

SECTION H

APPENDIX D2.3

Surface Water: River Vardar

Parameter			1995	1996	1997	1998	1999	min	average	max
pH value		min	8.0	7.9	7.8	7.2	7.2	7.2	7.860	8.2
		ave	8.1	8.1	8.0	7.9	8.1	7.7	8.033	8.3
		max	8.2	8.2	8.3	8.3	8.5	8.1	8.240	8.5
Total alkalinity expressed as (CaCO ₃)	mg/l	min	27.0	34.0	26.0	30.0	135.1	26.0	51.44	135.1
		ave	35.7	39.5	33.3	37.5	165.2	32.3	62.23	165.2
		max	45.0	45.0	43.0	45.0	240.2	38.0	77.84	240.2
Total suspended materials	mg/l	min	15.0	13.0	28.0	13.0	26.0	13.0	43.40	73.0
		ave	65.3	56.5	92.7	26.3	51.8	19.5	58.53	116.8
		max	159.0	115.0	151.0	37.0	103.0	30.0	77.60	159.0
Unvaporized residuals from filtered water	mg/l	min	185.00	146.00	163.00	185.00	135.12	135.12	165.440	198.00
		ave	212.33	211.83	201.00	219.67	165.16	155.43	201.999	235.83
		max	240.00	262.00	239.00	281.00	240.22	185.00	232.044	281.00
Dissolved Oxygen	mg/l	min	9.78	8.94	8.33	9.06	8.24	8.24	9.108	10.06
		ave	10.79	10.62	9.85	10.69	9.70	9.28	10.328	11.78
		max	11.70	15.38	11.05	12.09	11.42	10.57	12.214	15.38
Saturated Oxygen	%	min	96.35	90.71	84.65	94.02	82.81	82.81	91.062	100.73
		ave	105.93	102.00	98.33	105.15	94.24	91.69	101.128	116.11
		max	130.00	127.95	108.32	120.84	105.45	101.93	111.040	130.00
Bio-chemical oxygen demand in 5 days (BOD ₅)	mg/l	min	2.1200	1.7600	1.4000	1.2100	1.1000	1.1000	1.88200	2.5300
		ave	3.2150	2.1933	2.0217	1.8933	1.7000	1.3550	2.20467	3.4067
		max	5.2300	2.7600	2.8300	3.0300	2.8000	1.8400	3.07800	5.2300
Chemical oxygen demand for KMnO ₄ (consum.)	mg/l	min	4.7400	6.6400	5.6900	3.7900	0.8000	0.8000	6.68400	12.0000
		ave	11.8550	10.6917	9.1133	10.6917	1.3883	1.3883	8.74800	16.3317
		max	18.9700	14.2200	16.7500	22.7600	1.8000	1.8000	10.27400	22.7600

Parameter			1995	1996	1997	1998	1999	min	average	max
Total iron dissolved in water (Fe)	mg/l	min	0.0000	0.0187	0.0199	0.0109	0.0182	0.0000	0.02532	0.0698
		ave	0.8983	0.3069	0.4893	0.0385	0.3661	0.0206	0.41982	1.3980
		max	3.0000	1.0000	2.0000	0.0698	1.5082	0.0471	0.61702	3.0000
Total lead dissolved in water (Pb)	µg/l	min	5.9980	0.0000	0.0000	0.0000	0.0000	0.0000	4.21860	8.5490
		ave	9.0492	8.7375	9.5497	2.5383	1.3027	0.0000	6.23547	15.7503
		max	11.4020	19.9290	28.0070	8.3070	7.1160	0.0000	12.75480	28.0070
Total copper dissolved in water (Cu)	µg/l	min	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.29580	6.4790
		ave	1.7763	2.1287	4.4893	1.3533	1.8313	0.0000	2.31580	8.6303
		max	6.4790	8.3790	10.6480	8.1200	9.9880	0.0000	3.62160	10.6480
Total zink dissolved in water (Zn)	µg/l	min	2.1990	0.0000	8.5500	4.5320	10.3870	0.0000	9.69580	12.1550
		ave	6.5378	9.9018	19.5238	12.1705	18.3472	4.9135	13.29623	25.1290
		max	9.9730	18.6940	39.8180	22.1620	43.5450	9.9730	21.05200	43.5450
Total chromium dissolved in	mg/l	min	0.00	0.01	0.00	0.01	0.01	0.00	0.007	0.01
		ave	0.01	0.01	0.02	0.01	0.01	0.01	0.012	0.02

Table HD2.3b: Heavy Metal Contents in River Vardar Water in HPP “East” Location

Parameter			1995	1996	1997	1998	1999	min	average	max
water (Cr)		max	0.01	0.02	0.03	0.02	0.02	0.01	0.016	0.03

Table HD2.3c: Chemical Characteristics of River Vardar Water in HPP “East” Location

Parameter			1995	1996	1997	1998	1999	min	average	max
Ammonia - NH ₃ expressed as N		min	0.0000	0.1276	0.1172	0.1441	0.0000	0.0000	0.16782	0.2792
		ave	0.0323	0.1716	0.2468	0.3026	0.2967	0.0323	0.20999	0.4070
		max	0.0970	0.2502	0.3947	0.4681	0.5000	0.0970	0.24404	0.5000
Nitrites expressed as N	mg/l	min	0.0060	0.0063	0.0090	0.0130	0.0130	0.0060	0.01176	0.0180
		ave	0.0089	0.0135	0.0330	0.0215	0.0265	0.0073	0.02067	0.0418
		max	0.0126	0.0240	0.1200	0.0350	0.0500	0.0095	0.04600	0.1200
Nitrates expressed as N	mg/l	min	0.2500	0.2500	0.2500	0.0000	0.7000	0.0000	0.52000	0.9000
		ave	0.7250	1.2517	0.5167	0.5083	1.0833	0.2417	0.81700	1.5500
		max	1.3000	3.2000	0.7000	1.6000	1.8000	0.7000	1.24000	3.2000
Chlorides dissolved in water	mg/l	min	10.0000	7.0000	5.0000	8.0000	0.0000	0.0000	7.20000	12.0000
		ave	13.8333	11.1667	9.3333	11.6667	1.1667	1.1667	9.43333	15.0000
		max	16.0000	15.0000	12.0000	17.0000	7.0000	7.0000	12.00000	17.0000
Sulphates dissolved in water	mg/l	min	10.2600	8.3400	8.9800	12.1800	0.0000	0.0000	9.36000	16.0000
		ave	13.0333	13.1400	10.3667	16.3400	0.8567	0.8567	10.74733	17.6167
		max	17.9400	16.6600	13.4600	20.5000	5.1400	5.1400	12.43200	20.5000
Anions of diss. detergents In water	mg/l	min	0.0000	0.0000	0.0010	0.0000	0.0203	0.0000	0.01866	0.0490
		ave	0.0648	0.0323	0.0456	0.0273	0.0376	0.0069	0.04153	0.0904
		max	0.1050	0.0820	0.1984	0.0610	0.0524	0.0210	0.07910	0.1984
O-Phosphates dissolved in water	mg/l	min	0.0000	0.0048	0.0000	0.0000	0.0000	0.0000	0.01592	0.0482
		ave	0.0000	0.0928	0.0637	0.0404	0.0000	0.0000	0.03938	0.1074
		max	0.0000	0.2580	0.1717	0.0628	0.0000	0.0000	0.09850	0.2580
Total Phosphorus dissolved In water (P)	mg/l	min	0.0000	0.0000	0.0000	0.0000	3.9500	0.0000	0.79000	3.9500
		ave	0.0000	0.0000	0.0000	0.0000	37.8467	0.0000	7.56933	37.8467
		max	0.0000	0.0000	0.0000	0.0000	90.6000	0.0000	18.12000	90.6000

Table HD2.3d: Biological Characteristics of River Vardar Water in HPP “East” Location

Parameter			1995	1996	1997	1998	1999	min	average	max
Coliform germs	No/l	min	NF	NF	NF	NF	NF	NF	-	NF
		ave	-	-	-	-	-	-	-	-
		max	>250000	>240000	>240000	>240000	>240000	>240000	>240000	-
Live germs at 37°C	No/l	min	10,000	40,000	30,000	64,000	35,000	10,000	46,600	110,000
		ave	91,167	100,500	121,500	215,667	167,500	37,333	139,267	351,667
		max	280,000	245,000	450,000	550,000	450,000	64,000	230,000	550,000
Live germs at 22°C	No/l	min	25,000	25,000	20,000	40,000	20,000	20,000	55,600	80,000
		ave	101,167	98,167	155,833	160,000	140,000	36,833	131,033	286,667
		max	200,000	200,000	370,000	370,000	350,000	70,000	218,000	370,000

NF: Not Found

Figure HD2.3a: Characteristic annual Water Temperatures of the River Vardar

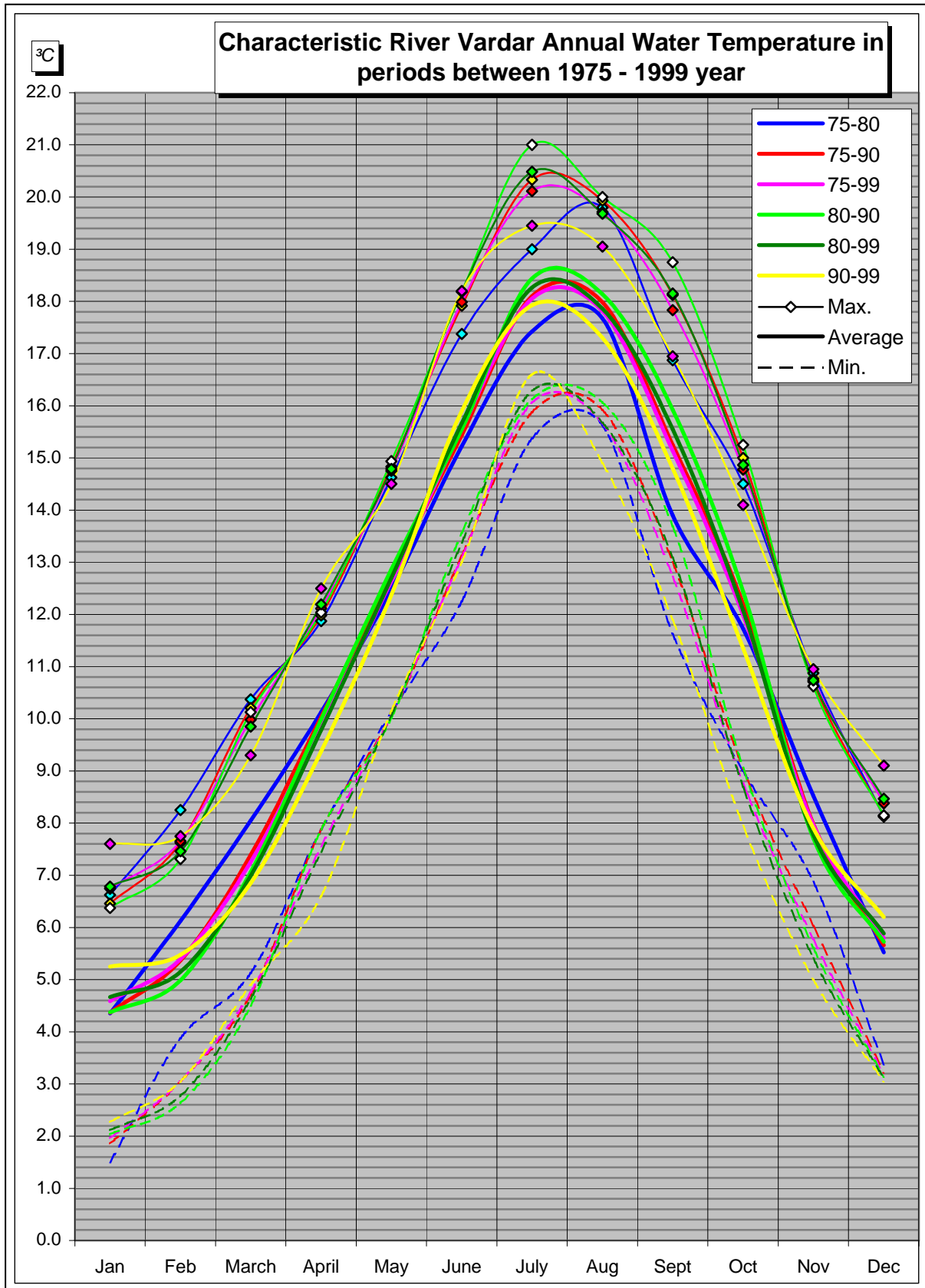


Figure HD2.3b: Yearly Characteristic Sediment Flow in the River Vardar

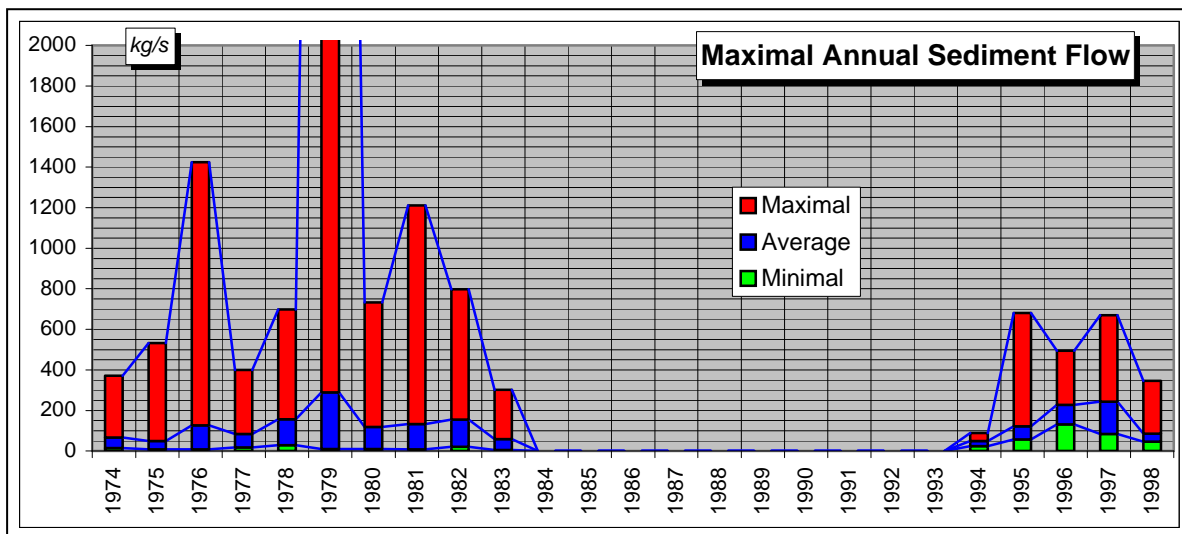
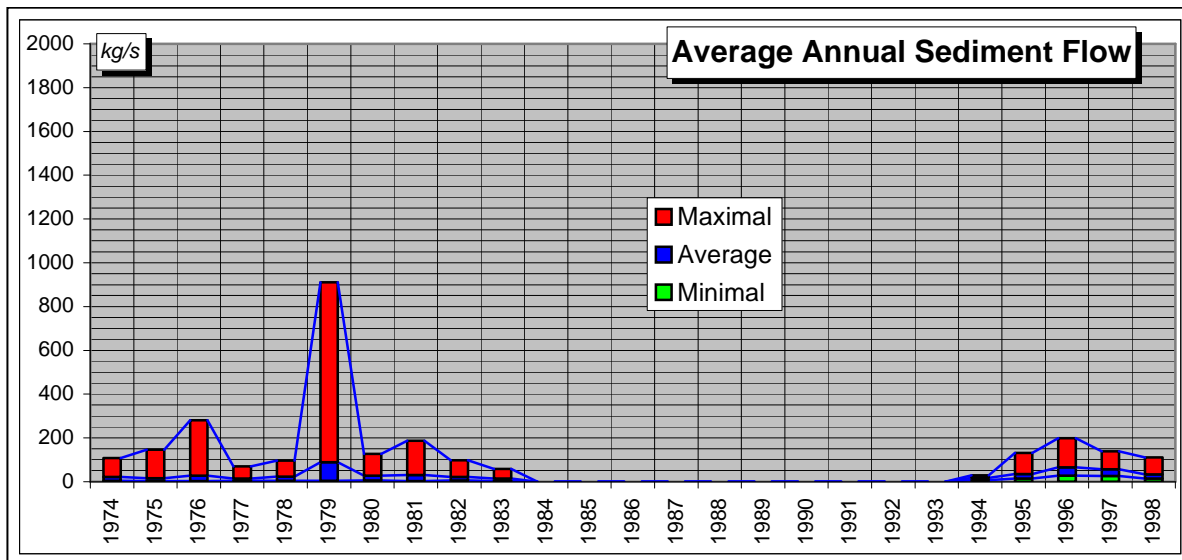
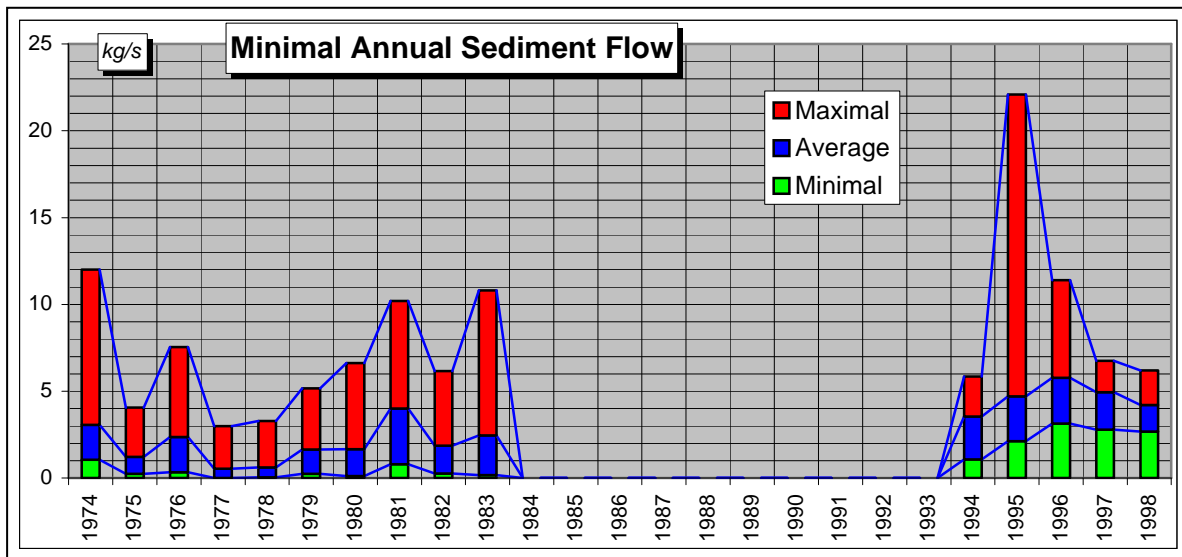
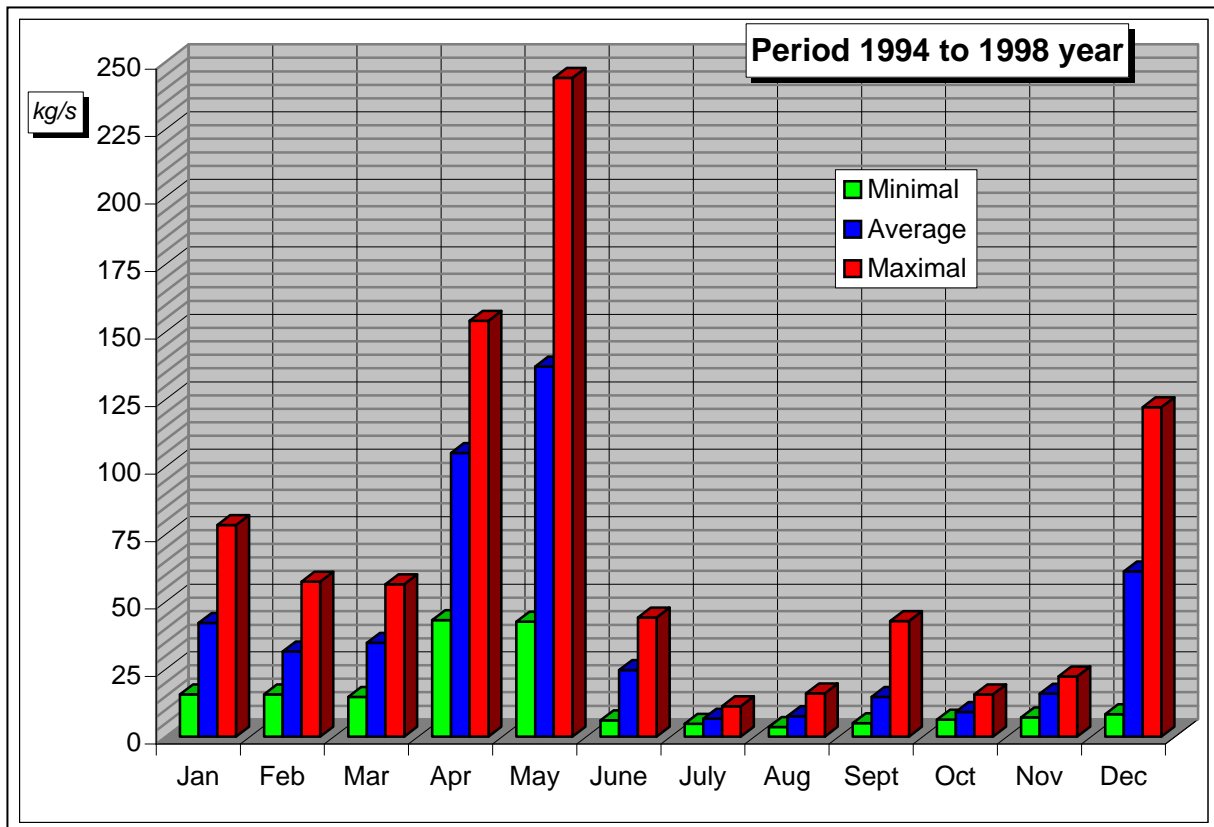
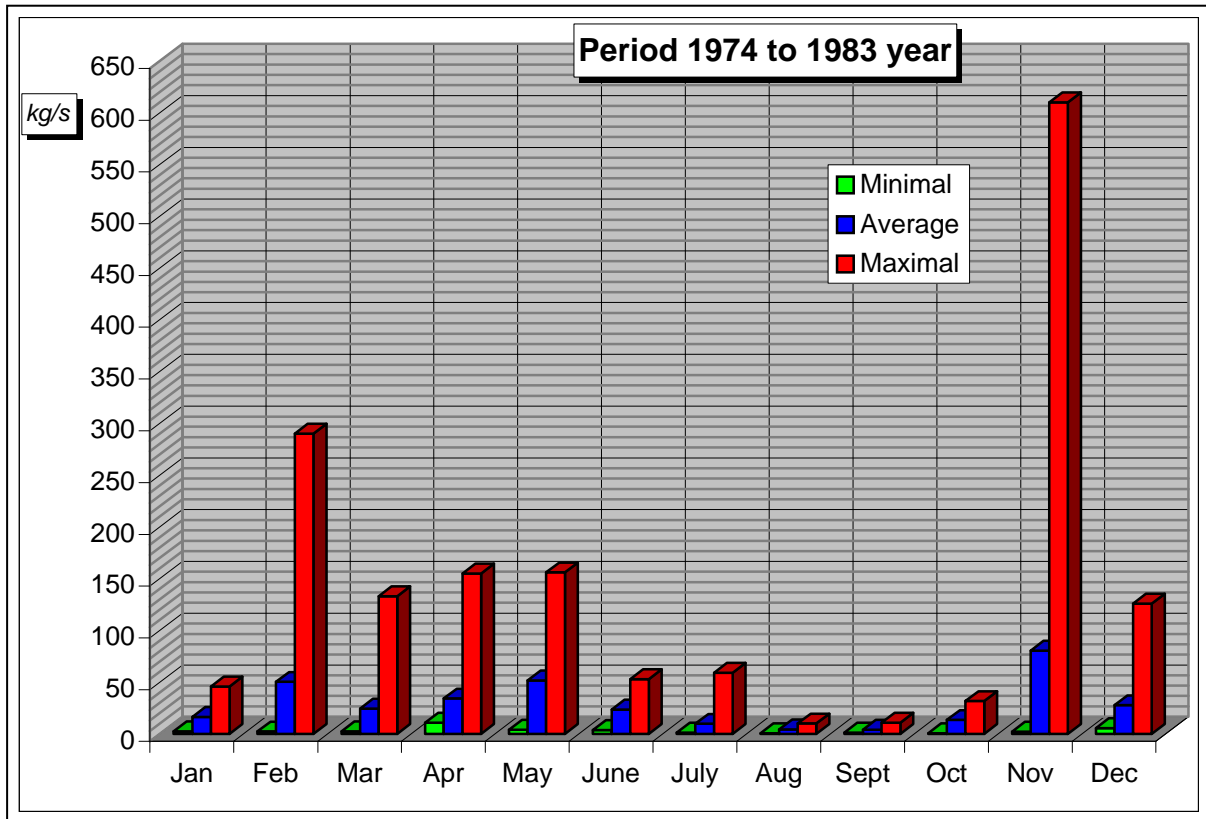


Figure HD2.3c: Characteristic Monthly Oscillation of suspended Bank of the River Vardar on CCPP site



Drinking Water

Parameter			1995	1996	1997	1998	1999	min	average	max
Alkalinity pH		min	7.2	7.0	6.7	7.0	7.3	6.7	7.140	7.3
		ave	7.3	7.3	7.2	7.2	7.4	7.1	7.278	7.4
		max	7.5	7.5	7.4	7.4	7.5	7.3	7.380	7.5
Electric Conductivity	µS/cm	min	493.0	569.0	546.0	574.0	580.0	493.0	566.25	620.0
		ave	569.3	599.6	601.5	621.4	660.6	561.4	616.11	693.1
		max	636.0	631.0	669.0	702.0	735.0	615.0	668.00	735.0
Dry Sediment	mg/l	min	268.0	210.0	210.0	220.0	240.0	210.0	251.80	311.0
		ave	288.4	300.4	282.4	272.5	311.7	244.4	291.08	340.8
		max	320.0	364.0	313.0	380.0	380.0	280.0	316.80	380.0
Residual Chlorine	mg/l	min	0.30	0.30	0.30	0.30	0.20	0.20	0.300	0.30
		ave	0.35	0.33	0.31	0.30	0.32	0.29	0.322	0.39
		max	0.50	0.40	0.40	0.30	0.40	0.30	0.340	0.50
Chlorides	mg/l	min	7.00	8.00	10.00	10.00	10.00	7.00	9.600	10.00
		ave	10.33	9.83	10.67	10.58	10.00	9.42	10.283	11.50
		max	15.00	12.00	12.00	13.00	10.00	10.00	11.000	15.00
Chemical oxygen demand for KMnO ₄	mg/l	min	2.50	1.80	2.50	2.50	2.20	1.80	2.620	3.10
		ave	3.61	3.71	3.52	3.52	3.01	2.62	3.472	4.38
		max	4.70	5.60	6.90	6.90	4.10	3.70	5.000	6.90
Ammonia (expressed as N)	mg/l	min	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		ave	0.0000	0.0000	0.0000	0.0025	0.0025	0.0000	0.00100	0.0025
		max	0.0000	0.0000	0.0000	0.0200	0.0200	0.0000	0.00800	0.0200
Nitrites (expressed as N)	mg/l	min	0.0000	0.0000	0.0000	0.0000	0.0015	0.0000	0.00060	0.0015
		ave	0.0000	0.0001	0.0009	0.0017	0.0026	0.0000	0.00108	0.0030
		max	0.0000	0.0015	0.0037	0.0037	0.0037	0.0000	0.00178	0.0037
Nitrates (expressed as N)	mg/l	min	0.50	0.50	0.25	0.25	0.50	0.25	0.790	1.80
		ave	1.91	1.43	0.80	0.66	1.01	0.47	1.169	2.28
		max	2.30	3.60	1.30	1.80	2.20	0.90	1.520	3.60

Parameter			1995	1996	1997	1998	1999	min	average	max
Aerobic germs in drinking water	No/100ml	min	0.00	0.00	0.00	0.00	0.00	0.00	2.000	10.00
		ave	4.17	7.50	3.33	5.00	8.33	0.00	5.667	15.00
		max	10.00	20.00	10.00	10.00	50.00	0.00	16.000	50.00
Coliform germs in drinking water	No/100ml	min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		ave	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		max	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00