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APPENDIX

Raw data for each steady state period

Table A 1

Raw Data for Control Reactor, COD = 477 mg/l,  $\theta_c = 4.9$  days.

Date	Daily Wastage	MLSS		$\theta_c$	Total Reac. MLVSS	Lead Concentration					Zinc Concentration				pH		
		Total Reac.	Efflu.			Feed	Effluent		Remov. Effic.	Reactor	Feed	Effluent		Remov. Effic.	Reactor	Feed	Efflu.
							Unfil.	Fil.				Unfil.	Fil.				
(1982)	(l/day)	(mg/l)	(mg/l)	(days)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(%)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(%)	(mg/l)		
2-10	1.40	1,320	34	5.5	1,060	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.8
3-10	1.40	1,410	80	4.3	1,145	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.8
4-10	1.40	-	-	-	-	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.8
5-10	1.40	1,410	60	4.7	1,100	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.7
6-10	1.40	1,205	56	4.6	1,160	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.7
7-10	1.40	1,360	60	4.7	945	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.7
8-10	1.40	1,260	48	4.7	1,040	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.8
9-10	1.40	1,320	30	5.6	1,075	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.8
AVE.	1.40	1,326	53	4.9	1,075	0.00	-	-	-	-	0.00	-	-	-	-	7.2	7.8

TABLE A 1 (Continued)

Date	Alkalinity as CaCO <sub>3</sub>			COD					NH <sub>3</sub> -N Concentration				Org-N Concentration			Efflu. NO <sub>3</sub> -N	
	Feed	Efflu.	Net Change	Feed	Effluent		Total Remov. Effic.	Soluble Remov. Effic.	Feed	Effluent		Net Change	Feed	Effluent			Net Change
					Unfil.	Fil.				Unfil.	Fil.			Unfil.	Fil.		
(1982)	(mg/l)	(mg/l)	(%)	(mg/l)	(mg/l)	(mg/l)	(%)	(%)	(mg/l)	(mg/l)	(mg/l)	(%)	(mg/l)	(mg/l)	(mg/l)	(%)	(mg/l)
2-10	562	488	-13.2	478	69	24	85.6	95.0	55.4	53.2	51.0	-7.9	21.8	6.2	6.5	-70.2	14.4
3-10	574	492	-14.3	474	60	24	87.3	94.9	52.7	51.0	44.5	-15.6	21.8	9.4	10.5	-51.8	14.4
4-10	588	515	-12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5-10	562	499	-11.2	483	56	16	88.4	96.7	57.1	53.0	43.9	-23.1	22.9	5.1	9.9	-56.8	6.8
6-10	610	529	-13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7-10	524	510	- 2.7	471	36	15	92.4	96.8	56.3	47.7	46.7	-17.1	22.0	4.0	6.5	-70.5	8.2
8-10	568	479	-15.7	478	44	24	90.8	95.0	52.1	47.2	48.6	- 6.7	21.0	4.6	1.9	-91.0	8.2
9-10	578	546	- 5.5	478	44	20	90.8	95.8	55.2	48.6	47.5	-13.9	21.0	4.3	2.4	-88.6	6.0
AVE.	571	507	-11.0	477	52	21	89.2	95.7	54.8	50.1	47.0	-14.1	21.8	5.6	6.3	-71.5	9.7

TABLE A 2

Raw Data for Control Reactor, COD = 484 mg/l,  $\theta_c = 6.1$  days

Date (1982)	Daily Wastage (l/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
21-10	1.00	1,475	80	5.2	1,230	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.8
22-10	1.00	1,445	36	7.0	1,260	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.8
23-10	1.00	1,370	40	6.7	-	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.7
24-10	1.00	1,445	58	5.9	1,320	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.8
25-10	1.00	1,425	62	5.7	1,215	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.8
26-10	1.00	1,310	48	6.2	1,285	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.4
27-10	1.00	1,405	54	6.0	-	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.8
AVE.	1.00	1,411	54	6.1	1,262	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.7

TABLE A 2 (Continued)

Date (1982)	Alkalinity as CaCO <sub>3</sub>			COD					NH <sub>3</sub> -N Concentration				Org-N Concentration				Efflu. NO <sub>3</sub> -N (mg/l)
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
21-10	538	192	-64.3	486	56	32	88.5	93.4	55.2	14.4	19.6	-64.5	27.4	6.4	5.5	-79.9	15.6
22-10	530	200	-62.3	470	28	16	94.0	96.6	52.7	15.3	16.9	-67.9	25.8	7.2	4.5	-82.6	17.6
23-10	572	196	-65.7	482	52	16	89.2	96.7	55.7	15.1	15.1	-72.9	26.1	3.9	2.2	-91.6	18.2
24-10	570	185	-67.5	486	92	8	81.1	98.4	54.9	12.1	10.9	-80.1	22.7	4.7	2.0	-91.2	20.4
25-10	554	178	-67.9	474	56	24	88.2	94.9	56.6	9.5	9.5	-83.2	28.6	4.8	1.7	-94.1	21.4
26-10	514	88	-82.9	498	56	16	88.8	96.8	54.9	13.3	14.6	-73.4	28.5	5.5	0.4	-98.6	-
27-10	514	182	-64.6	494	48	20	90.3	96.0	55.4	15.0	15.5	-72.0	31.3	6.1	5.0	-84.0	-
AVE.	542	174	-67.9	484	55	19	88.6	96.1	55.1	13.5	14.6	-73.4	27.2	5.5	3.0	-88.9	18.6

TABLE A 3

Raw Data for Control Reactor, COD = 495 mg/l,  $\theta_c = 8.0$  days.

Date (1982)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
27-9	0.67	1,415	42	8.4	1,245	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.7
28-9	0.67	1,515	66	7.0	1,380	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.5
29-9	0.67	1,580	58	7.7	1,360	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.7
30-9	0.67	1,630	46	8.6	1,530	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.6
1-10	0.67	1,515	48	8.2	1,340	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.5
2-10	0.67	1,680	56	8.0	1,495	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.5
AVE.	0.67	1,556	53	8.0	1,392	0.00	-	-	-	-	0.00	-	-	-	-	7.2	6.6

TABLE A 3 (Continued)

Date (1982)	Alkalinity as CaCO <sub>3</sub>			COD					NH <sub>3</sub> -N Concentration				Org-N Concentration				Efflu. NO <sub>3</sub> -N (mg/l)
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
27-9	580	154	-73.4	510	85	24	83.3	95.3	59.5	0.7	1.1	-98.2	23.4	10.3	3.5	-85.0	23.0
28-9	570	122	-78.6	510	118	52	76.9	89.8	55.4	0.6	1.7	-96.9	25.4	11.1	4.0	-84.3	15.0
29-9	590	150	-74.6	448	113	44	74.8	90.2	58.2	0.6	1.0	-98.3	23.7	10.0	3.7	-84.4	19.0
30-9	586	140	-76.1	506	109	70	78.5	86.2	59.0	0.3	0.4	-99.3	24.0	10.3	2.9	-87.9	21.0
1-10	600	138	-77.0	510	96	61	81.2	88.0	-	-	-	-	-	-	-	-	23.0
2-10	596	132	-77.9	484	61	22	87.4	95.5	-	-	-	-	-	-	-	-	23.0
AVE.	587	139	-76.3	495	97	46	80.4	90.8	58.0	0.6	1.1	-98.2	24.1	10.4	3.5	-85.4	20.7



TABLE A 4

Raw Data for Control Reactor, COD = 523 mg/l,  $\theta_c = 11.7$  days.

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil.	Fil.				Unfil.	Fil.				
							(mg/l)	(mg/l)				(mg/l)	(mg/l)				
29-3	0.55	1,828	24	12.8	1,696	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.1
30-3	0.55	1,864	48	10.0	1,740	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.1
31-3	0.55	1,868	28	12.3	1,644	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.2
1-4	0.55	1,996	38	11.3	1,712	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.2
2-4	0.55	1,800	28	12.2	1,656	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.3
AVE.	0.55	1,872	33	11.7	1,690	0.00	-	-	-	-	0.00	-	-	-	-	7.3	6.2

TABLE A 4 (Continued)

Date (1983)	Alkalinity as CaCO <sub>3</sub>			COD					NH <sub>3</sub> -N Concentration				Org-N Concentration				Efflu. NO <sub>3</sub> -N (mg/l)
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil.	Fil.				Unfil.	Fil.			Unfil.	Fil.		
					(mg/l)	(mg/l)				(mg/l)	(mg/l)			(mg/l)	(mg/l)		
29-3	568	86	-84.9	525	49	19	90.7	96.4	51.7	0.4	0.3	-99.4	31.0	3.4	0.0	-100.0	43.8
30-3	564	85	-84.9	522	53	19	89.8	96.4	55.4	0.9	0.3	-99.5	34.5	2.0	0.0	-100.0	48.3
31-3	575	92	-84.0	523	47	15	91.0	97.1	42.7	0.7	0.6	-98.6	33.5	2.6	0.0	-100.0	46.8
1-4	571	97	-83.0	512	44	19	91.4	96.3	48.3	0.6	0.3	-99.4	33.5	1.6	0.0	-100.0	42.9
2-4	587	107	-81.8	533	47	17	91.2	96.8	46.7	0.6	0.6	-98.7	41.6	1.7	0.0	-100.0	42.5
AVE.	573	93	-83.7	523	48	18	90.8	96.6	49.0	0.6	0.4	-99.1	34.8	2.3	0.0	-100.0	44.9

TABLE A 5

Raw Data for  $Pb^{++} = 1.08 \text{ mg/l}$  and  $Zn^{++} = 1.74 \text{ mg/l}$ ,  $COD = 485 \text{ mg/l}$ ,  $\theta_c = 4.3 \text{ days}$ 

Date (1983)	Daily Wastage (l/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
14-3	1.65	928	40	4.2	780	1.05	<0.50	<0.50	>52.4	7.30	1.67	0.53	0.13	92.2	7.10	7.3	6.9
15-3	1.65	876	40	4.2	664	1.09	<0.50	<0.50	>54.1	7.27	1.89	0.56	0.12	93.7	7.10	7.4	7.0
16-3	1.65	940	32	4.5	812	1.08	<0.50	<0.50	>53.7	7.39	1.79	0.47	0.11	93.8	7.70	7.3	6.9
17-3	1.65	904	30	4.6	712	1.09	<0.50	<0.50	>54.1	6.91	1.74	0.48	0.14	92.0	7.05	7.3	6.9
18-3	1.65	844	44	4.0	720	1.10	<0.50	<0.50	>54.5	-	1.64	0.56	0.11	93.3	-	7.3	7.0
19-3	1.65	920	34	4.4	740	1.12	<0.50	<0.50	>55.4	7.27	1.68	0.41	0.11	93.5	7.30	7.3	6.9
AVE.	1.65	902	37	4.3	738	1.08	<0.50	<0.50	>54.0	7.23	1.74	0.50	0.12	93.1	7.25	7.3	6.9

TABLE A 5 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3 - N$ Concentration				Org-N Concentration			Efflu. $NO_3 - N$ (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
14-3	541	215	-60.3	491	90	46	81.7	90.6	47.6	7.6	3.4	-92.9	34.5	11.5	6.2	-82.0	5.8
15-3	576	231	-59.9	499	99	49	80.2	90.2	43.8	2.3	3.7	-91.6	28.7	11.4	8.7	-69.7	5.1
16-3	568	217	-61.8	480	91	47	81.0	90.2	57.6	7.9	5.4	-90.6	22.2	11.3	12.2	-45.0	5.1
17-3	552	209	-62.1	474	82	40	82.7	91.6	51.2	2.0	3.1	-93.9	28.0	14.4	10.4	-62.9	5.8
18-3	586	225	-61.6	489	83	42	83.0	91.4	47.8	2.3	3.5	-92.7	37.0	13.7	9.9	-73.2	6.1
19-3	549	216	-60.7	474	89	44	81.2	90.7	53.2	6.8	3.4	-93.6	28.5	11.1	7.2	-74.7	5.1
AVE.	562	219	-61.1	485	89	45	81.6	90.8	50.2	4.8	3.8	-92.6	29.8	12.2	9.1	-67.9	5.5

TABLE A 6

Raw Data for  $Pb^{++} = 1.33 \text{ mg/l}$  and  $Zn^{++} = 1.78 \text{ mg/l}$ ,  $COD = 508 \text{ mg/l}$ ,  $\theta_c = 9.0 \text{ days}$ 

Date (1982)	Daily Wastage (l/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
23-10	0.94	1,500	24	8.2	1,310	1.50	<0.50	<0.50	>66.7	8.60	2.14	0.57	0.47	78.0	4.52	7.2	6.4
24-10	0.94	1,535	14	9.1	1,355	1.30	<0.50	<0.50	>61.5	9.70	2.17	0.56	0.50	77.0	4.91	7.2	6.4
25-10	0.94	1,570	8	9.7	1,390	1.40	<0.50	<0.50	>64.3	10.30	1.50	0.55	0.39	74.0	5.06	7.2	6.5
26-10	0.94	1,596	10	9.6	1,406	1.40	<0.50	<0.50	>64.3	19.60	1.54	0.66	0.56	63.6	5.17	7.1	6.4
27-10	0.94	1,588	12	9.4	1,404	1.30	<0.50	<0.50	>61.5	11.70	1.65	0.81	0.74	55.2	7.89	7.2	6.4
28-10	0.94	1,536	28	8.0	1,327	1.10	<0.50	<0.50	>54.5	11.90	1.68	0.87	0.81	51.8	7.40	7.2	6.4
AVE.	0.94	1,554	16	9.0	1,365	1.33	<0.50	<0.50	>62.1	11.97	1.78	0.67	0.58	66.6	5.83	7.2	6.4

TABLE A 6 (Continued)

Date (1982)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3$ -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
23-10	606	88	-85.5	492	43	31	91.3	93.7	50.1	1.9	1.0	-98.0	32.0	1.3	0.8	-97.5	48.4
24-10	600	94	-84.3	530	50	20	90.6	96.2	56.2	1.2	1.2	-97.9	26.2	0.7	1.0	-96.2	48.4
25-10	594	96	-83.8	519	26	14	95.0	97.3	-	-	-	-	-	-	-	-	48.4
26-10	542	75	-86.2	531	39	19	92.7	96.4	56.2	0.8	0.7	-98.8	30.0	0.4	0.3	-99.0	47.7
27-10	547	83	-84.8	485	28	23	94.2	95.3	60.2	1.3	0.7	-98.8	33.2	0.7	0.6	-98.2	48.1
28-10	551	86	-84.4	490	63	24	87.1	95.1	63.4	1.2	0.2	-99.7	26.9	0.4	0.2	-99.3	49.0
AVE.	573	87	-84.8	508	42	22	91.8	95.7	57.2	1.3	0.8	-98.6	29.7	0.7	0.6	-98.0	48.3

TABLE A 7

Raw Data for Pb<sup>++</sup> = 1.40 mg/l and Zn<sup>++</sup> = 1.79 mg/l, COD = 527 mg/l,  $\theta_c$  = 12.4 days

Date (1982)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil.	Fil.				Unfil.	Fil.				
							(mg/l)	(mg/l)				(mg/l)	(mg/l)				
23-10	0.78	2,040	6	12.0	1,740	1.80	<0.50	<0.50	>72.2	-	2.33	0.70	0.39	83.3	-	7.2	6.3
24-10	0.78	2,080	4	12.3	1,795	1.20	<0.50	<0.50	>58.3	13.80	1.53	0.62	0.41	73.2	5.82	7.3	6.4
25-10	0.78	2,090	2	12.6	1,805	1.40	<0.50	<0.50	>64.3	13.90	2.09	0.58	0.33	84.2	5.89	7.2	6.3
26-10	0.78	2,140	0	12.8	1,832	1.50	<0.50	<0.50	>66.7	15.00	1.71	0.60	0.45	73.7	5.93	7.2	6.3
27-10	0.78	2,144	0	12.8	1,864	1.30	<0.50	<0.50	>61.5	14.80	1.60	0.77	0.64	60.0	5.89	7.2	6.3
28-10	0.78	2,068	6	12.1	1,796	1.20	<0.50	<0.50	>58.3	15.60	1.50	0.86	0.80	46.7	5.80	7.2	6.3
AVE.	0.78	2,094	3	12.4	1,805	1.40	<0.50	<0.50	>63.6	14.62	1.79	0.69	0.50	70.2	5.87	7.2	6.3

TABLE A 7 (Continued)

Date (1982)	Alkalinity as CaCO <sub>3</sub>			COD					NH <sub>3</sub> -N Concentration				Org-N Concentration			Efflu. NO <sub>3</sub> -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil.	Fil.				Unfil.	Fil.			Unfil.	Fil.		
					(mg/l)	(mg/l)				(mg/l)	(mg/l)			(mg/l)	(mg/l)		
23-10	570	88	-84.6	533	28	17	94.7	96.8	54.3	1.4	1.0	-98.2	31.4	0.1	0.3	-99.0	46.7
24-10	617	107	-82.7	493	38	14	92.3	97.2	61.3	1.2	0.8	-98.7	25.6	0.4	0.0	-100.0	48.7
25-10	598	96	-83.9	549	22	6	96.0	98.9	59.5	1.4	0.7	-98.8	29.7	0.4	0.0	-100.0	48.9
26-10	557	87	-84.4	556	16	14	97.1	97.5	55.4	2.6	0.5	-99.1	29.5	0.8	0.4	-98.6	47.3
27-10	528	81	-84.7	519	24	6	95.4	98.8	59.6	3.3	0.6	-99.0	28.8	0.4	0.1	-99.7	44.8
28-10	540	77	-85.7	512	16	2	96.9	99.6	60.9	0.7	0.7	-98.9	30.0	0.2	0.1	-99.7	46.1
AVE.	568	89	-84.3	527	24	10	95.4	98.1	58.5	1.8	0.7	-98.8	29.2	0.4	0.2	-99.5	47.1

TABLE A 8

Raw Data for  $Pb^{++} = 1.15 \text{ mg/l}$  and  $Zn^{++} = 1.64 \text{ mg/l}$ ,  $COD = 468 \text{ mg/l}$ ,  $\theta_c = 13.5 \text{ days}$ .

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil.	Fil.				Unfil.	Fil.				
							(mg/l)	(mg/l)				(mg/l)	(mg/l)				
14-3	0.55	2,112	26	13.1	1,816	1.13	<0.50	<0.50	>55.8	26.21	1.48	0.69	0.44	70.3	25.05	7.3	6.1
15-3	0.55	2,180	32	12.4	1,784	1.14	<0.50	<0.50	>56.1	29.51	1.66	0.60	0.30	81.9	27.40	7.4	-
16-3	0.55	2,172	24	13.5	1,848	1.17	<0.50	<0.50	>57.3	29.69	1.80	0.54	0.36	80.0	26.55	7.3	6.2
17-3	0.55	2,152	20	14.0	1,756	1.07	<0.50	<0.50	>53.3	27.88	1.59	0.57	0.38	76.1	26.30	7.3	6.2
18-3	0.55	2,232	18	14.5	1,868	1.18	<0.50	<0.50	>57.6	-	1.57	0.54	0.32	79.6	-	7.3	6.1
19-3	0.55	2,160	22	13.7	1,816	1.18	<0.50	<0.50	>57.6	29.73	1.72	0.63	0.36	79.1	25.95	7.3	6.2
AVE.	0.55	2,168	24	13.5	1,815	1.15	<0.50	<0.50	>56.3	28.60	1.64	0.60	0.36	77.8	26.25	7.3	6.2

TABLE A 8 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3^-$ -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil.	Fil.				Unfil.	Fil.			Unfil.	Fil.		
					(mg/l)	(mg/l)				(mg/l)	(mg/l)			(mg/l)	(mg/l)		
14-3	544	83	-84.7	448	48	15	89.3	96.7	49.0	0.0	0.0	-100.0	30.0	0.0	0.0	-100.0	49.2
15-3	564	-	-	472	40	17	91.5	96.4	52.9	0.0	0.0	-100.0	29.0	0.0	0.0	-100.0	44.8
16-3	552	85	-84.6	470	38	13	91.9	97.2	45.5	0.0	0.0	-100.0	32.2	0.0	0.0	-100.0	46.7
17-3	548	82	-85.0	465	76	19	83.7	95.9	47.8	0.0	0.0	-100.0	31.8	0.0	0.0	-100.0	46.7
18-3	569	80	-85.9	480	76	30	84.2	93.8	53.2	0.0	0.0	-100.0	30.5	0.0	0.0	-100.0	46.7
19-3	531	85	-84.0	470	61	17	87.0	96.4	54.9	0.0	0.0	-100.0	29.1	0.0	0.0	-100.0	48.7
AVE.	551	83	-84.8	468	57	19	87.9	96.1	50.6	0.0	0.0	-100.0	30.4	0.0	0.0	-100.0	47.1

TABLE A 9

Raw Data for  $Pb^{++} = 5.36$  mg/l and  $Zn^{++} = 1.47$  mg/l, COD = 436 mg/l,  $\theta_c = 5.7$  days

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
22-2	1,65	1,096	4	5.8	972	5.55	0.69	<0.50	>91.0	29.35	1.69	0.50	0.09	94.7	10.55	7.4	7.2
23-2	1.65	1,168	14	5.4	1,052	5.23	0.50	<0.50	>90.4	28.70	1.57	0.40	0.08	94.9	10.60	7.4	7.2
24-2	1.65	1,080	4	5.8	968	-	<0.50	<0.50	-	24.32	1.01	0.37	0.09	91.1	9.40	7.4	7.1
25-2	1.65	1,084	6	5.7	972	5.32	0.50	<0.50	>90.6	25.76	1.35	0.36	0.08	94.1	8.30	7.4	7.2
26-2	1.65	1,104	8	5.7	972	5.37	<0.50	<0.50	>90.7	26.00	1.74	0.28	0.08	95.4	8.95	7.4	7.3
27-2	1.65	1,092	4	5.8	976	5.35	<0.50	<0.50	>90.7	25.95	1.45	0.28	0.06	95.7	8.05	7.4	7.2
AVE.	1.65	1,104	7	5.7	985	5.36	<0.53	<0.50	>90.7	26.68	1.47	0.37	0.08	94.3	9.31	7.4	7.2

TABLE A 9 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3^-$ -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
22-2	553	229	-58.6	452	49	31	89.2	93.1	53.2	6.2	9.0	-83.1	33.8	9.7	10.0	-70.4	2.5
23-2	560	233	-58.4	414	41	24	90.1	94.2	48.7	4.6	6.9	-85.8	29.7	14.0	10.4	-65.0	1.9
24-2	549	212	-61.4	405	47	24	88.4	94.1	52.4	4.0	9.6	-81.7	29.2	12.6	8.9	-69.5	2.3
25-2	547	225	-58.9	416	57	31	86.3	92.5	47.6	3.9	5.4	-88.7	28.2	12.0	11.4	-59.6	-
26-2	551	239	-56.6	471	43	24	90.9	94.9	43.4	5.5	5.6	-87.1	34.9	4.6	7.7	-77.9	3.2
27-2	551	241	-56.3	458	59	28	87.1	93.9	48.6	3.5	6.2	-87.2	31.8	6.9	10.0	-68.6	4.2
AVE.	552	230	-58.4	436	49	27	88.7	93.8	49.0	4.6	7.1	-85.6	31.3	10.0	9.7	-68.5	2.8

TABLE A 10

Raw Data for  $Pb^{++} = 5.15 \text{ mg/l}$  and  $Zn^{++} = 1.36 \text{ mg/l}$ ,  $COD = 445 \text{ mg/l}$ ,  $\theta_c = 8.9 \text{ days}$ .

Date (1983)	Daily Wastage (l/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
22-2	1.01	1,496	6	9.3	1,248	5.68	0.95	<0.50	>91.2	41.04	1.46	0.84	0.39	73.3	16.05	7.4	6.2
23-2	1.01	1,440	12	8.7	1,168	5.56	0.93	<0.50	>91.0	38.78	1.39	0.89	0.39	71.9	14.65	7.4	6.2
24-2	1.01	1,516	6	9.3	1,228	-	0.83	<0.50	-	35.30	0.98	0.70	0.42	57.1	12.50	7.4	6.2
25-2	1.01	1,464	14	8.5	1,204	4.95	0.89	<0.50	>89.9	34.38	1.54	0.88	0.36	76.6	11.95	7.4	6.2
26-2	1.01	1,456	8	9.1	1,156	5.72	0.66	<0.50	>91.3	35.83	1.41	0.66	0.35	75.2	11.45	7.4	6.3
27-2	1.01	1,412	16	8.3	1,136	5.77	<0.50	<0.50	>91.3	36.22	1.37	0.59	0.29	78.8	10.90	7.4	6.3
AVE.	1.01	1,464	10	8.9	1,190	5.15	<0.79	<0.50	>90.9	36.93	1.36	0.76	0.37	72.2	12.92	7.4	6.2

TABLE A 10 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3^-$ -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
22-2	565	75	-86.7	522	33	8	93.7	98.5	58.9	0.0	0.0	-100.0	29.7	0.9	0.3	-99.0	42.8
23-2	572	79	-86.2	418	33	2	92.1	99.5	55.7	0.0	0.0	-100.0	27.5	0.6	1.2	-95.6	42.1
24-2	564	67	-88.1	416	24	2	94.2	99.5	51.8	0.0	0.0	-100.0	27.5	-	0.3	-98.9	41.8
25-2	554	71	-87.2	412	30	8	92.7	98.1	54.1	0.0	0.0	-100.0	29.5	1.5	0.4	-98.6	42.2
26-2	579	78	-86.5	442	30	16	93.2	96.4	55.2	0.0	0.0	-100.0	34.1	0.6	0.3	-99.1	42.2
27-2	569	83	-85.4	458	45	22	90.2	95.2	53.8	0.0	0.0	-100.0	27.8	1.0	0.0	-100.0	42.5
AVE.	567	76	-86.7	445	33	10	92.7	97.9	54.9	0.0	0.0	-100.0	29.4	0.9	0.4	-98.5	42.3

TABLE A 11

Raw Data for  $Pb^{++} = 5.32 \text{ mg/l}$  and  $Zn^{++} = 1.62 \text{ mg/l}$ ,  $COD = 445 \text{ mg/l}$ ,  $\theta_c = 11.7 \text{ days}$ 

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration					pH	
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
22-2	0.75	1,792	8	12.1	1,468	5.45	0.72	<0.50	>90.8	50.13	1.71	0.80	0.49	71.3	12.90	7.4	6.2
23-2	0.75	1,800	14	11.3	1,468	5.41	0.64	<0.50	>90.8	53.24	1.65	0.89	0.34	79.4	11.90	7.4	6.2
24-2	0.75	1,764	4	12.7	1,448	5.03	0.79	<0.50	>90.1	53.26	1.38	0.67	0.35	74.6	12.00	7.4	6.2
25-2	0.75	1,772	12	11.5	1,456	5.04	0.89	<0.50	>90.1	52.58	1.85	0.71	0.32	82.7	11.40	7.4	6.2
26-2	0.75	1,784	20	10.6	1,448	5.47	0.94	<0.50	>90.9	54.23	1.55	0.52	0.25	83.9	11.10	7.4	6.3
27-2	0.75	1,848	10	11.9	1,538	5.54	0.81	<0.50	>91.0	48.68	1.60	0.59	0.23	85.6	11.60	7.4	6.3
AVE.	0.75	1,793	11	11.7	1,471	5.32	0.80	<0.50	>90.6	52.02	1.62	0.70	0.33	79.6	11.82	7.4	6.2

TABLE A 11 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration				Efflu. $NO_3^-$ -N (mg/l)
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
22-2	572	76	-86.7	467	51	28	89.1	94.0	62.2	0.0	0.0	-100.0	16.5	1.3	0.6	-96.4	46.3
23-2	568	77	-86.4	416	43	33	89.7	92.1	56.6	0.0	0.0	-100.0	28.1	0.7	0.6	-97.9	45.1
24-2	562	66	-88.3	409	55	22	86.6	94.6	51.2	0.0	0.0	-100.0	28.9	0.6	0.3	-99.0	46.6
25-2	569	73	-87.2	412	51	24	87.6	94.2	55.8	0.0	0.0	-100.0	27.2	1.6	0.3	-98.9	45.7
26-2	574	84	-85.4	448	55	26	87.7	94.2	52.4	0.0	0.0	-100.0	34.7	0.4	0.4	-98.8	45.0
27-2	574	85	-85.2	515	51	22	90.1	95.7	58.1	0.0	0.0	-100.0	29.9	1.7	-	-	45.5
AVE.	570	77	-86.5	445	51	26	88.5	94.1	56.1	0.0	0.0	-100.0	27.6	1.1	0.4	-98.2	45.7



TABLE A 12

Raw Data for  $Pb^{++} = 5.52 \text{ mg/l}$  and  $Zn^{++} = 1.69 \text{ mg/l}$ ,  $COD = 460 \text{ mg/l}$ ,  $\theta_c = 15.8 \text{ days}$ 

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
22-2	0.55	2,252	8	16.3	1,828	5.63	<0.50	<0.50	>91.1	45.06	1.88	0.75	0.51	72.9	52.50	7.4	6.2
23-2	0.55	2,228	20	14.2	1,792	5.48	<0.50	<0.50	>90.9	45.79	1.64	0.73	0.42	74.4	46.15	7.4	6.2
24-2	0.55	2,244	6	16.8	1,812	-	<0.50	<0.50	-	42.95	-	0.67	0.37	-	44.05	7.4	6.3
25-2	0.55	2,252	14	15.2	1,832	5.30	<0.50	<0.50	>90.6	47.86	1.53	0.69	0.33	78.4	43.05	7.4	6.3
26-2	0.55	2,248	12	15.5	1,824	5.50	<0.50	<0.50	>90.9	49.98	1.49	0.64	0.29	80.5	47.15	7.4	6.2
27-2	0.55	2,272	6	16.8	1,844	5.68	<0.50	<0.50	>91.2	48.73	1.90	0.67	0.35	81.6	42.80	7.4	6.2
AVE.	0.55	2,249	11	15.8	1,822	5.52	<0.50	<0.50	>90.9	46.73	1.69	0.69	0.38	77.6	45.95	7.4	6.2

TABLE A 12 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3^-$ -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
22-2	576	75	-87.0	479	28	6	94.2	98.7	58.1	0.0	0.0	-100.0	33.8	0.4	0.3	-99.1	46.4
23-2	564	71	-87.4	440	28	2	93.6	99.5	51.1	0.0	0.0	-100.0	31.0	0.6	0.3	-99.0	48.9
24-2	472	78	-86.4	416	26	10	93.8	97.6	48.9	0.0	0.0	-100.0	29.7	0.4	0.6	-98.0	45.8
25-2	564	79	-86.0	424	28	12	93.4	97.2	57.9	0.0	0.0	-100.0	28.3	0.6	0.1	-99.6	45.7
26-2	582	76	-86.9	467	33	12	92.9	97.4	56.7	0.0	0.0	-100.0	32.7	1.7	0.3	-99.1	45.7
27-2	578	74	-87.2	534	47	22	91.2	95.9	52.1	0.0	0.0	-100.0	35.3	0.7	0.0	-100.0	48.3
AVE.	573	76	-86.8	460	32	11	93.2	97.7	54.1	0.0	0.0	-100.0	31.8	0.7	0.3	-99.1	46.8

TABLE A 13

Raw Data for  $Pb^{++} = 1.13 \text{ mg/l}$  and  $Zn^{++} = 6.33 \text{ mg/l}$ ,  $COD = 447 \text{ mg/l}$ ,  $\theta_c = 5.6 \text{ days}$ .

Date (1983)	Daily Wastage (l/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil.	Fil.				Unfil.	Fil.				
							(mg/l)	(mg/l)				(mg/l)	(mg/l)				
5-2	1.65	1,152	10	5.6	1,048	1.10	< 0.50	< 0.50	> 54.5	7.70	6.60	1.44	0.35	94.7	34.60	7.2	7.0
6-2	1.65	1,224	8	5.7	1,100	1.10	< 0.50	< 0.50	> 54.5	7.90	6.40	1.79	0.25	96.1	37.00	7.2	7.0
7-2	1.65	1,228	10	5.6	1,072	1.10	< 0.50	< 0.50	> 54.5	8.00	6.40	1.74	0.25	96.1	36.70	7.2	7.1
8-2	1.65	1,240	12	5.5	1,088	1.20	< 0.50	< 0.50	> 58.3	-	6.60	1.65	0.21	96.8	36.40	7.3	7.1
9-2	1.65	1,176	12	5.5	920	1.10	< 0.50	< 0.50	> 54.5	9.40	5.80	1.87	0.29	95.0	36.30	7.3	7.1
10-2	1.65	1,184	8	5.7	1,044	1.20	< 0.50	< 0.50	> 58.3	8.80	6.20	1.74	0.24	96.1	36.40	7.3	7.1
AVE.	1.65	1,201	10	5.6	1,045	1.13	< 0.50	< 0.50	> 55.8	8.36	6.33	1.71	0.27	95.8	36.23	7.3	7.1

TABLE A 13 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3^-$ -N (mg/l)	
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent			Net Change (%)
					Unfil.	Fil.				Unfil.	Fil.			Unfil.	Fil.		
					(mg/l)	(mg/l)				(mg/l)	(mg/l)			(mg/l)	(mg/l)		
5-2	560	242	-56.8	461	56	11	87.9	97.6	43.2	14.4	12.3	-71.5	27.0	6.9	4.0	-85.2	12.2
6-2	545	230	-57.8	464	54	24	88.4	94.8	49.5	5.3	5.7	-88.5	25.8	14.4	-	-	12.5
7-2	593	240	-59.5	438	52	17	88.1	96.1	48.1	13.2	11.9	-75.3	25.3	6.9	6.9	-72.7	11.8
8-2	559	244	-56.4	429	39	10	90.9	97.7	51.2	12.1	10.5	-79.5	31.0	7.5	8.6	-72.3	11.8
9-2	555	242	-56.4	425	58	13	86.4	96.9	48.7	9.2	8.8	-81.9	26.3	8.2	8.6	-67.3	13.2
10-2	558	240	-57.0	464	52	21	88.9	95.5	52.1	8.0	6.7	-87.1	27.0	6.1	5.5	-79.6	11.8
AVE.	562	240	-57.3	447	52	16	88.4	96.4	48.8	10.4	9.3	-80.6	27.1	8.3	6.7	-75.4	12.2

TABLE A 14

Raw Data for  $Pb^{++} = 1.30 \text{ mg/l}$  and  $Zn^{++} = 6.73 \text{ mg/l}$ ,  $COD = 465 \text{ mg/l}$ ,  $\theta_c = 8.3 \text{ days}$ .

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Efflu. (mg/l)
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
5-2	1.01	1,492	14	8.6	1,312	1.20	0.50	<0.50	>58.3	9.40	7.00	2.68	0.56	92.0	35.50	7.2	6.7
6-2	1.01	1,500	14	8.6	1,292	1.20	<0.50	<0.50	>58.3	8.60	6.50	2.28	0.64	90.2	37.00	7.2	6.7
7-2	1.01	1,488	18	8.2	1,344	1.30	<0.50	<0.50	>61.5	8.80	7.30	1.79	0.74	89.9	38.70	7.2	6.8
8-2	1.01	1,444	28	7.5	1,308	1.30	<0.50	<0.50	>61.5	9.10	6.40	1.88	0.70	89.1	40.00	7.3	6.7
9-2	1.01	1,460	14	8.5	1,284	1.30	<0.50	<0.50	>61.5	9.40	7.00	2.18	0.80	88.6	41.10	7.3	6.7
10-2	1.01	1,428	16	8.3	1,292	1.20	<0.50	<0.50	>58.3	9.20	6.20	2.40	0.79	87.3	41.00	7.3	6.7
AVE.	1.01	1,469	17	8.3	1,305	1.30	<0.50	<0.50	>59.9	9.08	6.73	2.20	0.71	89.5	38.88	7.3	6.7

TABLE A 14 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD				$NH_3$ -N Concentration				Org-N Concentration			Efflu. $NO_3^-$ -N (mg/l)		
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)			Fil. (mg/l)
5-2	564	148	-73.8	504	51	9	89.9	98.2	50.2	5.0	4.0	-92.0	28.1	-	0.3	-98.9	27.1
6-2	550	143	-74.0	459	45	15	90.2	96.7	49.5	5.3	2.0	-96.0	24.1	4.9	4.3	-82.2	27.3
7-2	574	156	-72.8	459	36	17	92.2	96.3	53.5	3.9	3.6	-93.3	23.8	7.8	0.3	-98.7	30.5
8-2	581	140	-75.9	449	41	21	90.9	95.3	51.1	2.3	3.3	-93.5	24.8	6.3	0.3	-98.8	31.2
9-2	586	142	-75.8	440	51	13	88.4	97.1	52.7	2.6	0.1	-99.8	25.5	5.2	0.9	-96.5	37.3
10-2	580	140	-75.9	478	54	21	88.7	95.6	48.7	4.2	3.2	-93.4	24.4	4.9	0.0	-100.0	30.9
AVE.	573	145	-74.7	465	46	16	90.1	96.5	51.0	3.8	2.7	-94.7	25.1	5.8	1.0	-95.9	30.7

TABLE A 15

Raw Data for  $Pb^{++} = 1.48 \text{ mg/l}$  and  $Zn^{++} = 6.87 \text{ mg/l}$ ,  $COD = 510 \text{ mg/l}$ ,  $\theta_c = 12.1 \text{ days}$ .

Date (1983)	Daily Wastage (l/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil.	Fil.				Unfil.	Fil.				
							(mg/l)	(mg/l)				(mg/l)	(mg/l)				
24-1	0.75	2,036	8	12.2	1,644	1.60	0.70	<0.50	>68.8	13.10	7.30	2.67	1.77	75.8	65.40	7.3	6.4
25-1	0.75	2,072	8	12.2	1,676	1.50	0.70	<0.50	>66.7	10.90	6.80	2.68	1.71	74.9	44.50	7.3	6.4
26-1	0.75	1,996	10	12.0	1,644	-	0.60	<0.50	-	9.60	8.00	2.59	1.64	79.5	39.60	7.3	6.5
27-1	0.75	1,980	6	12.5	1,636	1.40	0.60	<0.50	>64.3	11.10	6.70	2.73	1.66	75.2	41.70	7.3	6.5
28-1	0.75	1,984	10	11.9	1,632	1.40	0.60	<0.50	>64.3	11.50	6.40	2.79	1.78	72.2	44.70	7.3	6.5
29-1	0.75	1,992	12	11.7	1,624	1.50	0.60	<0.50	>66.7	10.80	6.00	2.50	1.54	74.3	44.50	7.3	6.5
AVE.	0.75	2,010	9	12.1	1,643	1.48	0.63	<0.50	>66.2	11.17	6.87	2.66	1.68	75.3	46.73	7.3	6.5

TABLE A 15 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration				Efflu. $NO_3$ -N (mg/l)
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil.	Fil.				Unfil.	Fil.			Unfil.	Fil.		
					(mg/l)	(mg/l)				(mg/l)	(mg/l)			(mg/l)	(mg/l)		
24-1	604	95	-84.3	550	52	31	90.5	94.4	65.5	1.7	0.4	-99.4	30.5	4.8	0.1	-99.7	42.2
25-1	598	80	-86.6	531	58	27	89.1	94.9	60.5	2.9	1.5	-97.5	27.4	4.3	0.3	-98.9	40.9
26-1	629	110	-82.5	496	47	27	90.5	94.6	59.6	2.0	1.1	-98.2	27.2	2.8	0.1	-99.6	39.6
27-1	596	100	-83.2	485	68	27	86.0	94.4	57.1	2.5	1.3	-97.7	27.9	2.9	0.4	-98.6	39.9
28-1	602	94	-84.4	498	49	21	90.2	95.8	54.9	2.4	1.3	-97.6	32.8	7.3	0.0	-100.0	46.7
29-1	604	94	-84.4	500	76	29	84.8	94.2	57.1	2.2	1.5	-97.4	33.2	1.1	0.1	-99.7	51.6
AVE.	606	96	-84.2	510	58	27	88.5	94.7	59.1	2.3	1.2	-98.0	29.8	3.9	0.2	-99.4	43.5

TABLE A 16

Raw Data for  $Pb^{++} = 1.30 \text{ mg/l}$  and  $Zn^{++} = 6.36 \text{ mg/l}$ ,  $COD = 472 \text{ mg/l}$ ,  $\theta_c = 16.3 \text{ days}$ .

Date (1983)	Daily Wastage (1/day)	MLSS		$\theta_c$ (days)	Total Reac. MLVSS (mg/l)	Lead Concentration					Zinc Concentration				pH		
		Total Reac. (mg/l)	Efflu. (mg/l)			Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed (mg/l)	Effluent		Remov. Effic. (%)	Reactor (mg/l)	Feed	Efflu.
							Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)				
24-1	0.55	2,372	6	16.8	1,952	1.30	<0.50	<0.50	>61.5	15.50	6.60	2.03	1.30	80.3	57.10	7.2	6.4
25-1	0.55	2,432	6	16.9	1,988	1.30	<0.50	<0.50	>61.5	13.90	6.00	1.78	1.32	78.0	46.90	7.2	6.3
26-1	0.55	2,432	12	15.7	2,040	1.30	<0.50	<0.50	>61.5	16.90	6.60	1.52	1.11	83.2	57.90	7.2	6.4
27-1	0.55	2,384	6	16.8	1,972	1.40	<0.50	<0.50	>64.3	17.60	6.20	1.49	0.86	86.1	63.60	7.3	6.4
28-1	0.55	2,352	14	15.3	1,928	-	-	-	-	-	-	-	-	-	-	7.3	6.5
29-1	0.55	2,404	8	16.4	1,972	1.20	<0.50	<0.50	>58.3	18.40	6.40	1.50	1.20	81.3	65.00	7.3	6.4
AVE.	0.55	2,396	9	16.3	1,975	1.30	<0.50	<0.50	>61.4	16.46	6.36	1.66	1.16	81.8	58.10	7.3	6.4

TABLE A 16 (Continued)

Date (1983)	Alkalinity as $CaCO_3$			COD					$NH_3$ -N Concentration				Org-N Concentration				Efflu. $NO_3^-$ -N (mg/l)
	Feed (mg/l)	Efflu. (mg/l)	Net Change (%)	Feed (mg/l)	Effluent		Total Remov. Effic. (%)	Soluble Remov. Effic. (%)	Feed (mg/l)	Effluent		Net Change (%)	Feed (mg/l)	Effluent		Net Change (%)	
					Unfil. (mg/l)	Fil. (mg/l)				Unfil. (mg/l)	Fil. (mg/l)			Unfil. (mg/l)	Fil. (mg/l)		
24-1	562	83	-85.2	524	36	9	93.1	98.3	50.9	0.0	0.0	-100.0	28.1	2.9	0.9	-96.8	47.4
25-1	551	81	-85.3	438	39	2	91.1	99.5	48.9	0.0	0.0	-100.0	26.3	2.6	1.2	-95.4	46.7
26-1	558	82	-85.3	479	32	17	93.3	96.5	53.2	0.0	0.0	-100.0	25.3	3.7	0.6	-97.6	47.3
27-1	587	84	-85.7	449	51	2	88.6	99.6	48.7	0.0	0.0	-100.0	22.8	2.4	0.6	-97.4	45.8
28-1	601	97	-83.9	451	45	9	90.0	98.0	54.4	0.0	0.0	-100.0	24.1	1.4	0.9	-96.3	46.4
29-1	587	84	-85.7	489	43	11	91.2	97.8	50.9	0.0	0.0	-100.0	23.3	3.2	0.7	-97.0	46.7
AVE.	574	85	-85.2	472	41	8	91.2	98.3	51.2	0.0	0.0	-100.0	25.0	2.7	0.8	-96.8	46.7



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