

## EXISTING PLANT CONDITIONS

Data on plant flows and performance are collected by the plant operators and recorded on Discharge Monitoring Reports (DMR's) which the City submits each month to the Department of Ecology. A summary of the influent plant data for the previous 24 months (from the beginning of July, 1996 through the end of June, 1998) is presented in Table IV-5, and effluent data is provided in Table IV-6. For a variety of reasons (including a questionable flowmeter, some defective equipment, old reagents and a rapid population growth since 1993), data prior to July 1996 has not been used in this report.

Monthly averages and daily maximum/minimum for influent flow, influent and effluent SS and BOD, percent removal for SS and BOD, effluent pH and fecal coliform counts are listed for each month during the 24 month period. A summary of wet weather (November through February) data versus dry weather (July through October) average monthly values, and the 99<sup>th</sup>, 95<sup>th</sup>, and 90<sup>th</sup> percentile values are also presented in this table. The 99<sup>th</sup> percentile is used to represent maximum daily values, the 95<sup>th</sup> percentile to represent maximum weekly values, and the 90<sup>th</sup> percentile is used for maximum monthly values of design parameters. These percentiles are statistical calculations used by DOE to evaluate loadings on the plant and by engineers to design, and size treatment units.

**Table IV-5. WWTP Influent Data Summary.**

Month	Influent Flow (MGD)			Influent BOD Conc. (mg/L)			BOD Received (lbs/day)			Influent TSS Conc. (mg/L)			TSS Received (lbs/day)		
	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max
Jul-96 <sup>1</sup>	0.339	0.208	0.411	398	309	487	1237	892	1462	401	340	484	1245	981	1453
Aug-96	0.344	0.241	0.387	295	231	379	888	657	1160	303	212	400	912	580	1224
Sep-96	0.346	0.270	0.406	340	285	394	1056	908	1183	359	264	472	1110	841	1417
Oct-96	0.376	0.286	0.443	337	274	420	1052	880	1391	298	250	340	925	803	1052
Nov-96	0.388	0.149	0.584	254	175	300	684	217	931	252	74	356	734	92	1066
Dec-96	0.534	0.318	1.208	298	202	405	1261	1046	1594	292	168	368	1258	755	1544
Jan-97	0.683	0.343	1.045	224	169	266	1313	975	1870	255	190	336	1544	922	2727
Feb-97	0.494	0.331	0.661	265	220	300	1075	905	1275	324	218	374	1294	1022	1538
Mar-97	0.530	0.427	0.649	344	262	470	1552	1081	2074	340	298	380	1539	1267	1715
Apr-97	0.431	0.322	0.505	308	219	378	1025	813	1140	380	324	540	1328	897	2216
May-97	0.424	0.369	0.493	358	285	480	1295	970	1734	303	284	326	1095	966	1197
Jun-97	0.445	0.385	0.509	283	273	295	1019	951	1054	262	254	274	946	839	1024
Jul-97	0.400	0.341	0.470	411	345	503	1368	1220	1515	334	242	394	1115	834	1315
Aug-97	0.395	0.308	0.530	280	193	379	934	567	1285	338	190	438	1113	685	1487
Sep-97	0.341	0.217	0.430	319	253	388	954	773	1295	300	254	352	908	625	1174
Oct-97	0.307	0.250	0.360	314	272	355	797	716	847	303	248	344	774	614	854
Nov-97	0.301	0.184	0.421	311	245	347	741	429	904	243	146	356	561	382	861
Dec-97	0.305	0.137	0.398	309	272	358	799	757	854	326	238	472	849	610	1291
Jan-98	0.409	0.242	0.545	254	208	329	908	768	1205	259	240	290	934	740	1062
Feb-98	0.369	0.270	0.552	208	172	235	602	462	673	255	244	270	736	655	794
Mar-98	0.336	0.268	0.416	293	194	383	802	604	1064	290	214	370	796	568	969
Apr-98	0.292	0.248	0.334	323	255	420	781	626	923	323	252	490	781	580	1189
May-98	0.313	0.270	0.365	305	249	350	814	719	922	313	240	390	837	667	1008
Jun-98	0.334	0.278	0.376	329	273	518	915	812	1292	351	278	512	980	749	1277
<b>Average</b>	<b>0.393</b>	<b>0.137</b>	<b>1.208</b>	<b>307</b>	<b>169</b>	<b>518</b>	<b>995</b>	<b>217</b>	<b>2074</b>	<b>308</b>	<b>74</b>	<b>540</b>	<b>1013</b>	<b>92</b>	<b>2727</b>
99th <sup>2</sup>	0.525			505			1461			494			1355		
95th <sup>2</sup>	0.443			400			1291			398			1262		
90th <sup>2</sup>	0.416			372			1183			388			1172		
Dry Season <sup>3</sup>	0.356			337			1036			329			1013		
Wet Season <sup>4</sup>	0.435			265			923			276			989		

1. Milestone cleaning and O&M. New flow meter installed.

2. Percentiles are based on a normal distribution and actual daily values are used.

3. Dry Season taken to be July through October (Summer Months).

4. Wet Season taken to be November through February (Winter Months).

**Table IV-6. WWTP Effluent Data Summary (sheet 1).**

Month	Effluent BOD Conc. (mg/L)			BOD Discharged (lbs/day)			BOD Removed (%)			Chlorine Residual (mg/L)		
	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max
Jul-96 <sup>1</sup>	18	7	25	58	22	82	95.1%	93.4%	98.5%	0.4	0.2	0.7
Aug-96	21	15	28	63	46	88	92.9%	91.1%	94.1%	0.4	0.2	0.7
Sep-96	28	25	32	88	74	101	91.5%	88.8%	93.8%	0.5	0.2	0.8
Oct-96	23	19	27	71	55	82	93.0%	90.8%	94.6%	0.7	0.6	1.0
Nov-96	14	11	18	37	16	56	94.3%	92.5%	95.7%	0.6	0.3	0.9
Dec-96	19	18	20	84	72	98	93.1%	90.6%	95.5%	0.7	0.3	1.1
Jan-97	22	15	29	135	70	238	89.9%	82.7%	93.3%	0.8	0.6	1.1
Feb-97	22	19	27	89	77	99	91.6%	90.9%	93.2%	0.7	0.3	0.9
Mar-97	21	19	22	94	77	108	93.7%	92.0%	96.2%	0.7	0.2	1.0
Apr-97	18	16	23	62	48	93	93.9%	91.3%	95.7%	0.7	0.3	1.0
May-97	14	9	18	50	32	70	96.1%	93.9%	97.0%	0.7	0.3	1.0
Jun-97	12	8	15	43	29	50	95.8%	94.8%	97.1%	0.8	0.6	1.1
Jul-97	16	14	19	54	45	64	96.0%	95.4%	97.1%	0.8	0.6	1.0
Aug-97	11	3	18	37	8	56	96.4%	95.3%	98.6%	0.7	0.3	1.1
Sep-97	16	14	18	47	34	53	95.0%	93.6%	96.2%	0.6	0.3	1.0
Oct-97	16	13	20	41	31	58	94.9%	92.6%	96.4%	0.6	0.2	1.2
Nov-97	11	9	12	26	18	31	96.4%	95.8%	97.3%	0.5	0.1	0.8
Dec-97	15	13	19	38	33	48	95.3%	93.8%	96.1%	0.4	0.2	0.9
Jan-98	17	15	19	62	42	79	93.1%	91.1%	94.6%	0.7	0.3	1.2
Feb-98	17	11	21	48	30	66	92.1%	90.2%	93.5%	0.6	0.2	0.9
Mar-98	19	12	23	52	40	62	93.4%	91.0%	95.3%	0.7	0.2	0.9
Apr-98	22	17	28	54	38	69	93.0%	90.7%	95.9%	0.6	0.3	0.8
May-98	22	20	26	59	52	69	92.7%	90.4%	93.7%	0.4	0.2	0.7
Jun-98	20	18	23	56	48	72	93.8%	93.1%	95.6%	0.5	0.2	0.7
<b>Average</b>	<b>18</b>	<b>3</b>	<b>32</b>	<b>60</b>	<b>8</b>	<b>238</b>	<b>93.9%</b>	<b>82.7%</b>	<b>98.6%</b>	<b>0.6</b>	<b>0.1</b>	<b>1.2</b>
99th <sup>2</sup>	26			73			90.4%			1.1		
95th <sup>2</sup>	24			68			91.0%			0.9		
90th <sup>2</sup>	23			64			92.0%			0.9		
Dry Season <sup>3</sup>	19			57			94.3%			0.6		
Wet Season <sup>4</sup>	17			65			93.2%			0.6		

1. Milestone cleaning and O&M. New flow meter installed.

2. Percentiles are based on a normal distribution and actual daily values are used.

3. Dry Season taken to be July through October (Summer Months).

4. Wet Season taken to be November through February (Winter Months).

**Table IV-6. WWTP Effluent Data Summary (sheet 2).**

Month	Effluent TSS Conc. (mg/L)			TSS Discharged (lbs/day)			TSS Removed (%)			Fecal Coliforms (#/100 mL)		
	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max	Avg Monthly	Min	Max
Jul-96 <sup>1</sup>	12	7	16	38	22	48	96.9%	96.2%	98.3%	53	16	122
Aug-96	18	8	24	53	21	75	94.2%	91.2%	96.5%	131	72	180
Sep-96	16	13	18	49	39	58	95.5%	94.5%	96.4%	72	22	160
Oct-96	12	8	16	36	25	50	96.0%	93.8%	97.6%	12	4	52
Nov-96	12	9	16	32	11	49	93.8%	88.1%	96.9%	13	2	180
Dec-96	13	7	16	56	31	83	95.6%	94.6%	96.1%	14	4	46
Jan-97	17	5	25	94	35	146	93.6%	91.4%	97.6%	49	16	200
Feb-97	18	13	19	70	61	78	94.5%	94.0%	94.9%	62	20	250
Mar-97	13	8	21	57	33	90	96.3%	94.5%	97.4%	61	20	120
Apr-97	14	11	17	48	38	64	96.2%	95.4%	97.1%	13	8	40
May-97	8	6	13	30	20	48	97.3%	96.0%	98.1%	33	12	60
Jun-97	8	7	10	28	23	36	97.0%	96.2%	97.4%	47	32	94
Jul-97	8	6	10	28	17	35	97.5%	96.8%	98.6%	26	8	70
Aug-97	9	7	11	29	23	39	97.3%	96.5%	97.8%	71	38	153
Sep-97	8	7	9	23	18	26	97.4%	96.7%	98.0%	82	44	155
Oct-97	9	8	11	24	19	32	96.9%	96.3%	97.5%	101	32	170
Nov-97	7	4	8	17	7	21	96.8%	94.5%	98.4%	52	22	96
Dec-97	9	7	12	25	17	30	96.9%	95.9%	98.2%	119	70	166
Jan-98	13	11	15	47	30	62	95.0%	94.1%	96.0%	39	16	76
Feb-98	14	13	17	41	36	48	94.4%	93.4%	95.2%	67	32	106
Mar-98	13	10	17	36	24	47	95.4%	94.2%	96.4%	46	20	130
Apr-98	13	11	15	31	23	39	95.9%	94.3%	97.2%	71	40	136
May-98	14	13	16	36	33	45	95.6%	94.6%	96.4%	98	64	155
Jun-98	12	11	14	32	29	37	96.6%	95.5%	97.4%	113	71	166
<b>Average</b>	<b>12</b>	<b>4</b>	<b>25</b>	<b>40</b>	<b>7</b>	<b>146</b>	<b>95.9%</b>	<b>88.1%</b>	<b>98.6%</b>	<b>60</b>	<b>2</b>	<b>250</b>
99th <sup>2</sup>	17			54			94.0%			169		
95th <sup>2</sup>	15			45			94.3%			166		
90th <sup>2</sup>	15			42			94.7%			156		
Dry Season <sup>3</sup>	11			35			96.5%			69		
Wet Season <sup>4</sup>	13			48			95.1%			52		

1. Milestone cleaning and O&M. New flow meter installed.

2. Percentiles are based on a normal distribution and actual daily values are used.

3. Dry Season taken to be July through October (Summer Months).

4. Wet Season taken to be November through February (Winter Months).

The plant's performance is further illustrated in a series of figures which show the relationship of the actual performance to the design criteria, or to NPDES Permit limits. In all cases, the daily values and monthly values are based on weekly sampling as required by the NPDES Permit. An examination of these figures provides the following information on plant performance:

Figure IV-10: This graph shows the monthly and weekly average WWTP flowrate vs. time. There is an NPDES Permit limit of 0.48 MGD on a monthly average basis. The WWTP exceeded this limit during the end of December, 1996 through the end of March, 1997. During the previous two years, record-breaking rainfalls occurred in western Washington. The record-breaking wet weather caused the Army Corp. of Engineers to release record-breaking amounts of water from upstream dams. The large release of water continued into the summer of 1997 and because of this, kept groundwater levels high all along the Columbia River. It is concluded that I/I is directly influenced by the groundwater table due to the area's sandy soils. This provides an explanation for the slowly decreasing flowrate after the peak WWTP flow of 1.208 which decreased for nearly 3 months before WWTP flows normalized.

Figure IV-11: Influent BOD concentration (mg/L) is plotted versus time. From this graph, influent BOD concentration fluctuates between 500 mg/L and 200 mg/L on a weekly average, and from 200 mg/L to 400 mg/L on a monthly average. Monthly average concentrations also show that for the period of high WWTP flows the concentration decreased. The overall average influent BOD concentration is 307 mg/L which is high compared to typical domestic wastewater BOD concentration of about 200-220 mg/L. The high average BOD concentration coupled with the large fluctuations reflect the impact from industrial customers and/or commercial customers where the loads are dependent on production peaks. The City is currently investigating and testing several industrial and commercial customers who potentially may have a significant BOD discharge. The City's current lead operator is highly competent in BOD analysis and has had previous experience running BOD samples for DOE. Because of this, there is a high level of confidence in the quality of the BOD data.

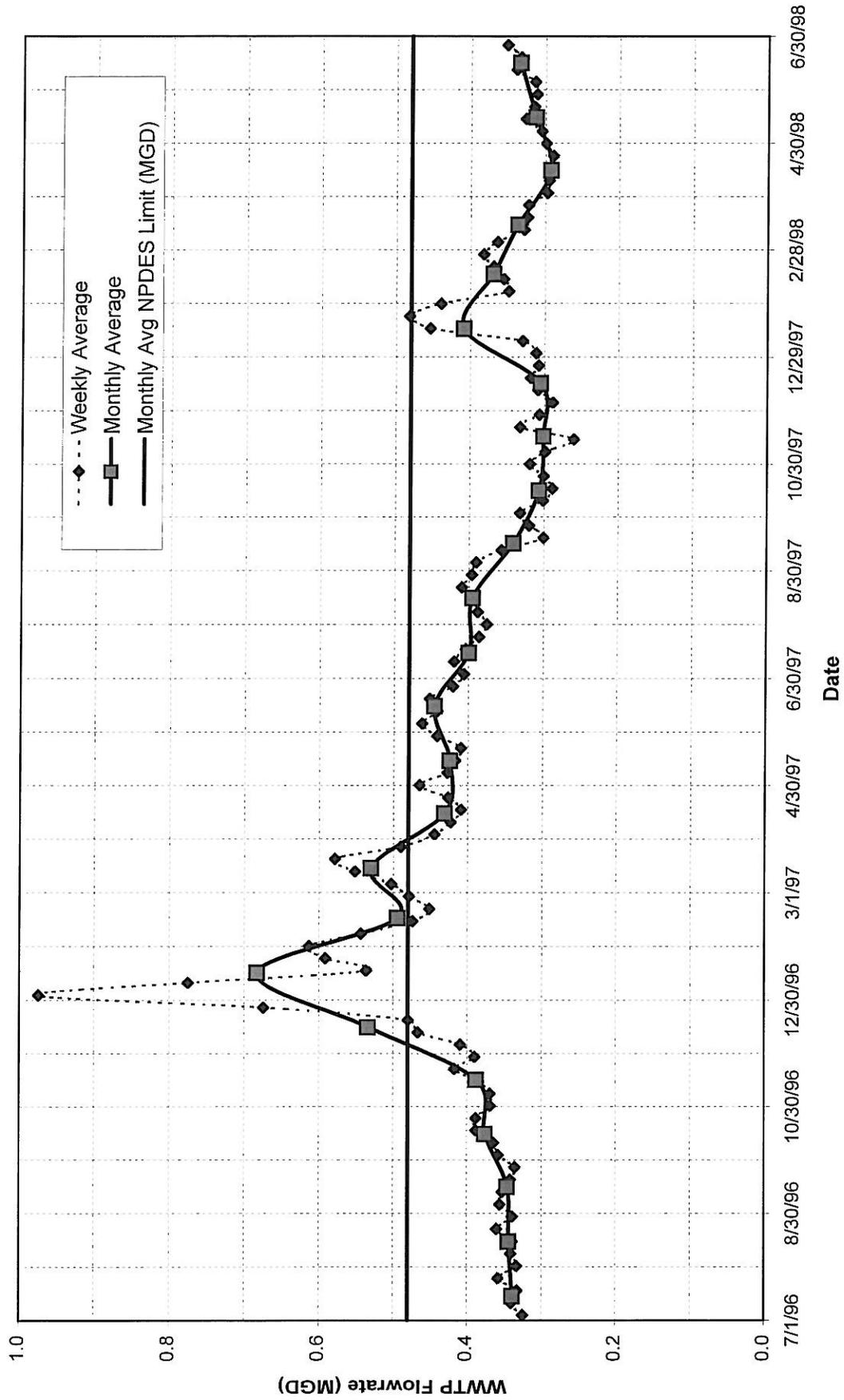


Figure IV-10. WWTP Flow (MGD) vs. Time.

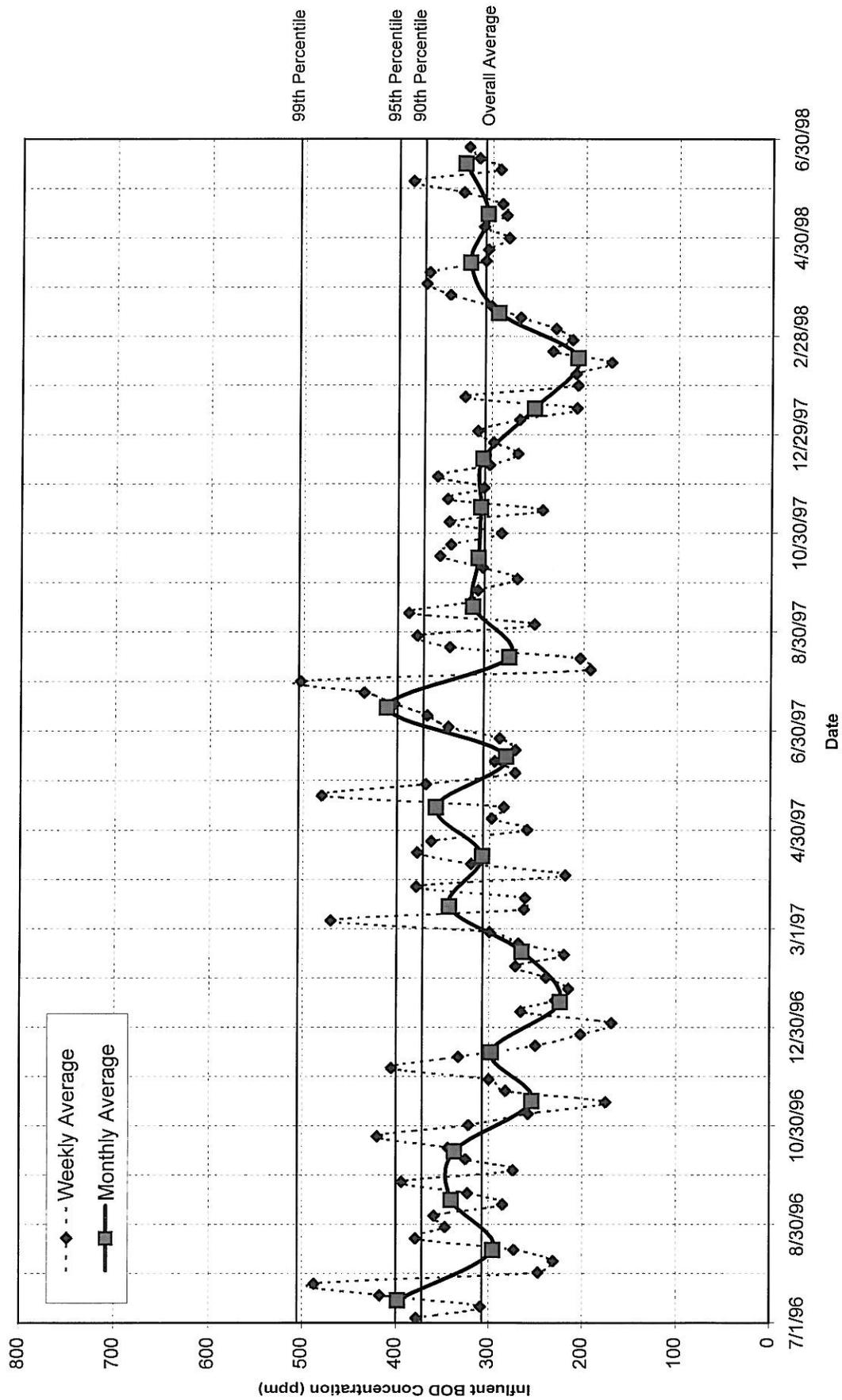


Figure IV-11. Influent BOD Concentration (mg/L) vs. Time.

Figure IV-12: Influent BOD loading (lbs/day) vs. time is shown in this figure. Weekly BOD loading ranges from 2,100 lbs/day to 200 lbs/day; monthly BOD loading ranges from 700 lbs/day to 1,600 lbs/day. The fluctuations in BOD loading is due to variations in daily WWTP flow, and measured BOD concentration. BOD samples were collected once a week from 7/1/96 to 3/2/98, and three times a week from 3/3/98 to 6/30/98. Average weekly values were calculated based on either one BOD sample or three BOD samples, respectively. Monthly average values are calculations based on the number of BOD samples measured for that month. The figure shows varied fluctuations in BOD loading from the period 7/1/96 through 3/3/98, this is attributed to number of BOD samples that was collected during that period (one sample per week). The increased frequency of BOD measurements should be more representative of weekly average BOD concentrations/loadings. Likewise, the increased measurement of BOD will also factor the daily variations of flow during the week when BOD loading is analyzed. The large fluctuation in mass loading (from about 200 lbs/day to over 2,000 lbs/day) show the need to identify the source of this.

Figure IV-13: This figure shows the influent TSS concentration (mg/L) vs. time. Weekly average TSS concentration ranges from about 100 mg/L to about 550 mg/L; monthly average concentrations range from 250 mg/L to 400 mg/L. A similar argument is made for TSS concentration as for BOD concentration (above). The TSS overall concentration is 308 mg/L for the period of record used in this report. This concentration is high as compared to typical municipal TSS loads of 200-220 mg/L. TSS fluctuations and trends appear to be closely related to the BOD fluctuations and trends. This may imply that the TSS and BOD received by the plant are largely proportional to one another. Hence, the plant may be receiving a large amount of particulate BOD. This has been verified by conducting soluble and total BOD tests for the influent, the primary clarifier effluent, and the effluent. The results of the testing has shown

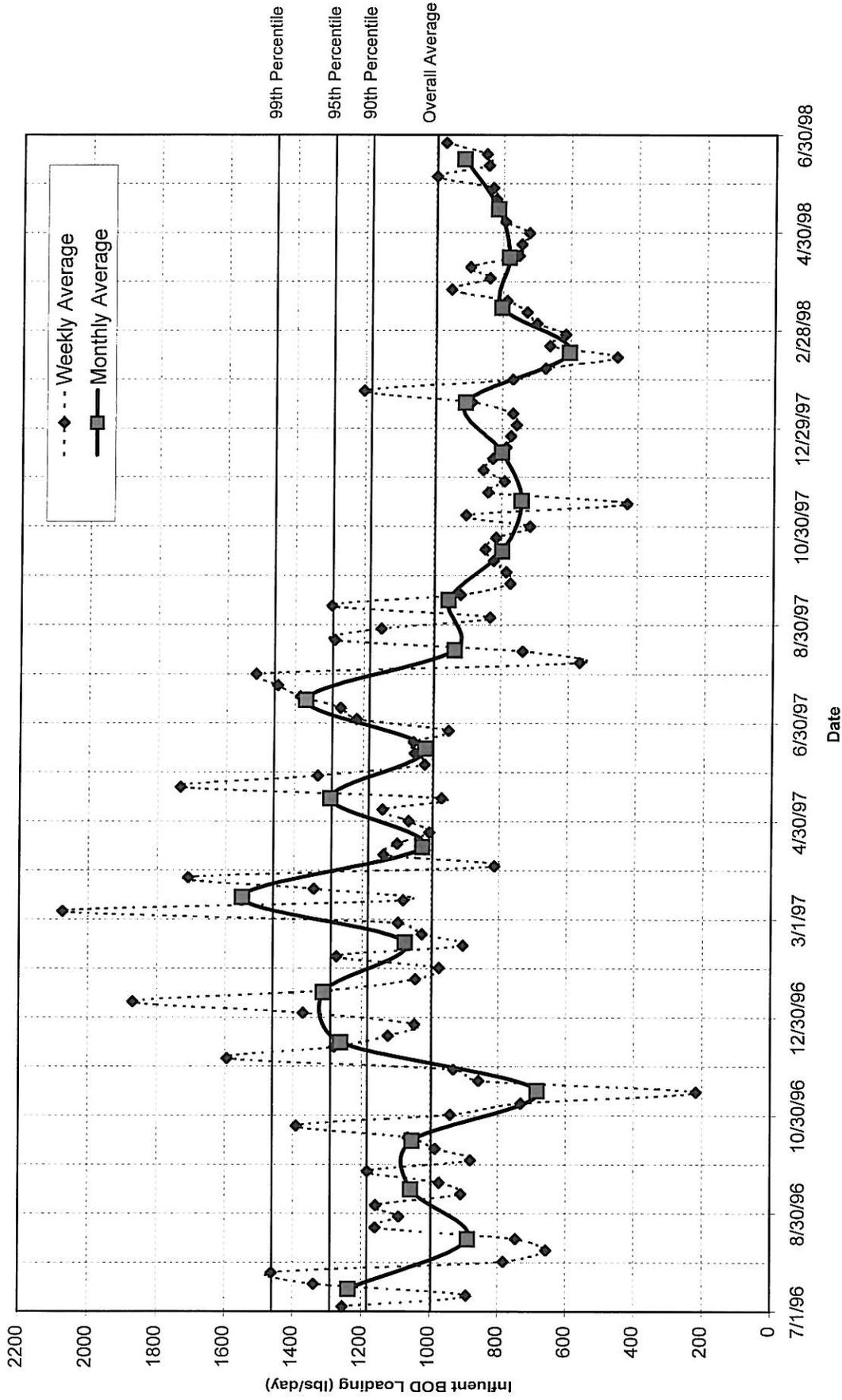


Figure IV-12. Influent BOD Loading (lbs/day) vs. Time.

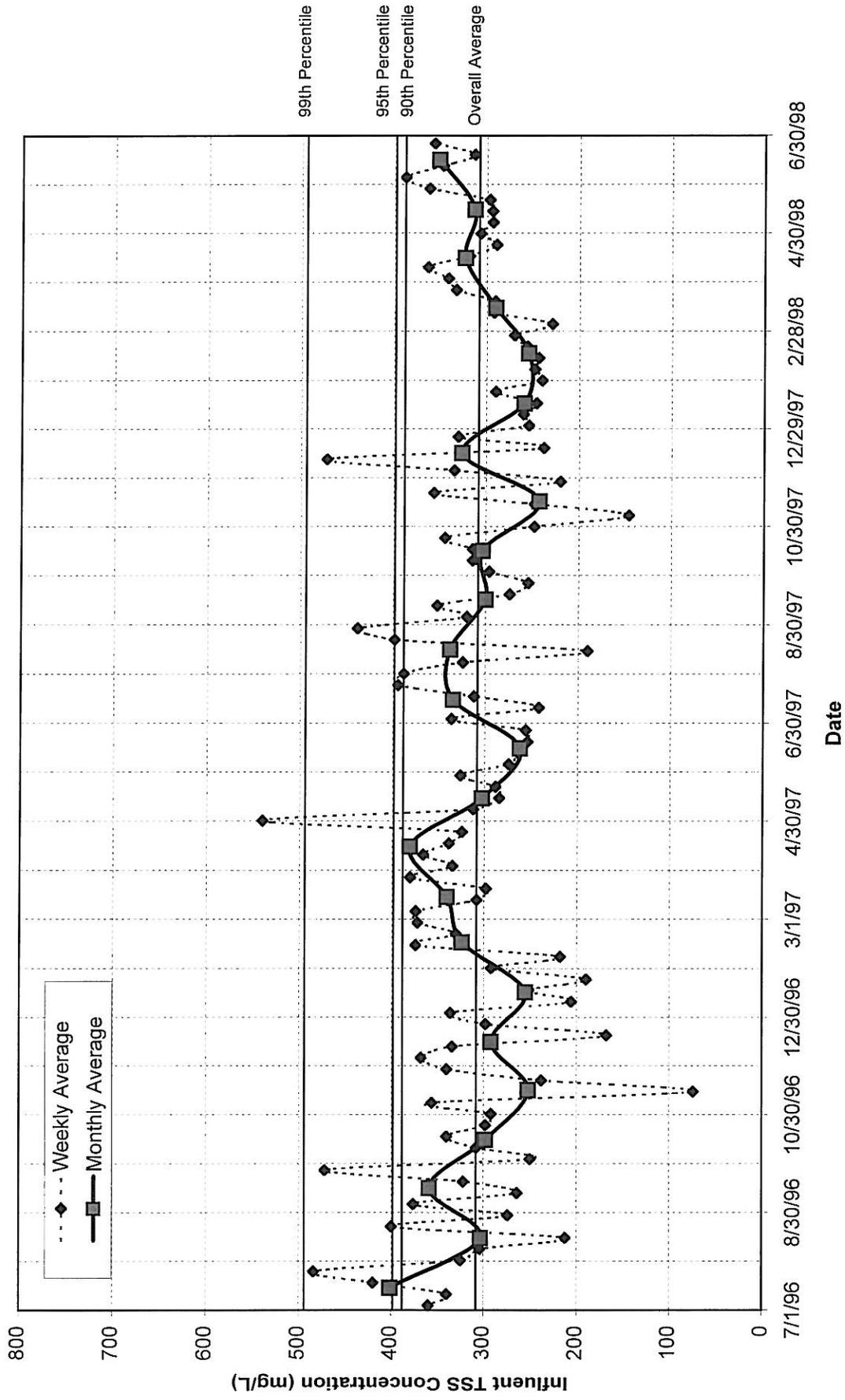


Figure IV-13. Influent TSS Concentration (mg/L) vs. Time.

that approximately one third of the total BOD is soluble (33%), and approximately one half of the total BOD is settleable particulates (50%), and one sixth (17%) is suspended particulates. Typical municipal wastewaters have one third of the total BOD as soluble (33%), one third as settleable particulates (33%), and one third as suspended particulates (33%).

Figure IV-14: A relationship of influent TSS loading (lbs/day) vs. time is shown here. The discussion for this figure is very similar to that for influent BOD loading (above).

Figure IV-15: Effluent BOD concentration (mg/L) vs. time shows that the WWTP consistently meets its NPDES permit limits. This figure shows that the plant consistently meets the 30 mg/L effluent standard in a monthly average and is far below the 45 mg/L weekly effluent standard.

Figure IV-16: Effluent BOD discharged (lbs/day) vs. time shows that there were no violations to the NPDES permit except for one weekly average, and one monthly average value that occurred during January 1997. The January violation is a result of the high WWTP flows that were experienced due to high groundwater levels. The high mass discharge may be a result of an inaccurate BOD concentration that was measured on very dilute wastewater. Even though the BOD reading was low, the high flow would result in a calculation that shows excess pounds of BOD discharged.

Figure IV-17: BOD Removal Efficiency (%) vs. time shows no NPDES Permit violations occurred from July, 1996 through June, 1998. (Percent removal only applies to monthly averages.) The treatment plant data shows a decrease in removal efficiency during the beginning of January, 1997. This period occurs when high groundwater levels induced I/I affected the flow through the WWTP and diluted incoming wastewaters which make it difficult to remove 85% of the pollutants.

Figure IV-18: Effluent TSS concentration (mg/L) vs. time shows that the WWTP consistently met the monthly and weekly NPDES Permit limits of 30 mg/L and 45 mg/L, respectively. The data shows that the plant can consistently provide less than 20 mg/L TSS quality effluent.

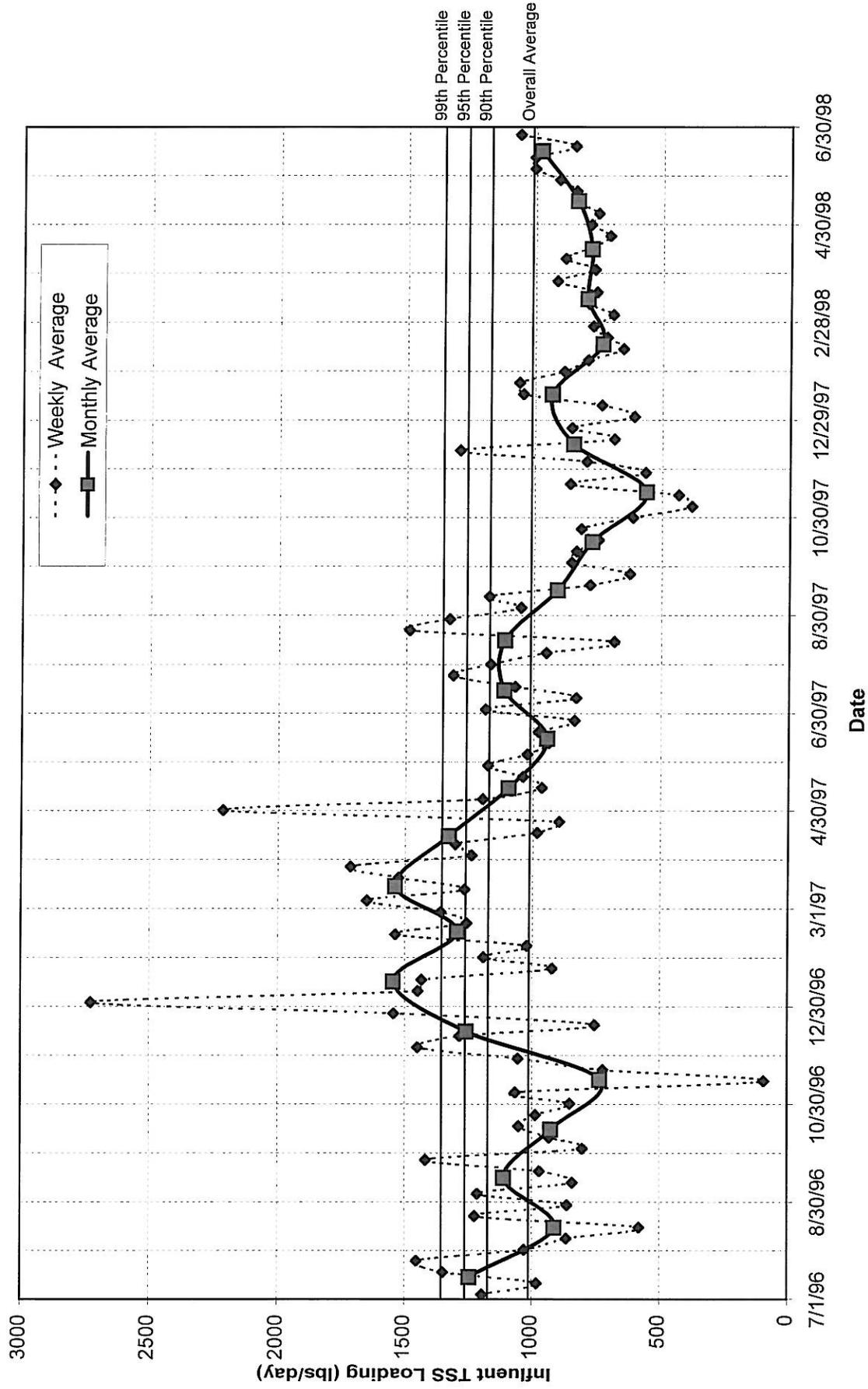


Figure IV-14. Influent TSS Loading (lbs/day) vs. Time.

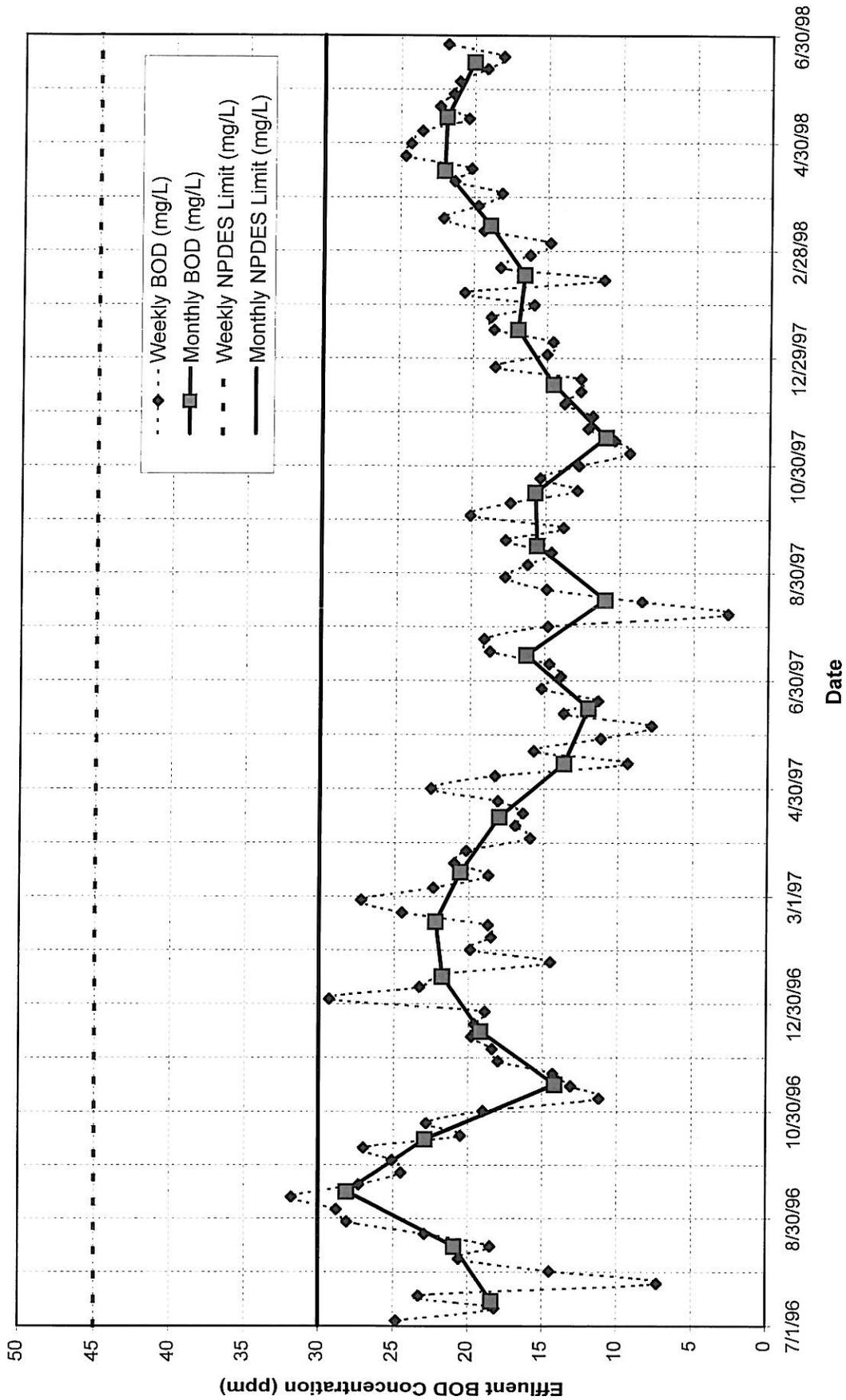


Figure IV-15. Effluent BOD Concentration (mg/L) vs. Time.

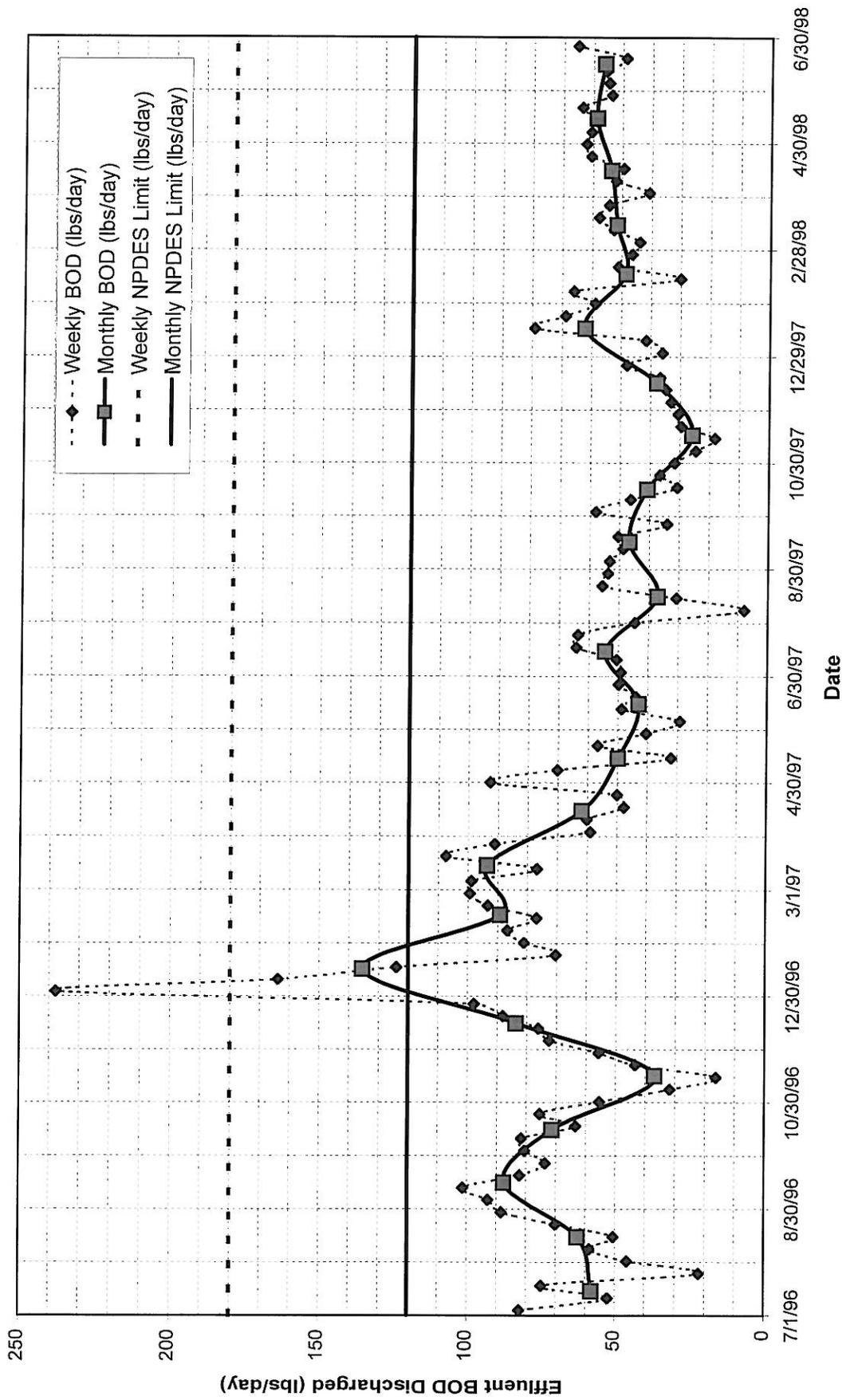


Figure IV-16. Effluent BOD Discharged (lbs/day) vs. Time.