.67	0.18	0.12	--
Manganese	61.6	4.61	10.7	16.1	11.2	1.99
Nickel	144	129	17.0	28.7	19.9	0.99
Lead	144	29.0	3.34	39.5	27.3	--
Selenium	8.210	3.78	0.37	--	--	--
Zinc	1,400	212	108	96.9	67.1	4.64
<b>Chlorinated hydrocarbons (kg/yr)</b>						
Total DDT	21500.00	73.7	13.6	65.0	--	--
Total PCB	5,180	364.00	188	3,000	--	--
Dieldrin	--	16.6	1.38	--	--	--

**Table 3.**

Mass emission rates of general constituents, trace metals, and chlorinated hydrocarbons in the final effluents of major municipal wastewater dishchargers, 1973.

	<b>JWPCP</b>	<b>Hyperion</b>		<b>Orange County</b>	<b>Point Loma</b>	<b>Oxnard</b>
		<b>5-mi</b>	<b>7-mi</b>			
<b>Flow (mgd)</b>	359	339	4.82	152	99.6	12.1
<b>General constituents (metric tons/yr)</b>						
Total suspended solids	128,000	38,000	49,900	32,300	21,600	2,120
Volatile suspended solids	87,700	29,200	30,700	21,800	16,200	--
5-day biological oxygen demand	112,000	46,600	--	35,000	24,600	2,860
Chemical oxygen demand	291,000	104,000	--	--	--	8,620
Oil and grease	29,300	8,380	6,130	8,430	4,980	391
Nitrate nitrogen	119	74.9	--	--	--	--
Ammonia nitrogen	29,500	6,080	--	7,490	2,830	--
Organic nitrogen	8,570	2,480	--	--	--	--
Total nitrogen	38,400	8,650	--	--	4,840	--
Total phosphate	23,700	11,600	--	--	5,260	--
Detergent (MBAS)	3,100	2,010	--	--	803	--
Cyanide	168	74.9	0.73	--	--	--
Phenols	1,800	28.100	--	--	42.6	--
<b>Trace metals (metric tons/yr)</b>						
Silver	5.45	14.0	5.32	2.73	1.51	0.15
Arsenic	7.43	5.61	1.8	--	1.37	--
Cadmium	13.4	8.42	6.52	16.4	4.54	0.1



Total Chromium	357	136	121	73.4	7.15	0.4
Copper	233	65.5	90.5	103	16.5	1.34
Iron	3,190	327.00	511	--	94.8	19.7
Mercury	0.59	1.22	0.93	--	0.40	0.02
Manganese	46.1	25.3	2.46	--	9.07	1.64
Nickel	154	79.5	23.7	54.5	6.32	1.14
Lead	104	21.1	10.40	35.7	8.25	1.12
Selenium	4.950	7.95	2.99	--	--	--
Zinc	882	117	180	122	49.5	4.51
<b>Chlorinated hydrocarbons (kg/yr)</b>						
Total DDT	3720.00	304	26.8	71.3	--	40.1
Total PCB	1,280	936	169	2,240	--	--
Dieldrin	26.8	6.08	3.26	252	--	

**Table 4.**

A comparison of the capabilities of the five major dischargers to meet the State of California's "50 percent" standards in 1973.

	<b>50% Standard<sub>a</sub> (mg/L)</b>			<b>Hyperion</b>		<b>Hyperion</b>		<b>Orange County</b>		<b>Point Loma</b>		<b>Oxnard</b>	
		<b>JWPCP</b>		<b>5-mile</b>		<b>7-mile</b>							
		<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>
<b>General constituents</b>													
Total suspended solids	50.0	100	260	100	81	100	7500	100	150	100	160	100	130
Ammonia nitrogen	40.0	58	78.0	0	--	NMd	--	8	42	0	--	NM	--
Oil/grease	10.0	100	59.0	100	18	100	920	100	40	100	36	83	26
Cyanide	0.1	100	0.34	83	0.17	33	0.16	NM	--	NM	--	NM	--
Phenols	0.5	100	3.6	0	--	NM	--	NM	--	25	0.57	NM	--
<b>Trace metals</b>													
Silver	0.02	0	--	50	0.037	87	0.96	0	--	8	0.035	0	--
Arsenic	0.01	44	0.025	33	0.02	100	0.27	NM	--	42	0.016	NM	--

Cadmium	0.02	100	0.027	25	0.033	100	0.98	100	0.078	58	0.047	0	--
Total chromium	0.005	100	0.72	100	0.29	100	18	100	0.35	100	0.052	100	0.024
Copper	0.2	100	0.47	8	0.24	100	14	100	0.49	25	0.23	0	--
Mercury	0.001	58	0.0015	100	0.0026	100	0.14	NM	--	36	0.007	50	0.002C
Nickel	0.1	100	0.31	83	0.2	100	3.6	100	0.26	8	0.18	50	0.13
Lead	0.1	92	0.22	0		100	1.6	92	0.17	17	0.14	0	--
Zinc	0.3	100	1.8	17	0.34	100	27	100	0.58	50	0.51	50	0.44
<b>Total identifiable</b>													
chlorinated hydrocarbons	0.002	100	0.010	58	0.0038	92	33	75	0.011	NM	--	50	0.0028

<sup>a</sup>Concentration designated by the State as not to be exceeded more than 50 percent of the time.

<sup>b</sup>Percent of the time discharger exceeded the "50 percent" limit.

<sup>c</sup>Average of the concentrations that exceeded the limit. dNM = not measured.

<sup>d</sup>NM = not measured.

**Table 5.**

A comparison of the capabilities of the five major dischargers for meeting the State of California's "10 percent" standards in 1973.

	<b>10% Standard<sub>a</sub> (mg/L)</b>			<b>Hyperion</b>		<b>Hyperion</b>		<b>Orange County</b>		<b>Point Loma</b>		<b>Oxnard</b>	
		<b>JWPCP</b>		<b>5-mile</b>		<b>7-mile</b>							
		<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>	<b>%<sub>b</sub></b>	<b>mg/L<sub>c</sub></b>
<b>General constituents</b>													
Total suspended solids	75.0	100	260	100	81.0	100	7500	100	150	100	160	83	140
Ammonia nitrogen	60.0	42	91.0	0	--	NMd	--	0	--	0	--	NM	--
Oil/grease	15.0	100	59.0	100	18.0	100	920	100	40.0	100	36.0	50	36.0
Cyanide	0.2	100	0.34	17	0.21	0	--	NM	--	NM	--	NM	--
Phenols	1.0	92	3.9	0	--	NM	--	NM	--	0	--	NM	--
<b>Trace metals</b>													
Silver	0.04	0	--	17	0.05	83	0.96	0	--	0	--	0	--

Arsenic	0.02	22	0.030	0	--	100	0.27	NM	--	8	0.023	NM	--
Cadmium	0.03	25	0.032	8	0.04	92	1.1	100	0.078	33	0.063	0	--
Total chromium	0.01	100	0.72	92	0.32	100	18.0	100	0.35	83	0.061	100	0.024
Copper	0.3	100	0.47	0	--	100	14.0	100	0.49	0	--	0	--
Mercury	0.002	0	--	58	0.0033	100	0.14	NM	--	9	0.024	0	--
Nickel	0.2	100	0.31	17	0.34	100	3.6	92	0.27	0	--	0	--
Lead	0.2	50	0.26	0	--	100	1.6	8	0.25	0	--	0	--
Zinc	0.5	100	1.8	0	--	100	27.0	83	0.6	33	0.57	25	0.56
<b>Total identifiable</b>													
chlorinated hydrocarbons	0.004	100	0.010	17	0.0058	92	0.033	75	0.011	NM	--	0	--

<sup>a</sup>Concentration designated by the State as not to be exceeded more than 10 percent of the time.

<sup>b</sup>Percent of the time discharger exceeded the "10 percent" limit.

<sup>c</sup>Average of the concentrations that exceeded the limit.

<sup>d</sup>NM = not measured.